

# *THE STRUCTURE AND RESILIENCE OF THE FINANCIAL SYSTEM*



Reserve Bank of Australia



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## *THE STRUCTURE AND RESILIENCE OF THE FINANCIAL SYSTEM*

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Reserve Bank of Australia

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# Table of Contents

## Introduction

Christopher Kent and Jeremy Lawson 1

---

## Change and Constancy in the Financial System: Implications for Financial Distress and Policy

Claudio Borio 8

*Discussant: Jan Brockmeijer* 36

## Risk and the Transformation of the Australian Financial System

Chris Ryan and Chris Thompson 38

*Discussant: Saul Eslake* 76

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## The Rise in US Household Indebtedness: Causes and Consequences

Karen E Dynan and Donald L Kohn 84

*Discussant: Chris Carroll* 114

## The Rise of Household Indebtedness

Christopher Kent, Crystal Ossolinski and Luke Willard 123

*Discussant: Jack Selody* 164

## Finance and Welfare States in Globalising Markets

Giuseppe Bertola 167

*Discussant: Guy Debelle* 196

---

## Banks, Markets and Liquidity

Franklin Allen and Elena Carletti 201

*Discussant: Mathias Drehmann* 219

## Innovation and Integration in Financial Markets and the Implications for Financial Stability

Rob Hamilton, Nigel Jenkinson and Adrian Penalver 226

*Discussant: Jonathan Fiechter* 251

## Banking Concentration, Financial Stability and Public Policy

Kevin Davis 255

*Discussant: Ian Harper* 285

|   |     |
|---|-----|
| <b>Regulatory Challenges of Cross-border Banking: Possible Ways Forward</b>             |     |
| Stefan Ingves   | 290 |
| <i>Discussant: Grant Spencer</i>  | 297 |
| <b>The Evolution of Risk and Risk Management – A Prudential Regulator’s Perspective</b> |     |
| John Laker  | 300 |
| <i>Discussant: Jenny Corbett</i>  | 318 |
| <hr/>   |     |
| <b>Wrap-up Discussion</b>   |     |
| Avinash D Persaud   | 324 |
| Philip Lowe   | 332 |
| <hr/>   |     |
| <b>Biographies of Contributors</b>  | 340 |
| <hr/>   |     |
| Glossary: Alphabetical List of Selected ISO Country Codes                               | 348 |
| List of Conference Participants   | 349 |
| Other Volumes in this Series  | 351 |
| Copyright and Disclaimer Notices  | 352 |

# Introduction

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Christopher Kent and Jeremy Lawson

The papers in this volume were commissioned with the aim of exploring the significant structural changes in the financial system over the past decade or so and the implications for policy-makers charged with the responsibility of maintaining financial system stability. In many ways these structural changes build on trends that had started in the 1980s in many advanced economies following widespread financial deregulation and the opening-up of capital markets.<sup>1</sup> Financial deepening over the past decade has continued at a rapid pace, with a wide range of new financial instruments and markets, securitisation now a prominent feature of markets in many countries, lightly regulated institutions growing in importance and household balance sheets expanding rapidly. Competitive pressures have intensified in many respects, helped in part by the ongoing globalisation of financial markets and an increasing number of large financial institutions operating across international borders. There have also been important changes in the ways in which financial institutions measure and manage their risks, spurred on by regulatory efforts.

These developments are in the main welcome. There is a general consensus that they have helped to underpin a more efficient allocation of financial capital, reduced the costs for households and corporations to manage their financial affairs and tended to spread risks more widely. There is perhaps less agreement about the implications of these changes for the management of risk and financial system stability more generally. A reminder of some of the uncertainties here was provided by the problems in the United States sub-prime mortgage market and the resulting turmoil in global financial markets that were unfolding at the time of the conference. One concern, for example, is the ability of market participants to assess risks accurately in the face of increasingly complex financial instruments. Weaknesses on this front may contribute to some risks being mispriced, allowing them to build to excessive levels. Another concern is that financial institutions and markets have become more tightly linked, including across countries, with the potential to alter the way in which shocks propagate through the system.

## Overview

The conference opened with Claudio Borio's paper, which describes how technological advances have contributed to the creation of new instruments and markets, the emergence of new players, and tighter links between financial institutions and markets, including across international borders. He argues that the smooth functioning of the system is now more dependent on the availability

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1. Eleven years ago the Bank held its conference on 'The Future of the Financial System' (Edey 1996). Many of the themes identified here were also described as important features of the changes taking place through the decade or so up to the mid 1990s.

of liquidity, and that the way in which problems in the financial system unfold has become more unpredictable as the complexity and scope of the system has increased. However, Borio cautions against placing too much emphasis on what has changed because key features of the financial system remain in place. In particular, there are still pervasive information problems, and the ability to perceive risk accurately and the incentives to manage it prudently remain imperfect, which can lead to excessive risk-taking during good times. Combined with the potential for the financial system to amplify shocks, these shortcomings can lead to financial system instability, whereby financial disturbances adversely affect the real economy.

Borio acknowledges the steady progress that has been made to strengthen financial systems around the world, through better infrastructure (payment and settlement systems, and accounting standards, for example) and minimum capital standards, which provide a buffer against shocks. Nevertheless, he argues that more should be done to limit the excessive build-up of risk by applying prudential 'speed limits'. Examples include adjusting provisioning and margin requirements so as to create some drag during periods of rapid expansion and provide support once risks are realised during less favourable periods. He suggests that to do this effectively will require not only close cooperation between prudential and monetary authorities, but also involve tax authorities and those responsible for setting accounting standards.

Chris Ryan and Chris Thompson complement Borio's paper by describing how the financial positions of Australian households, businesses and financial institutions have changed in recent decades. The authors show that household balance sheets in Australia have expanded significantly since the early 1990s, with housing debt, housing assets and financial assets all growing rapidly. Among financial assets, the strongest growth has been in superannuation and direct equity holdings, suggesting that households are now more exposed to market risks. In contrast to households, business sector gearing has remained moderate and is well below the levels seen in the late 1980s, notwithstanding the more rapid growth of business debt in recent years.

As in many other countries, rapid growth of the financial sector has been accompanied by large changes in the composition of financial institutions' assets and liabilities. For example, Ryan and Thompson show that banks now obtain less funding from retail deposits and more from wholesale markets. The banking sector has also become much more competitive, as evidenced by declining margins and the introduction of many new lending products. In the market for housing loans, this has been spurred by the emergence of mortgage originators (making extensive use of securitisation) and brokers, and the increasing prominence of foreign banks. Overall, the authors are positive about recent changes in the financial system. In particular, they argue that although mortgage portfolios have become riskier, the Australian banking system is healthy enough to cope with adverse shocks and that much of the rise in household debt is attributable to higher-income households with relatively low gearing and moderate debt-servicing requirements. However, they also note that sudden changes in pricing and liquidity may be more damaging than in the past.

## Risk in the Household Sector

Household debt has risen substantially in a range of advanced economies. Karen Dynan and Donald Kohn's paper attempts to identify the factors that explain the rise in indebtedness in the US and assess whether it has increased the responsiveness of household consumption to income and asset-price shocks. Using household level data from successive waves of the Survey of Consumer Finances, the authors argue that financial innovations, increases in house prices and demographic changes have been the most important factors encouraging US households to take on more debt. Financial innovations have made it easier to assess credit risk, facilitating the process of securitising loans and increasing the availability of credit, including to those whose access had previously been limited. The importance of house prices is supported by evidence that most of the increase in indebtedness has been among home owners and that the increase tends to be larger in regions that have experienced larger rises in house prices. In addition, two types of demographic change have supported rising aggregate debt: the baby-boom generation entering their peak years of indebtedness and rising levels of educational attainment, which implies steeper lifetime income profiles. The authors argue that households with larger debts relative to their incomes may respond more to income and interest rate shocks, and that financial innovations that increase the availability of credit can increase the vulnerability of inexperienced borrowers. At the same time, however, the greater availability of credit and increases in net worth are likely to have made it easier for households to smooth their consumption through adverse shocks.

The paper by Christopher Kent, Crystal Ossolinski and Luke Willard explores similar themes to that of Dynan and Kohn, but from a cross-country perspective. They show that aggregate debt-to-income ratios have tended to rise more in those OECD countries with flexible financial markets; larger rises in house prices; larger declines in inflation and unemployment; and larger falls in macroeconomic and nominal mortgage rate volatility. The authors then present simulations based on an overlapping generations set-up with binding credit constraints to explore the relative strength of various explanatory factors. The results suggest that for countries where maximum repayment ratios are important features of credit constraints, lower inflation has been a key factor boosting indebtedness, though the bulk of this effect should have run its course by now. Lower unemployment and a willingness to refinance loans and hold debt for longer may also have played a role, along with the more recent relaxation of lending standards in a number of countries.

Kent *et al* also examine the implications of rising indebtedness for vulnerability, assuming that household decisions regarding debt are made optimally with regard to factors affecting risk. If the probability of adverse shocks is unchanged, an easing in credit constraints would lead unambiguously to an increase in vulnerability; this may nevertheless be welfare-improving if credit constraints had been unduly restrictive. In contrast, a decline in the probability of adverse shocks has two opposing effects. On the one hand, households are less vulnerable to adverse shocks for unchanged levels of debt. On the other hand, this creates the incentive to borrow more, which works to offset the decline in the risk of adverse shocks; the net effect depends on parameter values. Finally, looking beyond the confines of the model, the authors

acknowledge that vulnerability can increase if households and financial institutions are overly optimistic about the true risks they face.

Giuseppe Bertola's paper examines the relationship between the depth of the financial system and household risk from a different angle by asking whether efficient financial markets can substitute for government redistributive policies when countries become more integrated with the rest of the world. He argues that if increasing international economic integration results in greater labour income risk for individuals, then countries that are more open might be expected to have broader redistributive policies. However, he also points out that because financial markets assist households to pool and offset these risks, countries with more efficient financial markets may have less need for redistributive policies. Bertola's econometric results broadly support his thesis; controlling for openness, there is evidence that those countries with more developed financial markets have smaller governments. Bertola concludes that governments should use regulatory policies and supervision to encourage financial market development, particularly in response to increasing globalisation.

## **Financial Institutions and Markets**

Although regulation of the banking sector is pervasive, Franklin Allen and Elena Carletti argue that the market failures that justify this regulation are poorly understood, and hence it is difficult to determine whether public policies can improve on free-market outcomes or what form they should take. The authors postulate that policy-makers' desire to regulate financial markets is explained by their aversion to the high average and tail costs of financial crises. In their discussion of the benefits of regulation, the authors refer to earlier theoretical work that suggests that incomplete markets may result in liquidity to banks being inadequate when it is needed most, forcing them to sell assets in the market. However, because suppliers of liquidity are not compensated for the cost of providing liquidity in states where the demand for it is low, their average profitability can only be maintained if they can acquire assets cheaply when banks need liquidity. Thus, asset prices must be volatile to provide incentives for liquidity provision. Allen and Carletti describe how the problems of financial fragility, contagion and asset-price bubbles are all manifestations of this inefficient provision of liquidity.

Although the authors argue that with incomplete financial markets it may be optimal to regulate bank liquidity and bank capital, the information needed to do this is considerable. Consequently, financial instability may be best dealt with through the provision of liquidity by the central bank. Even so, the authors note that more research of these issues is required to determine optimal policy responses.

In contrast to Allen and Carletti, Rob Hamilton, Nigel Jenkinson and Adrian Penalver take the need for regulation as given and instead examine how regulators should respond to the financial deepening that has taken place in recent years. As with other conference papers, the authors argue that financial innovations have, overall, enhanced welfare. They also point out that financial institutions' risk management practices have been altered by these developments. For example, growth in derivatives

has made it easier for institutions to hedge, diversify and transfer their risks, and innovation has allowed institutions to originate loans without holding them on their balance sheets, which has in turn spread credit risk more widely. However, the authors argue that these changes have not come without some cost. In particular, the incentive to monitor credit risk may become weaker when it is less concentrated, and increasing linkages between national financial markets may increase the likelihood of contagion and make it more difficult to resolve financial crises.

To maintain financial stability in the face of such large changes, the authors make a number of recommendations, including: improving stress testing to better account for the potential for contagion; delivering better capital and liquidity buffers through initiatives such as the Basel II capital standards; strengthening financial infrastructure; and enhancing international financial crisis planning.

To understand the regulatory challenges arising from structural changes, it is also necessary to have an understanding of the structure of the banking sector. Kevin Davis's paper does this by documenting how concentration and competition in the banking sector have changed over the past decade and discussing the implications of these changes for policy-makers. He argues that there has been no cross-country trend in the concentration of the banking sector over the past decade, though the global market share of the largest multinational banks has increased. His reading of the extensive literature is that there is little correlation between concentration and the contestability of banking markets. For example, in Australia, where the four major banks have long had a prominent position in the market, the banking sector appears relatively competitive, in part because of the presence of foreign banks and mid-sized domestic institutions.

This raises the question of whether increasing concentration in the banking sector is likely, and if so, whether it is desirable. Davis's survey suggests there is little evidence that very large banks are more efficient than their smaller counterparts, or that they benefit from economies of scope. Moreover, concentrated markets are not inherently more conducive to financial stability. Indeed, he cites evidence that the restriction of entry and competition may actually reduce stability. Finally, Davis draws out some of the implications of this analysis for Australian policy-makers. On the one hand, he argues that increased competitive pressures may have undermined the original rationale for the four pillars policy, which prevents mergers between the four major banks. On the other hand, he acknowledges that it is difficult to identify substantial benefits from further increases in the size of large banks. Given these uncertainties, he suggests that a review would be beneficial to ensure that the pros and cons of the current policy are carefully evaluated. He also argues that further work is needed to consider a range of other interrelated policies, such as the restrictions on foreign branch participation in the retail market; although if such restrictions are lifted, detailed consideration will have to be given to how depositors should be protected.

## **Regulatory Challenges**

One manifestation of the globalisation of financial markets and lighter banking regulation is the emergence of large banks operating in many different countries. Observing this development in the European Union, Stefan Ingves argues that although cross-border banking stimulates competition, it involves special challenges for regulators. For example, as cross-border banking becomes more important, problems in one country's banking system will be more likely to spill over to other countries. In addition, actions by national supervisors may affect financial stability in other countries. Each of these challenges implies that national financial stability will become increasingly dependent on the activities of banks and authorities in other countries.

Ingves proposes that a European Organisation for Financial Supervision (EOFS) be created to supervise banks with substantial cross-border activities. Initially the EOFS would function as a non-regulatory central bank, conducting macro-prudential oversight and working closely with national supervisory authorities. If successful, the EOFS would eventually assume proper supervisory powers. This would result in a three-layered regulatory structure whereby banks that mainly operate domestically would be supervised by national authorities, regionally oriented banks would be supervised by 'colleges' that cooperate across borders, and the small number of truly pan-European banks would be supervised by the EOFS.

John Laker's paper focuses on the contribution of improvements in risk management practices within Australian banking institutions and regulatory structures to the strength of the banking system over the past decade. He points out that over this period, technological developments (such as electronic commerce) have not only changed the way banks deliver services but also altered the way they manage their risks. For instance, risk management functions within banks are more clearly identified and resourced, and better integrated into their overall operations. In his view, although regulatory initiatives such as the Basel II Capital Framework encouraged improvements, an equally important factor has been the greater sensitivity of boards and senior management to risk.

Although Laker is positive about the overall financial condition of Australia's banking institutions, he also sees a number of important challenges for the future. For example, he recognises that good economic times can erode the incentives for institutions to maintain and improve their risk management practices. More specifically, he argues that although the premise of regulation and economic capital modelling is that managers of banks will be rewarded for acting in the long-term interests of their organisation, in practice incentive structures that reward myopic behaviour could undermine the progress of the past decade. In addition, the move to a principles-based approach to prudential regulation presents new challenges because it can be difficult to judge whether a solution proposed by an institution is consistent with those principles.

## Conclusions

There is no doubt that the financial systems of the advanced economies have undergone a significant transformation over the past decade or so. The papers presented at the conference highlighted a number of important factors driving these changes. In more deregulated markets, competitive pressures and technological changes have driven innovation and reduced the cost and increased the availability of funding; a relatively benign macroeconomic environment also seems to have been a relevant factor supporting both the supply of and demand for credit. Among other things, this has encouraged the rapid expansion of household balance sheets. There was some debate about whether the accumulation of household debt had gone too far. Although most households appear to be in a position to manage the new risks they have taken on, there was support for the idea that there was scope to help households better understand complex financial products.

There was a broad consensus that the financial system has become more efficient overall, and more resilient in a number of respects, though changes that have helped to moderate risks on certain fronts have also encouraged agents to take on new risks. The nature of these new risks and the implications for overall financial stability received substantial attention. It was recognised that much has been done to bolster the measurement and management of risk, including through improvements in regulatory frameworks and financial institutions' internal risk management systems. However, this has not prevented some mispricing of risks, which can, therefore, build up during relatively benign periods. This may in part reflect a natural tendency for procyclical optimism and incentives that tend to focus on short-term results. While these problems are relatively clear, the appropriate policy responses are less so. Some argue for built-in stabilisers and discretionary policies to rein in risk-taking. Others note that this will be difficult because of practical and political concerns including the right balance between monetary and prudential policy, and the overall breadth and depth of regulation more generally. What is clear is that these issues require further research.

The stresses in global financial markets of late were a timely reminder of at least two other issues that are likely to warrant further close attention. The first is how best to ensure sufficient provision of liquidity during times of stress, particularly in light of the apparent strong complementarity between financial institutions and markets. The second is how best to coordinate monetary and prudential policies, both within and across countries, in an increasingly interconnected world.

## Reference

Edey M (ed) (1996), *The Future of the Financial System*, Proceedings of a Conference, Reserve Bank of Australia, Sydney.

# Change and Constancy in the Financial System: Implications for Financial Distress and Policy<sup>1</sup>

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Claudio Borio

## 1. Introduction

Over the past three decades, the financial system has been going through a historical phase of major structural change. And far from slowing down, the pace of change seems to be accelerating. The joint influence of financial liberalisation, breakthroughs in financial know-how and advances in information technology has ushered in an era of extraordinary innovation – an era that may well go down in history as another ‘financial revolution’. Heavily controlled, segmented and ‘sleepy’ domestic financial systems have given way to a lightly regulated, open and vibrant global financial system.

This revolution has been for the good. Financial liberalisation and innovation are critical for a better allocation of resources and long-term growth; the serious costs of financial repression around the world have been abundantly documented. And these forces can justifiably take some of the credit for the so-called ‘Great Moderation’, the current extended phase of low output volatility and low inflation across much of the world.

At the same time, this revolution, as for all its predecessors, has not been without costs. Like rare storms interrupting long periods of tranquillity, episodes of financial distress, sometimes with serious macroeconomic costs, have emerged (Bordo *et al* 2001; Hoggarth and Saporta 2001). The past decade has indeed been a period of tranquillity. Not least, despite a world-wide boom and bust in equity prices in the late 1990s–early 2000s, the financial system has proved robust and remarkably resilient. However, the continuation of this phase should not be taken for granted.

The key policy challenge is to maximise the benefits of financial liberalisation and innovation while minimising their potential costs. What does this mean for the authorities with responsibilities for financial stability? By analogy with risk management practices at the level of individual institutions, heuristically the task can be thought of as limiting the expected output costs of financial distress, as determined by the likelihood of their occurrence multiplied by the loss given their

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1. This paper was drafted before the market turbulence in August that followed strains in the US sub-prime market as described in BIS (2007b). It was not updated to take those events explicitly into account. I would like to thank Philippe Hainaut for excellent statistical assistance and Bill White, Frank Packer and Kostas Tsatsaronis for their comments. The views expressed are my own and do not necessarily reflect those of the Bank for International Settlements.

occurrence. And it means doing so in such a way as to not undermine the benefits of liberalisation and innovation for economic growth.

This is clearly a tall order. In particular, it requires a lot of judgment about trade-offs that are very hard to specify, given the state of our understanding of the behaviour of the financial system and of its interaction with the macroeconomy. This judgment is particularly hard to make at a time when the financial system is undergoing such profound structural change.

Against this background, the objective of this paper is twofold. First, it is to explore how the financial revolution under way might be altering the dynamics of financial distress.<sup>2</sup> The main focus here is on the past decade, although clearly the period largely saw the strengthening of trends that had started much earlier, and on advanced industrialised countries, where these trends have been more visible. Second, it is to identify the key challenges for policy-makers with responsibilities for financial stability and to suggest broad guidelines for policy action.

This objective is both ambitious and limited at the same time. It is ambitious because some of the issues raised are quite controversial. It is limited because the paper does not seek to make an overall judgment on whether the changes in the financial system have, on balance, increased or reduced the expected losses associated with financial distress.

One basic thesis underlies the paper. Undoubtedly, the major structural changes experienced by the financial system do have implications for the dynamics of financial distress and for the design of policy. However, despite these changes, some fundamental characteristics have not changed. And it is precisely these characteristics – what has not changed – that hold the key to the dynamics of financial instability and hence to the appropriate policy responses to it. These characteristics relate to the basic nature of financial relationships, to risk perceptions and incentives and to powerful feedback mechanisms that operate both within the financial system and between the financial system and the macroeconomy. They jointly imply that the primary cause of financial instability has always been, and will continue to be, overextension in risk-taking and balance sheets; that is, the occasional build-up of financial imbalances that at some point unwind, inflicting damage on the economy.

This view has implications for policy. The objective would be to anchor the policy response on the more enduring characteristics of the dynamics of financial instability while at the same time tailoring it to the changing profile of the financial

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2. Of course, the term ‘financial distress’ is ambiguous. Roughly speaking, what is meant here are situations in which financial institutions fail or nearly fail and/or markets seize up, leading to broader systemic disruptions with potential material costs for the real economy. The definition is intended to capture banking crises (such as those in the Nordic countries, Japan and Asia in the late 1980s and in the 1990s) as well as episodes of serious market strains, such as those surrounding the Long Term Capital Management (LTCM) failure in 1998. It would exclude large fluctuations in asset prices and/or major retrenchment of spending by households and corporations to rebuild balance sheets unless accompanied by the other symptoms. Admittedly, however, these phenomena could, by themselves, have serious macroeconomic implications and tend to be driven by similar factors to those that underlie the dynamics of financial distress. Their policy implications would be similar.

system. Using an analogy with policy towards road safety, it could be argued that policy has so far largely focused quite effectively on improving the state of the roads and introducing buffers (guard-rails, car bumpers and safety belts). More attention, however, could usefully be devoted to the design and implementation of speed limits.

The rest of the paper is organised as follows. Section 2 describes what has changed in the financial system and seeks to draw out the implications for the dynamics of financial distress. Section 3 highlights what has not changed and seeks to identify the comparatively more invariant characteristics of distress. Section 4 explores the policy response in terms of improvements in the state of the roads, the introduction of buffers and the role of speed limits. The conclusion summarises the key points and assesses the prospects for policy action.

## 2. Change in the Financial System

What, then, has changed in the financial system and what are the implications for financial distress?

### 2.1 What has changed

The changes that have taken place in the financial system are well known and can be summarised in various ways. However, for my purposes, I will highlight five such changes and three key corollaries of these.

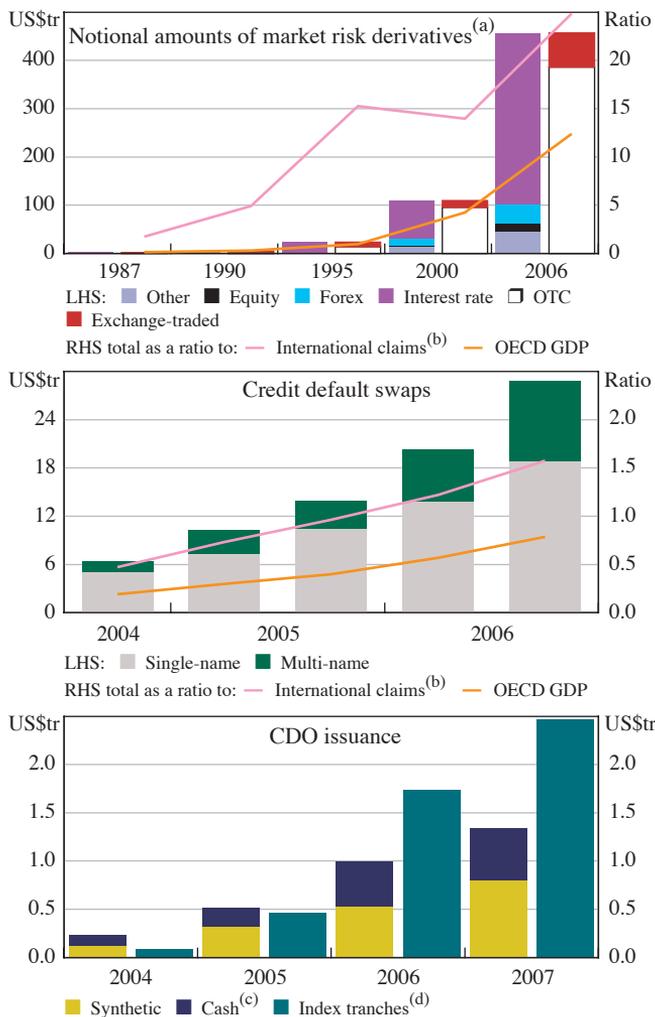
First, we have witnessed what might be called the *atomisation of risk* (Knight 2007).<sup>3</sup> Major advances in financial know-how and information technology have permitted the unbundling and re-bundling of the pay-offs and hence of the risks associated with primitive financial products and securities. This has opened up unprecedented opportunities to create new financial instruments. Derivative products and various forms of structured finance are the primary examples (Figure 1). The first, now apparently so distant, wave of innovation dealt with market risks. It permitted, for instance, the separation of the exchange rate and interest rate risks in a traditional loan or security through derivative instruments, such as exchange rate and interest rate swaps. The more recent, and arguably further-reaching, wave has addressed credit risk. It has been reflected, in particular, in the exponential growth of credit derivatives, such as credit default swaps (CDSs) and varieties of collateralised debt obligations (CDOs) (Figure 1).<sup>4</sup>

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3. References in this paper are largely to BIS work. A more complete set of references is included in the individual studies mentioned.

4. Leverage refers here to the sensitivity of the value of an instrument to a change in underlying risk factors. Embedded leverage is achieved not through explicit borrowing but through the structuring of the instrument itself. This in turn implies that large exposures can be taken with limited need to borrow or fund positions, at least initially. For a discussion of concepts of leverage, see CRMPG (1999) and McGuire, Remolona and Tsatsaronis (2005).

**Figure 1: Rapid Growth of Derivatives Markets**

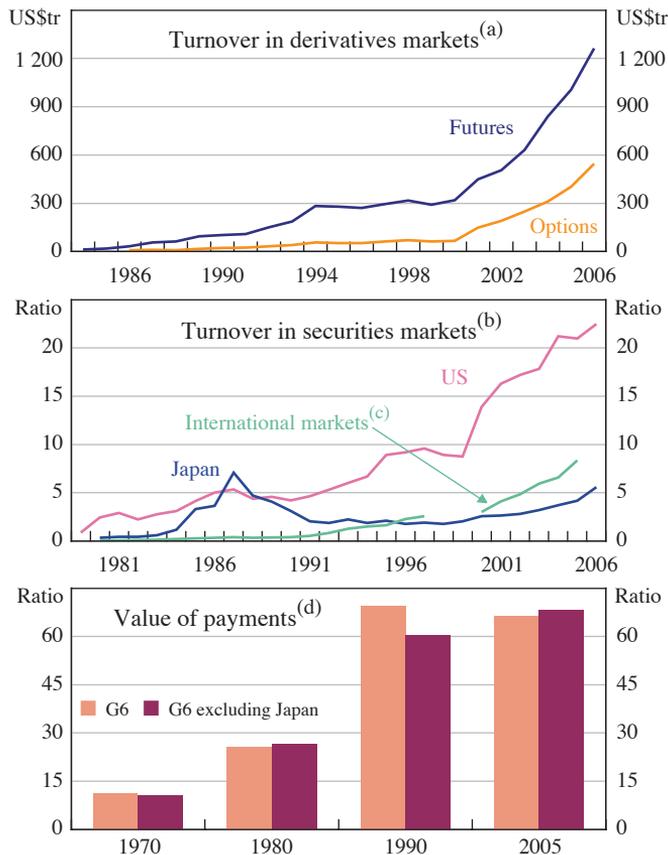


Notes: OTC is over-the-counter. A CDO is a collateralised debt obligation.  
 (a) Break in series between 1995 and 2000.  
 (b) Of BIS reporting banks; cross-border and local foreign currency claims.  
 (c) Sum of cash tranche sizes by pricing date; includes only cash and hybrid structures. Hybrid portfolios consisting mainly of structured finance products different from cash CDOs are excluded.  
 (d) Covers about 80 per cent of index trade volume, according to CreditFlux Data+.

Sources: BIS; CreditFlux Data+; IMF; International Swaps and Derivatives Association, Inc; national data

Second, in a closely related development, we have witnessed the *marketisation of finance*. What can be measured, can be priced; and what can be priced, if sufficiently standardised, can also be traded. Thus, the atomisation of risk has led to a quantum leap in the range of instruments that are traded in markets. It has also facilitated a shift in the business model of traditional intermediaries, such as banks, away from relationship lending towards ‘originate-to-distribute’ strategies, in response to a mixture of regulatory and market incentives. As a result, according to various measures, the size of the markets for instruments that can, at least in principle, be traded in secondary markets has grown in relation to that of less easily tradable

**Figure 2: Surge in Transactions and Payments**



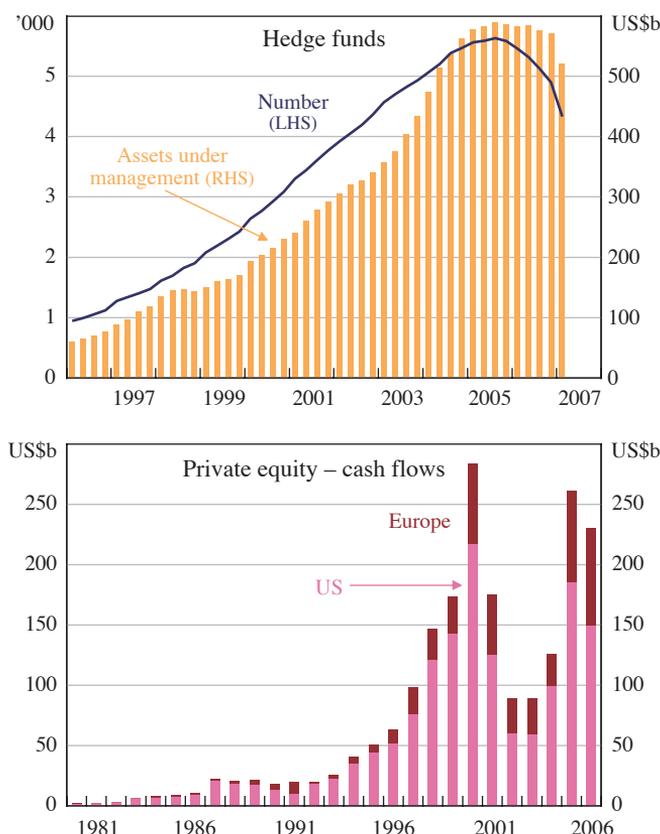
- Notes:
- (a) Financial instruments traded on organised exchanges; notional amounts.
  - (b) Estimates of the annual value of secondary transactions in equities and bonds, as a ratio to GDP.
  - (c) Total transactions settled through Euroclear and Clearstream (Cedel prior to 2000) as a ratio to GDP in the G10 economies.
  - (d) Payments through the main interbank funds transfer systems in operation in the years shown; ratio of the annual value of funds transferred to GDP. G6 = weighted average of France, Germany, Italy, Japan, the UK and the US, based on 2000 GDP and PPP exchange rates.

Sources: BIS; Cedel; Clearstream; Euroclear; national data

instruments such as loans. Likewise, the volume of transactions has grown enormously in relation to GDP (BIS 1994; Figure 2).

Third, we have witnessed a *new configuration of players* in the financial system along three dimensions. There has been a blurring of distinctions among different types of financial intermediary. The atomisation of risk, the marketisation of finance and the tendency for financial intermediaries to combine different types of business have made it harder to draw clear distinctions between previously distinct forms of intermediation. This has been true for quite some time for commercial and investment banking. In recent years it has also been evident in the case of retail banking and insurance, as the two industries have eagerly competed for the savings of an ageing, richer and more self-reliant retail investor alongside, or as part of a blossoming asset management sector (for example, CGFS 2007). There has been greater consolidation, both within and across business segments. In particular, a set of so-called large complex financial institutions (LCFIs) have strengthened their role at the core of the financial system, both with respect to traditional on-balance sheet intermediation and the functioning of markets (G10 2001). And there has been

**Figure 3: The Rise of Hedge Funds and Private Equity**

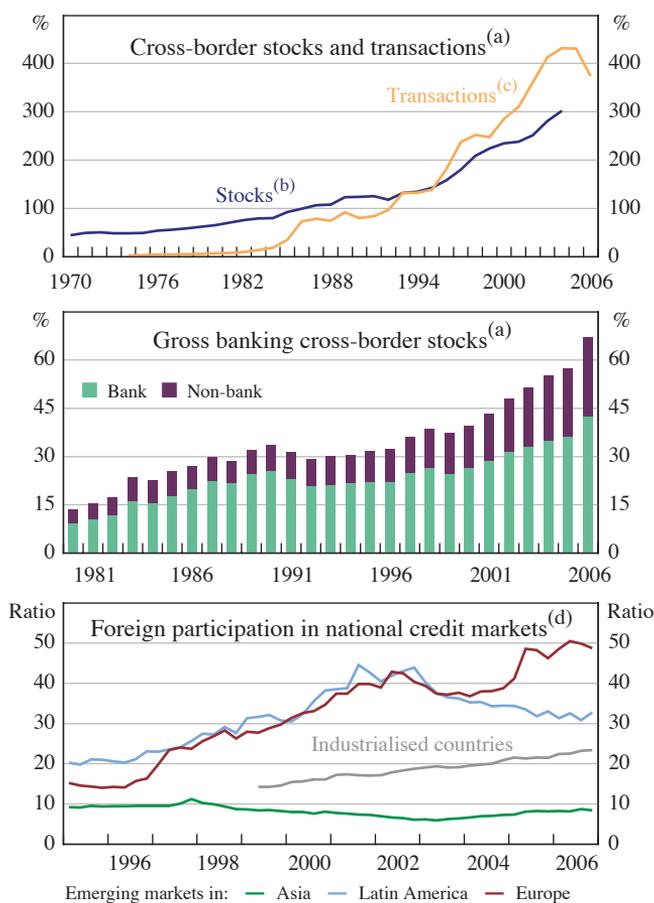


Sources: BIS; Hedge Fund Research, Inc.; Thomson Financial

a rapid growth of new financial players. In recent years, hedge funds and private equity firms have received particular attention (Figure 3). Hedge funds have become a particularly attractive outlet for the savings of retail and institutional investors, dominate trading in a broad spectrum of financial markets and now represent a major source of income and profits for commercial and investment banks (Banque de France 2007). Private equity firms have been fuelling a major wave of leveraged mergers and acquisitions that, at least in terms of the size of the deals, is dwarfing that of the 1980s.

Fourth, we have witnessed the *globalisation of finance* (Figure 4). Cross-border financial linkages have greatly expanded. Financial intermediaries have extended

**Figure 4: Finance Goes Global**



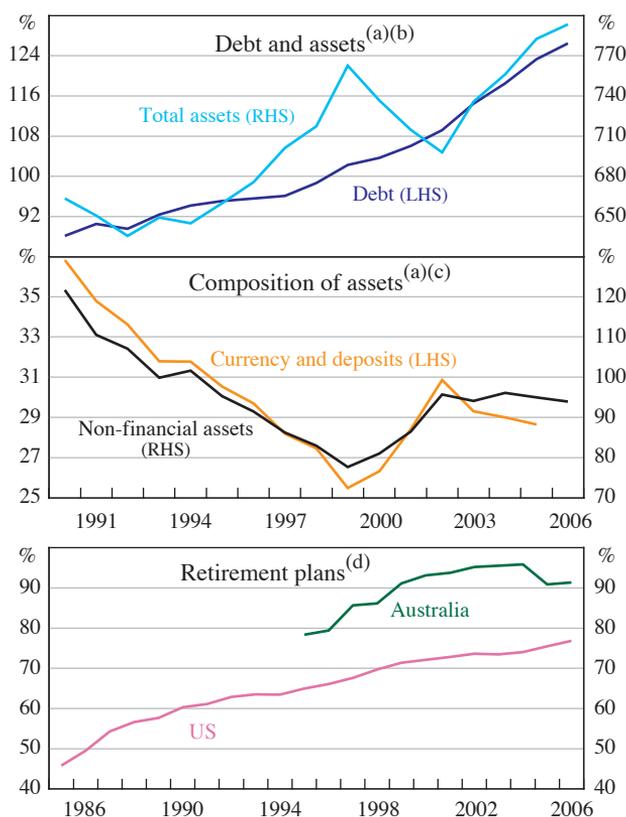
- Notes: (a) As a per cent of GDP.  
 (b) Sum of external assets and liabilities for 22 industrialised countries.  
 (c) Gross purchases and sales of bonds and equities between residents and non-residents; G7 countries excluding the UK.  
 (d) By residence of borrower. Foreign credit (sum of cross-border credit and local credit in local currency by foreign banks) as a share of total lending to non-bank borrowers.

Sources: BIS; IMF; Lane and Milesi-Ferretti (available at <<http://www.imf.org/external/pubs/cat/longres.cfm?sk=18942>>); national data

their international operations, through both the cross-border provision of services and the location of offices abroad (CGFS 2004; BIS 2007a). In addition, cross-border portfolio investments have become increasingly popular. As a result, the stock of international assets and liabilities has grown sharply in relation to GDP.

Finally, we have witnessed a *transfer of risk to the household sector* (BIS 2005; IMF 2005; Ferguson *et al* 2007). Of course, there is a sense in which the household sector has always been the final repository of all risk. But households have now become more directly responsible for the management of financial risks than before, with fewer layers in between (Figure 5). The most visible manifestation of the shift is that a larger proportion of household assets are now held in the form of instruments more vulnerable to market risk, not least as the share of deposits has fallen. The share of home ownership has tended to rise and balance sheets have

**Figure 5: Financial Risk has Shifted to the Household Sector**



Notes: (a) Weighted average of France, Germany, Italy, Japan, the UK and the US, based on 2000 GDP and PPP exchange rates.  
 (b) As a per cent of disposable income.  
 (c) As a per cent of financial assets.  
 (d) Defined contribution, as a per cent of total.

Sources: BIS; OECD; national data

grown significantly, including an increase in both debt and assets in relation to current incomes. A number of factors have combined to produce this result. One longer-term, structural factor has been the shift away from defined benefit towards defined contribution pension schemes (CGFS 2007). Another has been government policies aimed at raising the share of owner-occupied housing, together with a weakening of financial constraints associated with financial innovation and greater competition in the financial sector especially in mortgage markets (CGFS 2006). Yet another, more conjunctural, factor has been the nature of the global economic expansion since the slowdown of 2001, characterised by subdued corporate demand but buoyant household demand, especially on the back of rising residential property markets (BIS 2007a).

A number of corollaries of these structural changes deserve highlighting.

First, the above changes have led to a *growing complementarity between markets and intermediaries* (BIS 2003; Borio 2003a), which ironically have often been seen as alternative forms of arranging financial relationships. Intermediaries such as banks have become increasingly reliant on markets as a source of income and for their risk management, through their hedging operations. Markets in turn have become increasingly dependent on intermediaries for the provision of market-making services and of funding liquidity (such as through credit lines), which underpins their smooth functioning. Correspondingly, given the nature of the instruments traded, counterparty risk – the unwanted stepchild of innovation – has risen in prominence. And the same capital base can ultimately support the operation of both intermediaries and markets.

Second, the changes have greatly *increased complexity* in the financial system. This complexity applies to individual financial instruments. As the slicing and dicing of risks has become increasingly sophisticated in an effort to tailor the products to the demand of ultimate users, the role of models to price the corresponding instruments has also grown. Those models in turn have come to rely on estimates of parameters that are increasingly hard to estimate. Think, for example, of the pricing of certain bespoke tranches of CDOs and of their heavy dependence on statistical assumptions about correlations (see, for example, CGFS 2003; Amato and Gyntelberg 2005; Tarashev and Zhu 2006; and Duffie 2007).<sup>5</sup> In addition, greater complexity also applies to the financial system as a whole. Its various segments have become more tightly interconnected and the linkages across them more opaque.

Third, the *size of the financial sector in relation to the real economy has increased significantly*. This is true whether the financial sector is simply measured by the size of gross assets and liabilities to GDP or, more narrowly, in terms of its value added to GDP. This suggests that the stability of the financial system has become more important for the real economy.

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5. Tranching as a means of tailoring instruments to investors' tastes is now being extended to foreign exchange.

## 2.2 Implications for financial distress

The changes just outlined have several implications for the dynamics of financial distress. Some of these are quite straightforward and uncontroversial. Others are more speculative.

One uncontroversial implication is that financial distress is more likely to involve, as a manifestation and as a key transmission channel, the *evaporation of market liquidity* (Borio 2000, 2003a; Persaud 2003).<sup>6</sup> This is a natural consequence of the development of markets and instruments that are actively traded or that are held in the expectation that, were the need to arise, they could be traded. It also reflects the development of risk management strategies that are built on this premise. More than ever before, the smooth functioning of the financial system is predicated on the assumption that the option to trade can be exercised even under testing market conditions. In other words, it is predicated on the assumption of robust market liquidity.

More controversially, it could be argued that the new financial environment, paradoxically, is more, rather than less, reliant on the availability of funding liquidity. Funding liquidity is critical for the orderly execution of trades and hence for market liquidity too.<sup>7</sup> It can become scarce at times of distress, precisely when it is most needed, as market participants cut credit lines and/or raise margin requirements to defend themselves against counterparty risks. Indeed, just like banks, markets are subject to runs (Borio 2000, 2003a). The mechanisms at work are exactly the same – concerns about credit risks, uncertainty about the creditworthiness of other participants and the drying-up of funding liquidity.<sup>8</sup> In other words, the current financial system is particularly ‘funding liquidity hungry’.

The greater relevance of the evaporation of market liquidity and its link to funding liquidity and counterparty risk has been very much in evidence in some of the most recent episodes of financial distress. The failure of LTCM in 1998 is a clear example of how such financial distress can unfold (CGFS 1999). Similar mechanisms had

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6. Market liquidity is more easily recognised than defined. A working definition is that a market is liquid if transactions can take place rapidly and with little impact on price. So defined, market liquidity has several dimensions. Tightness refers to the difference between buy and sell prices, for example the bid-ask spread in a quote-driven market. Depth relates to the size of the transactions that can be absorbed without affecting prices. Immediacy denotes the speed with which orders can be executed, and resiliency the ease with which prices return to ‘normal’ after temporary order imbalances.
  7. The notion of funding (cash) liquidity should be distinguished from that of market liquidity. Funding liquidity can be defined as the ability to realise (‘cash in’) value, either via the sale of an asset or access to external funding. This is what underpins an institution’s capacity to meet its contractual obligations. In modern financial markets, funding liquidity is best thought of as including not only command over cash and deposits, but also over other instruments that can be used to meet margin calls and hence, effectively, settle transactions (most commonly government securities).
  8. Recent academic work has begun to model the interactions between funding liquidity constraints and market liquidity (see, for example, Brunnermeier and Pedersen 2007 and, for a survey, Shim and von Peter 2007). To the best of my knowledge, however, the key role played by counterparty risk has not yet received attention.

already been present in the case of the failure of Drexel Burnham Lambert in 1990, given its critical market-making role in the high-yield securities segment.

A second uncontroversial implication is that financial distress is more likely to have *far-reaching cross-border effects*. This is a natural consequence of the tighter cross-border linkages that have taken shape. Such effects are almost guaranteed if distress involves one of the LCFIs that operate across so many countries and underpin the smooth performance of so many markets. In fact, over 30 years ago, even the failure of a small bank active in foreign exchange transactions, Bankhaus Herstatt, was sufficient to have significant cross-border ramifications – so significant as to act as a catalyst for the establishment of the Basel Committee on Banking Supervision. The knock-on effects of distress at one of the current large global players would obviously score much higher on the Richter scale.

A third uncontroversial implication is that *new players* are now more likely to be at the origin of financial distress and/or to contribute to amplifying it. This is so quite apart from whether, on balance, they make the financial system more or less resilient. The experience of LTCM is a clear example of this possibility. Similarly, one might envisage a scenario in which the failure to refinance a large leveraged deal, or a number of such deals, funded with private equity could generate broader strains, through the materialisation of the inventory risk associated with bridge financing.

A fourth implication is that the increased complexity and opacity within the financial sector may make the dynamics of distress *more unpredictable*. On the one hand, it makes it harder to assess exactly where risk is located and how strains might propagate across the system. On the other hand, the tighter interconnections make it more likely that the strains that do materialise will be more far-reaching than in the past.

A final, more speculative implication is that the transfer of risk to the household sector may have lengthened the time lag between the build-up of embedded risk in the financial system and its overt emergence – the *'longer fuse'* hypothesis. This is because the link is more indirect. True, credit intermediaries and investors through markets have been very active in the financing of the household sector. And the recent signs of market strains in the case of the US sub-prime market attest to the potential losses involved. Even so, the direct exposures appear more manageable than the lumpier ones vis-à-vis the corporate sector, historically a more important source of stress. At the same time, the indirect exposures, through the impact of households' retrenchment on the macroeconomy, can potentially have more serious effects but would inevitably take longer to materialise.<sup>9</sup>

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9. The transfer of risk to the household sector has also raised important concerns regarding households' ability to assess and manage the corresponding risks (see Ferguson *et al* 2007 and Shiller 2007). Delayed recognition of the true extent of the liabilities facing households, given their very long-term nature, could be another factor lengthening the fuse of the emergence of problems. In addition, the transfer of risk to the household sector, together with the rise in prominence of LCFIs, is likely to increase the politicisation of the handling of any financial crisis that might emerge as well as of its consequences (Kapstein 2006).

### 3. Constancy in the Financial System

But much as the financial system has changed, the basic mechanisms that underlie its functioning have remained constant. While the recognition of change adds to our understanding of financial distress, the recognition of what remains constant should represent the core of that understanding.

#### 3.1 What has not changed

From the perspective of the dynamics of financial distress, four constant elements deserve highlighting. The first two relate, respectively, to micro and macro characteristics of the financial system; the last two, to characteristics of human behaviour. Together, they provide a specific perspective on how distress arises and propagates (Borio 2003b).

The first element concerns the *asymmetric information* problems that plague financial relationships. At the core of any financial relationship is the transfer of claims on resources across agents that do not have access to the same information. This is true regardless of whether the main function of the financial system is thought of as shifting current resources from savers to investors or as allocating risks across agents and over time. For instance, borrowers and managers have better information about how they plan to use the funds under their control than do the external financiers that provide them. Counterparties to a trade are very much in the same situation. Conflicts of interest are endemic in the transfer of control over these resources. Financial contracting is designed to address these issues, which arise regardless of whether the transfer occurs through intermediaries or markets. Think, for instance, of the principal-agent problem and potential conflicts of interest that arise in the underwriting of securities or in the off-loading of assets from balance sheets (Duffie 2007; Hellwig 2007).<sup>10</sup>

Indeed, the distinction between intermediaries and markets is in many respects an artificial one. As Hellwig (2007) correctly reminds us, the markets in real life are a far cry from those postulated in an Arrow-Debreu world. The presence of counterparty risk, in effect ruled out in such a world, is probably the clearest symptom of such a difference.<sup>11</sup> Partly as a result, the line between what can and cannot be traded in the market is a fine one indeed, and varies depending on economic conditions. The bottom line is that changes in the financial system may affect the nature and contours of asymmetric information problems. They do not, however, eliminate them.

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10. In this context, a recent form of potential conflict of interest concerns rating agencies, which act as both advisers to issuers and raters for structured finance products, such as CDOs; see for example CGFS (2005). More generally, agencies have now become very active vendors of credit risk measurement products.

11. Strictly speaking, since 'states of the world' are a complete description of outcomes, the failure of a counterparty to fulfill his/her obligation could be included as one of these outcomes. But the more substantive point is that such a contingency would not result in a revision of trading plans since it would be insured away in complete markets.

The second element concerns the powerful *positive feedback mechanisms* that operate within the financial system in the aggregate as well as between the financial system, on the one hand, and the real economy, on the other. A well-known example within the financial sector is the potential self-reinforcing process that links profitability, revealed risk appetite, asset prices, short-term volatility and market liquidity. For instance, higher profits induce greater risk-taking, which tends to raise asset prices and, given its well-documented directional nature,<sup>12</sup> reduce short-term volatility as well as improve market liquidity. Another well-known example is the similar self-reinforcing process that links the availability and terms on external financing, asset prices and output.<sup>13</sup> The familiar financial accelerator mechanism highlighted in the economic literature is but one such illustration (see Bernanke, Gertler and Gilchrist 1999).<sup>14</sup>

This observation points to a special characteristic of the financial sector relative to other sectors of the economy (Borio and Crockett 2000). In other sectors, increases in supply tend to reduce the corresponding prices. For example, as more cars are produced, their price will tend to fall. The adjustment in the price will naturally equilibrate the market. In the financial sector, this is not necessarily the case, at least in the short run. Given the critical role that the sector plays in the economy and the positive feedback mechanisms at work, increases in the supply of funds (for example, credit) will, up to a point, create their own demand, by making financing terms more attractive, boosting asset prices and hence aggregate demand. In a sense, a greater supply of funding ultimately generates additional demand for itself.

The third element relates to *limitations of risk perceptions*. As extensively argued and documented elsewhere (Borio, Furfine and Lowe 2001), for a number of reasons it seems much harder to measure the time dimension than the cross-sectional dimension of risk, especially how risk for the financial system as a whole evolves over time. In fact, market indicators of risk, such as risk premia, tend to be comparatively low precisely before the peak of the financial cycle, when, in retrospect at least, it turns out that risk was highest. As Greenspan (2005) so aptly put it, ‘... history has not dealt kindly with the aftermath of protracted periods of low risk premiums’.

The fourth element relates to *limitations of incentives*. In particular, actions that are individually rational and compelling may not result in desirable aggregate outcomes. Familiar economic notions such as herding, coordination failures and prisoner’s dilemmas are obvious examples of the genre. For instance, is it rational for a bank manager to trade off a sure loss of market share in a lending boom by being cautious against the distant hope of regaining it in a future potential slump? Or is it reasonable to expect a risk manager not to retrench at times of market distress

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12. For equity markets, see Schwert (1989); for bond markets, see Borio and McCauley (1996).

13. These processes are inherently non-linear, and, together with non-linearities in the pay-offs of individual instruments and trading strategies (for example, carry trades, the provision of insurance, etc), can generate the impression of calm even as underlying vulnerabilities build up (Knight 2007). See also Rajan (2005) on the issue of tail risk.

14. See also Adrian and Shin (2007) for a recent formalisation of some of these mechanisms along somewhat different lines.

simply because, if everyone did the same, a vicious circle of deepening financial stress could be avoided? More generally, it is not uncommon to hear market participants note that risks are indeed under-priced in markets but that, for them, leaving the market would be more costly than staying in.<sup>15</sup>

With these two types of limitations, short horizons play a key role. It is easier to extrapolate current conditions if the forecasting horizon is short. As plenty of empirical evidence confirms, mean reversion in expectations is a property of longer horizons (Frankel and Froot 1990). Similarly, longer horizons could at least reinforce some of the reputational effects that might limit the influence of limitations of incentives. In turn, short horizons can reflect rational contract terms aimed at addressing some of the principal-agent problems endemic in finance noted above, with possibly unintended consequences in the aggregate (Rajan 1994, 2005). The tendency to monitor and judge performance on a frequent basis is one such example.<sup>16</sup>

### 3.2 Implications for financial distress

The four elements just outlined underpin what is the most classic source of financial distress – overextension in risk-taking and balance sheets in good times, masked by the veneer of a vibrant economy. This overextension generates financial vulnerabilities that are seriously exposed only once the economic environment becomes less benign, in turn contributing to its further deterioration. The risk that builds up in good times simply materialises in adversity. The build-up and unwinding of financial imbalances is what can be termed the potential ‘excessive procyclicality’ of the financial system (Borio *et al* 2001; Goodhart 2004). The term, in fact, is nothing but a more modern way of denoting those processes that, nuances aside, long-standing observers of financial instability such as Kindleberger and Minsky had already extensively and colourfully discussed in their writings (Minsky 1982; Kindleberger 1996).

To be sure, given the presence of positive feedback mechanisms, the financial system has a number of natural procyclical elements. This is part of its physiology. Excessive procyclicality refers to the pathological manifestation of the same processes. It refers to those episodes in which, given the limitations of risk perceptions and incentives, the processes go too far, sowing the seeds of subsequent financial instability *with*

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15. As Charles Prince, Citigroup’s Chief Executive Officer, vividly put it: ‘... as long as the music is playing, you’ve got to get up and dance’ (‘Citi Bullish on Buy-Out Boom’, *Financial Times*, 10 July 2007, p 15).

16. It is, of course, often exceedingly hard in practice to distinguish between the roles of incentives and risk limitations. The search for yield which has been under way in markets in recent years provides some telling examples (BIS 2007a). It has been known for some time, for instance, that ratings of structured products can be misleading if taken as sufficient statistics for the corresponding credit risk by simply extrapolating from those of corporate bonds. Specifically, even if the expected (average) loss associated with them may be the same, the unexpected loss (tail of the distribution) can be considerably higher (for example, CGFS 2005). After all, this is precisely one reason why the yields on them tend to be higher. It is hard to tell, however, to what extent investments in these products reflect conscious attempts to seek higher yields in full recognition of the higher risks or, possibly, an underestimation of those risks.

*potentially serious macroeconomic costs*. The financial system turns into a shock amplifier.<sup>17</sup> Such episodes have tended to be irregular and infrequent, not occurring every business cycle. By their very nature, the build-up of financial imbalances takes considerable time and requires a conjunction of favourable circumstances.

Analytically, a key implication of this view is that any model of financial instability should have three key properties (Borio 2003b). It should be dynamic, not static. It should incorporate in a meaningful way the interactions between the real economy and the financial system. And it should pay close attention to the endogenous nature of the processes through which financial imbalances build up and unwind. The exogenous shock, if any, that finally triggers distress is the least interesting part of the story. Financial instability is not like a meteorite strike from outer space; it is more like the result of the sudden release of the pressures that build up owing to the shifts in the tectonic plates of the planet.<sup>18</sup>

## 4. Policy

This view of financial instability also has significant implications for policy. For one, it suggests that thinking of the challenge simply in terms of ensuring that the financial system is resilient to *exogenous* shocks, while useful, is not the complete story. For the characteristics of the financial system may also help to *generate* those shocks, not just passively absorb or amplify them. More specifically, if the problem is one of overextension in good times then at least part of the answer is to find ways of keeping that overextension in check. As always, prevention is better than cure. The challenge, therefore, is to design a policy response that addresses this constant feature of financial instability while at the same time tailoring it to the evolving profile of the system.

What does this mean in practice? In thinking about possible strategies, an analogy with the design of policies towards road safety can be helpful. A holistic policy does not just involve ensuring that (i) the *state of the roads* is fine and (ii) there are sufficient *buffers* to limit the damage of any accidents that do occur. Importantly, it also involves ensuring that (iii) the speed is not excessive given the design of the system, the characteristics of the cars that travel on it and traffic conditions (the '*speed limits*' question).

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17. For an alternative analytical perspective on the conditions under which the financial system can act as a shock absorber or amplifier, see Allen and Carletti (2007).

18. Seen from this perspective, the changes that the financial system has been experiencing are a double-edged sword. On the one hand, financial innovation has allowed for the possibility of a better distribution of risk, more widely dispersed and held by those that are more willing and better able to manage it. As a result, the financial system could be more resilient than in the past and it would be easier to smooth real spending patterns in the event of external 'shocks'; certainly, the experience since the late 1990s can support this conclusion. On the other hand, the increased ability to obtain external funding and/or to economise on it, via derivative instruments, has also made it easier to hold leveraged positions while growing competitive pressures may have added to the incentive to take on risk. This could accommodate the build-up of financial imbalances more easily than in the past, and hence also be a source of 'shocks' to the system (see below). The jury is still out on this.

On balance, an assessment of the policies implemented to date suggests that a lot of very good work has been done in the first two areas; arguably, however, the third could benefit from more attention. To continue the analogy, the point is not that the maximum speed should be invariant with respect to the state of the roads and the buffers in place. On the contrary, one reason for improving conditions in these two areas is precisely to support higher speeds! Better risk measurement should to some extent allow more risk-taking. Rather, it is that beyond a certain point, higher speeds (in part induced by an increased sense of safety) could undo the good progress made in the other areas.<sup>19</sup>

While the mapping between policy initiatives and the three areas is not perfect, what follows elaborates on this assessment based on the proposed taxonomy. The objective is not to provide a comprehensive evaluation of the policies implemented in recent years. It is simply to add sufficient ‘flesh to the bones’ through some illustrations so as to clarify the main concept. In the process, the analysis also highlights how the calibration of policy action has been tailored to the evolution of the financial system as well as some of the challenges it has faced.

#### 4.1 State of the roads

The policies that best fit the analogy under the heading of ‘improvements in the state of the roads’ are all those that aim at limiting the likelihood of accidents by strengthening the financial infrastructure.

The neatest example is the extensive work done to strengthen *payment and settlement systems*. Over the years, major efforts have been made to improve their architecture and risk characteristics, notably through the introduction of Real-Time Gross Settlement (RTGS) systems, and by promoting the implementation of Delivery-versus-Payment for securities and of Payment-versus-Payment for foreign exchange transactions, such as through CLS Bank (Borio and Van den Bergh 1993; BIS 1994; Borio 1995; Galati 2002). The central bank Committee on Payment and Settlement Systems (CPSS) has been instrumental in these efforts. More recently, the steps taken to improve confirmation and settlement in over-the-counter credit derivatives deserve highlighting, with the official authorities playing a key catalytic role (Geithner 2006). This was another area in which the infrastructure risked lagging behind business imperatives.

Another example includes the major efforts made to develop a set of agreed *international financial reporting standards* (Crockett 2002). As highlighted by the Asian crisis and the high-profile failure of Enron, reliable accounting standards are an important pillar of the financial infrastructure. Substantial progress has been made in this area. At the same time, it has not always been easy to reconcile the perspective of accountants and those of prudential authorities, given the tension between the objectives of providing an ‘unbiased’ picture of the condition of the

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19. The mechanism is analogous to the well-known ‘safety belt’ effect, whereby the introduction of safety belts could induce drivers to be more careless, possibly even leading to more casualties among innocent bystanders (Peltzman 1975).

firms and of instilling prudence into their behaviour. Likewise, ensuring consistency between accounting standards and principles of good risk management has proved to be a challenge (Borio and Tsatsaronis 2006; see also below).

## 4.2 Buffers

The term ‘buffers’ is here intended to apply to all those policies aimed at limiting the risk that a shock, such as a major fall in asset prices or an economic downturn, could lead to financial distress. The corresponding measures can either be *ex ante* or *ex post*.

A natural example of *ex ante* buffers relates to *minimum capital standards*. In fact, nowadays the standards are calibrated precisely to cover all losses up to a given level such that the probability of failure within a particular horizon remains suitably low. Since the late 1980s, prudential authorities have made major, and successful, efforts to strengthen minimum capital standards, helping to improve the degree of capitalisation of the industry. Building on the initial Capital Accord, the work done under Basel II to develop and implement the second generation of bank capital standards, much more sensitive to risk, has represented a landmark in this area (BCBS 2006). Similar efforts are proceeding in the insurance industry. Importantly, in order to take into account the blurring of distinctions between different types of intermediary, much thought has been given to greater convergence across sectors. And the demands of financial globalisation have meant that cross-border issues have figured prominently, generating pressure towards international convergence.

*Ex post* buffers involve the various mechanisms to *manage distress* once it arises, containing the damage and/or nipping it in the bud. The mechanisms are quite varied, depending on the nature of the strains and institutional factors. They involve the authorities acting as, *inter alia*, honest brokers, solvency- and liquidity-support providers, and overall coordinators of orderly wind-downs and restructurings. The well-known challenge in this area is to ensure an orderly resolution of the strains without risking sowing the seeds of future problems by weakening financial discipline (that is, creating moral hazard).<sup>20</sup> In other words, the risk is precisely that the buffers may induce drivers to drive faster in the future.<sup>21</sup>

The changes in the financial system have raised two key challenges for the management of distress.

The *globalisation of finance* has highlighted the complications that arise when the distress has an international dimension. As distress strikes, the perspective of national authorities may well diverge, raising daunting questions regarding the incentives and ability to ensure an orderly resolution (see, for example, Goodhart 2004; BIS 2007a). The difficulties are exacerbated by asymmetries in the size of institutions, as when

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20. Early structured intervention has been proposed to limit moral hazard, but its effectiveness in the case of distress at a core LCFI has yet to be proven.

21. See White (2004) for a perspective on the possible ways in which changes in the financial system may be altering the scope of safety nets.

the institution in distress is systemically important in the host country but not in its home base. Considerable, quiet efforts have been made in recent years to address these issues. Whether they suffice, however, is still moot.

The *marketisation of finance* has meant that, compared with the past, the management of distress is more likely to deal with disturbances involving serious dislocations to market functioning. The case of LTCM discussed above is one such example. One open question regards the effectiveness of emergency liquidity provision. Can the indiscriminate provision to the markets, as opposed to the institutions in distress, be trusted to flow to the ‘right’ locations? The LTCM case appears to suggest that it can, at least if supported by more targeted intervention, in that case with the central bank acting as honest broker. Whether this experience can be generalised to intervention that excludes targeted steps is unclear. After all, concerns with counterparty risk may persist if the relevant counterparty does not receive support, possibly inducing a more generalised withdrawal from transactions and a drying-up of market liquidity. In addition, is a generalised infusion more or less likely to generate moral hazard compared with a more targeted one? One view is that it is less likely to do so; Bagehot’s classic prescription was based on this premise. An alternative view is that such indiscriminate infusions may be too blunt, as they lift all boats, supporting also those that may be taking too much risk but are not yet in overt distress.<sup>22</sup>

### 4.3 Speed limits

What about speed limits? At a minimum, a speed limit would act as a restraint on risk-taking, preventing it from moving too far into the danger zone.<sup>23</sup>

One obvious candidate is *better risk measurement and management* at individual institutions. Clearly this is a must, and much has indeed been done. In particular, in banking, Basel II has been instrumental in encouraging improvements and hardwiring best practice. Think, for instance, of the fact that the implementation of the new framework has been delayed in part because banks did not keep historical records of the default experience on their loans. Moreover, great attention has rightly been paid to encouraging improvements in the management of counterparty risk and the potential evaporation of liquidity in markets (CRMPG 1999; CRMPG II 2005).

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22. Moreover, broader and contentious first-order questions arise concerning the longer-lasting implications of adjustments in the *monetary policy stance*, defined as adjustments in policy rates, which may accompany the injection of liquidity. The risk here is misjudging the calibration of the monetary easing and finding it hard to reverse it in a timely manner, with possible untoward longer-term implications for the policy stance (Borio 2003a). The need to take decisions within a very tight time frame and in a state of great uncertainty about the potential consequences of a hands-off approach can easily increase the risk of an over-reaction. For an analysis that stresses the potential moral hazard implications of policy easing, see White (2006a).

23. This notion of speed limits is related to, but is much broader than, the one used by, say, Honohan (1997). In that paper, speed limits refer specifically to limits on (bank) asset/loan growth. Here the term refers to any arrangement that is designed to constrain the build-up of excessive risk in the system (see below).

Stress tests can be quite helpful.<sup>24</sup> This general indirect approach, for instance, has underpinned efforts to address the potential risks raised by hedge funds (BCBS 2000; FSF 2007).

Even so, to the extent that some of the limitations of incentives noted above are not addressed, better risk measurement could act more like a speedometer than a speed limit *per se*. That is, it could be a more accurate gauge of the travelling speed (the amount of risk being taken) rather than a brake slowing it down.<sup>25</sup>

Another obvious candidate is *stronger market discipline*. Again, this is an important area in which much progress has been made. In particular, efforts have focused on encouraging better disclosure of the risk profiles of financial firms. Most recently, here too Basel II has been quite helpful, through Pillar III. Moreover, this is an area in which further improvements could be made, in part using the influence of those that set accounting standards. As extensively argued elsewhere (Borio and Tsatsaronis 2004, 2006), attention has so far concentrated on estimates of expected losses and of the variability in values (such as value-at-risk and, to a lesser extent, stress-test measures). More attention should be given, in particular, to the uncertainty that surrounds point estimates of current values. As marking-to-model becomes more widespread, this type of information is bound to grow in importance, as it is critical to avoid lulling participants, particularly end-users, into a false sense of security. The wide dispersion of valuations of tranches of mortgage-backed securities exposed recently in connection with the strains at some hedge funds have highlighted the relevance of such concerns.

Even so, disclosure is potentially subject to similar limitations to those that affect better risk measurement. In particular, episodes of widespread financial distress suggest that markets are comparatively more effective in exerting discipline on 'outliers' than in limiting generalised overextension. Here, too, a mixture of the limitations of risk perceptions and incentives is arguably at work. The fact that policy-makers' intervention is more likely in the case of generalised distress also plays a role. The problem here is a form of time inconsistency not dissimilar to the one so familiar in the context of monetary policy.

Now, pursuing the analogy, an ideal speed limit would vary with the design of the roads and traffic conditions. This means that it would slow the build-up of vulnerabilities (overextension/financial imbalances) by increasing the resistance to them as they develop (a kind of 'dragging anchor'). By the same token, it would allow the speed to pick up following any strains that do materialise (by 'releasing the drag'). In other words, it would act as a *stabiliser* in both upward and downward

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24. Despite the improvements made, however, stress tests still find it particularly hard to take proper account of liquidity risk and of the interaction between various types of risk (for example, counterparty, market and funding liquidity risks). Ultimately, this results from difficulties in capturing adequately the 'endogenous' dimension of risk, which reflects the implications for asset prices and market functioning of the aggregate behaviour of participants; see for example Borio (2003a) for a detailed discussion.

25. See, for instance, Lowe (2002) for a discussion of the procyclicality of the output of credit risk measurement systems and Borio and Shim (2007) for some elaboration on this point.

phases. Technically, the shadow price of the measures would increase with the build-up of the vulnerabilities and fall as they materialise. This is one distinguishing property of what has elsewhere been referred to as the ‘macroprudential’ approach to financial regulation and supervision (Crockett 2000; Borio 2003b; Knight 2006; White 2006b).

There is, however, an important catch. It is very hard to say what the speed limit should be. For instance, is a boom sustainable or not? Are financial imbalances building-up or is a new sustainable trend in place? And it is very tricky to design the speed limit effectively.

With these reservations firmly in mind, it is still possible to suggest three broad directions for policy that would be consistent with this approach.

The first direction is to give priority to *reliance on built-in stabilisers* over discretionary measures (Borio and Shim 2007). The main reason is that real-time identification of the imbalances is difficult and acting upon it is even more so, given institutional and political economy constraints. The main advantage of built-in stabilisers is that, provided they are related to reasonably robust aspects of the imbalances, they leave less room for policy error. Moreover, once in place, they do not require continuous justification, and hence can act as an effective pre-commitment device. As such, they can relieve pressure on the supervisors not to take action during the boom, given that a tightening of prudential standards would inevitably be seen as going against the manifest view of the markets. Without built-in stabilisers, action could be taken too late, if at all. Finally, the presence of built-in stabilisers can influence private behaviour *ex ante*, encouraging more prudent behaviour. The best analogy here is with built-in stabilisers in fiscal policy.

Several examples spring to mind; all based on reliance on through-the-cycle or stress-test measures. One is statistical loan provisioning, based on loan loss experience over several business cycles (for instance, as introduced by the Bank of Spain). Another is conservative loan-to-valuation ratios, both in terms of size of maximum ratios and the methodology for the valuation of the collateral. Yet another is using inputs based on long-term averages or stress parameters in minimum capital requirements. Think, for instance, of the use of estimates of downturn loss-given-default provided for in Basel II. Similar arrangements can also apply to instruments designed to address market malfunctioning, such as the evaporation of market liquidity under stress. Reliance on through-the-cycle margining practices to address counterparty risk, as noted by Geithner (2006), would be a welcome step.<sup>26</sup>

The second direction is to allow for the possibility of complementing built-in stabilisers with *occasional discretionary measures*. This would serve to reinforce the effect of built-in stabilisers in cases in which it was found appropriate. And it would permit tailoring the policy response to the specific characteristics of the imbalances, which vary in shape and size, such as in terms of the sectors affected. The possible measures range widely, but the basic principle is to tighten the calibration

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26. Another, quite distinct, possibility could be to seek to influence remuneration schedules; see Rajan (2005).

of the various prudential tools or the intensity of the supervisory review if the authorities suspect that imbalances are building up. In banking, Pillar II of Basel II provides the basis for effective action in this context, not least because of the ability of supervisors to make use of the outcomes of stress tests. As described in detail in Borio and Shim (2007), in recent years discretionary measures to address the build-up of financial imbalances have been used more frequently than in the past in many countries.

One prerequisite for effective action along these lines is to be able to measure with sufficient reliability system-wide risk in real time. In recent years, major efforts have been made to improve policy-makers' ability to do so. On the one hand, considerable resources have gone into developing quantitative tools. One set of tools, known as early warning indicators, have sought to provide the basis for assessments of the likelihood of system-wide distress.<sup>27</sup> Another set of tools, known as macro stress tests, have sought to provide estimates of the damage caused to the financial system by large macroeconomic shocks (such as a major recession or a sharp fall in asset prices). On the other hand, more qualitative evaluations of system-wide vulnerabilities are now routinely carried out at the national and international level by central banks, supervisory authorities and international financial institutions. For example, the Committee on the Global Financial System plays such a role at the BIS and its representative in turn participates in similar assessments made by the Financial Stability Forum. These regular monitoring exercises are complemented by tailored studies that evaluate structural vulnerabilities. The Joint Forum (2005) study on the extent of credit risk transfer between banks and insurance companies falls into this category. But despite the improvements made, the results have so far fallen well short of providing a basis for policy decisions that could compare, say, with that which informs monetary policy.

The third direction is to strengthen *cooperation among the relevant authorities* in the development and, where appropriate, implementation of the various policies above. Responsibility for financial stability is quite diffused. It is shared, at a minimum, among prudential authorities, monetary authorities and ministries of finance. In addition, increasingly, the policies pursued by accounting authorities can also have first-order effects.

A few examples may suffice to highlight the tight interconnections between these various policies. Take accounting first. Despite favourable modifications, the international accounting standard for the valuation of financial instruments

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27. Some of this work has also been carried out at the BIS (Borio and Lowe 2002). The key idea behind these real-time indicators is to exploit the basic characteristics of the build-up of financial imbalances. The indicators seek to capture joint excessive asset-price increases and credit growth. The proxies are intended to measure the co-existence of asset-price misalignments with a limited capacity of the system to absorb the asset-price reversal. Misalignments are simply captured by deviations of equity prices and possibly exchange rates from trend; the absorption capacity of the system by similar deviations from trend in the ratio of private sector debt to GDP. In its rating assessments of banking systems and countries, Fitch Ratings has implemented a combination of micro- and macro-prudential indicators, with the macro-prudential component based on this methodology (Fitch Ratings 2005).

(IAS 39) is not easily reconcilable with certain versions of statistical provisioning for loans, traditionally seen by accountants, and indeed securities regulators, as a form of artificial profit smoothing.<sup>28</sup> More generally, as argued in detail elsewhere (Borio and Tsatsaronis 2006), serious thought should be given to the implications of the trend towards fair value accounting for the ‘speed’ of the system and for the design of regulation and disclosure. As regards tax policies, the interaction between taxation and indebtedness or that between taxation and asset booms/busts are well known (G10 2003). Above all, the close nexus with monetary policy should not be underestimated. After all, the availability of, and terms on, funding liquidity are key determinants of the ‘speed’ of the system. To be sure, funding liquidity is partly endogenous, and it naturally behaves procyclically. Procyclicality in perceptions of values and risks, and hence in the ease with which external funding can be obtained, are critical. Even so, monetary authorities retain the ultimate influence on funding liquidity through their setting of monetary policy (Borio 2006).

Support from monetary policy can help overcome one of the limitations of prudential instruments. In a world in which financial technology has greatly increased the scope to avoid prudential restrictions, in which competitive pressures have increased the incentives to do so, and in which so much financial activity is already beyond the reach of supervision, prudential measures (in isolation) may turn out to be a rather blunt tool. By contrast, the monetary policy levers, given their pervasive impact, can be more effective. It goes without saying, of course, that the relative reliance on the two sets of tools would very much depend on various factors, ranging from country-specific institutional characteristics to the precise nature of the financial imbalances and of the broader economic backdrop against which they develop.<sup>29</sup>

## 5. Conclusion

The financial system has been going through a phase of major structural change in recent decades; and far from slowing down, the pace of change seems to be accelerating. The technology for breaking down risk into its elementary components has spawned an extraordinary variety of new instruments and markets. The volume of transactions has surged to unprecedented highs. New players have emerged and gained possession of large parts of the financial territory; others have grown larger and more complex at the heart of the financial system. Functional distinctions between intermediaries have been eroded even as financial intermediaries and markets have become ever more tightly interdependent. Finance has become truly

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28. Alternatively, prudential authorities could make the corresponding adjustment through additional capital charges (Borio and Lowe 2001; Borio and Tsatsaronis 2004). However, this would forego the disciplinary effect that might work through reported earnings, a focus of market attention.

29. The room for manoeuvre of monetary policy could also be seriously constrained. For instance, in a small open economy, a tightening of policy could induce strong capital inflows and put unwelcome upward pressures on the exchange rate. For a more detailed discussion of the coordination between monetary and prudential instruments, including an analysis of actual experience, see Borio and Shim (2007).

global. Households are now more directly responsible for the management of financial risks than ever before. The financial sphere has greatly expanded relative to the ‘real’ economy.

These profound changes have had implications for the potential dynamics of financial distress. Financial distress is more likely to involve the evaporation of market liquidity and to have far-reaching cross-border effects. New players are more likely to be at its origin and/or to amplify it. The dynamics of distress may have become more unpredictable. And the transfer of risk to the household sector may arguably have lengthened the time lag between the build-up of embedded risk in the financial system and its overt emergence.

But the sea changes we have observed should not blind us to what has remained constant. For it is what has not changed that holds the key to the more durable aspects of financial instability. This paper has argued that the main form of financial instability with potentially serious macroeconomic costs has historically been, and continues to be, overextension in risk-taking and balance sheets in good times, masked by the veneer of a vibrant economy, that is, the occasional build-up of financial imbalances that at some point unwind, inflicting damage on the economy. And behind this form of instability hide four enduring characteristics of financial activity and human behaviour, namely: deep-seated and pervasive (asymmetric) information problems in financial relationships; powerful positive feedback mechanisms within the financial system as well as between the financial system and the real economy; limitations of risk perceptions; and limitations of incentives. The sea changes observed may affect the specific manifestation of these elements and their prominence, but should not be expected to alter them in a fundamental way.

This perspective has implications for policy. The challenge is to design a policy response that addresses the more enduring features of financial instability while at the same time tailoring it to the evolving financial system.

In recent years, major progress has been made in strengthening the financial system; even so, there is scope for improving the balance of the different types of policy initiatives. By analogy with policies aimed at improving safety on the roads, it could be argued that policy has so far largely focused quite effectively on improving the state of the roads and on introducing buffers (guard-rails, car bumpers and safety belts), but that more attention could usefully be devoted to the design and implementation of speed limits. In other words, much has been done to strengthen the payment and settlement system infrastructure and accounting standards (‘the state of the roads’). Similar progress has been made in developing minimum capital standards and, with a telling question mark about cross-border arrangements, in articulating crisis management mechanisms (‘buffers’). But more could be done in designing policies that would seek to limit overextension in risk-taking and balance sheets (‘speed limits’). Admittedly, very good work has been done in encouraging improvements in risk measurement and management and in risk disclosures. Even so, given limitations in risk perceptions and incentives, the effectiveness of these steps may not, in the end, fully match expectations.

Ideally, speed limits would become more binding as the risk of overextension increases. Three guidelines could inform their design. First, as with fiscal policy, built-in stabilisers appear, on balance, superior to discretionary measures. This could be achieved, for instance, by calibrating prudential instruments based on experience over whole business cycles or stress estimates. Second, discretionary measures could be deployed to complement built-in stabilisers if and when it was judged appropriate. This could help to tailor the measures to specific features of the overextension. Third, close cooperation between different authorities with responsibility for, or whose policies impinged on, financial stability would be needed. This would involve prudential and monetary authorities in the first instance, but also those who set accounting standards and the tax authorities.

No doubt, designing and implementing effective speed limits is a daunting task. The analytical, institutional and political economy challenges involved should not be underestimated (Borio and Shim, 2007). Introducing such speed limits is part of what elsewhere has been described as strengthening the macro-prudential orientation of supervisory and regulatory frameworks. Despite the challenges, some progress in this direction has been made in recent years. Continuing to follow this route holds out the prospect of edging closer to securing lasting financial stability.

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## *Discussion*

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### **Jan Brockmeijer**

It is a great pleasure to be asked to comment on an excellent overview of the critical issues relevant to financial stability by Claudio Borio. The reason I liked the paper so much is that it drew my attention to what Claudio calls the ‘durable aspects’ of financial instability. For example, when I was vacationing last week, wandering around with the red light on my Blackberry flashing constantly as it kept me updated with news about the turmoil in financial markets, Claudio’s paper forced me to step back from the chaos of the moment and think about the underlying forces that drive such turmoil.

Claudio’s main messages are that many of the market’s current problems were caused by market participants overextending themselves in a favourable economic environment and that the challenge for policy-makers is to do more to prevent financial crises by imposing ‘speed limits’ on the system. This suggestion would take policy-makers into very challenging territory because financial crises are closely related to phenomena such as asymmetric information, positive feedback loops, and limitations of risk perception and incentives that are not easily influenced by policy.

Nevertheless his point is well taken; it is all well and good to have better cars and better roads, but they are of little use if there is an idiot behind the steering wheel. How do you get drivers to slow down and encourage them to take fewer risks? Without pretending to fully understand the events of recent weeks, let me use Claudio’s approach to reflect on some of the possible causes of the sub-prime crisis.

First, it is clear that the enduring features of financial markets described by Claudio have had an important influence on recent events. For example, I agree with Claudio that overextension by households and investors helped to lay the foundations for a crisis. Second, changes in financial markets over the past two decades have amplified the effects of this overextension. For example, financial innovation and globalisation have meant that the crisis has spread more widely and rapidly than it might have in the past.

The question is – how could we have prevented the over-borrowing that took place in the sub-prime mortgage market in the United States, or the underestimation of risk that led to over-investment in some securitised loan products? Let me first look at households. Although Claudio did not dwell long on this issue, I think that we should be concerned about the increasing concentration of risk on household balance sheets. I also think that it would be sensible to impose speed limits in this area. One way of doing this would be to improve financial literacy. For example, the Netherlands Bank recently surveyed Dutch households and found that only around 40 per cent of respondents could answer basic questions about inflation and interest rates. Thus, although improving financial literacy is likely to be an uphill battle, it is definitely worth the effort.

I also think that there is scope to improve consumer protection by improving access to independent advice and ensuring that the vendors of complex loan products are not being paid according to turnover. Looking at my own country, we have

tried to encourage mortgage lenders to enter into a voluntary code of conduct that would require them to consider the risks that borrowers are taking and match loan sizes with households' capacity to pay. Supervisors also have a role here. We have seen several cases in the Netherlands where lenders and financial advisers have sold unsuspecting customers products without notifying them of their true risks. As Claudio mentioned, these factors all work together to create an environment where excessive borrowing takes place and risks to financial institutions also increase.

Turning to the broader issue of risk perceptions and the incentives to manage risk, Claudio was particularly supportive of using built-in stabilisers, such as incorporating estimates of parameters relevant to periods of financial stress into estimates of loss-given default. I agree that this is the best way to go, particularly after the recent turmoil in financial markets. This has implications for the banking book as well as the trading book, where assumptions about liquidity and the price at which contracts can be liquidated need to be scrutinised more carefully.

When it comes to the use of more discretionary prudential measures, as Claudio pointed out, it can be difficult to find the right reference point. For example, it may sound easy to lean against the wind but in practice it is not, especially when policy-makers are imperfectly informed about the mispricing of risk. Here I agree with Claudio that macro stress testing has an important contribution to make, though it too has its challenges. Looking forward I believe that there is much more work that needs to be done before stabilisers can be introduced effectively.

Consistent with the line taken by the Basel Committee, I also think that a longer-term assessment of risk should be further promoted and should be introduced to other regulated sectors such as the insurance industry and pension funds. This is important because these sectors have, in addition to banks, been important players in the market for credit instruments.

But can we rely on prudential stabilisers for currently regulated entities to maintain financial stability? Or should we extend the scope of regulation to other entities such as hedge funds as well? This issue has of course been debated for a long time. Thinking back to the LTCM crisis, the aftermath of that event resulted in the balance of power between banks and hedge funds shifting dramatically toward banks. It also enabled regulators to strengthen counterparty risk management through the Basel Committee, which further strengthened the competitive position of banks. Although hedge funds have reasserted themselves in recent years, I think that the current crisis presents us with another opportunity to incorporate our greater awareness of risk into better regulation.

Let me wind up by emphasising the pivotal roles of central banks and prudential regulators more generally, and the importance of cooperation between them. I have mentioned the possibility of developing prudential stabilisers further, and also broadening the field of regulation. However, such actions would require the agreement of political decision-makers and would benefit from international coordination. In my opinion the International Monetary Fund, given its increased focus on financial sector surveillance, can make a major contribution by placing these longer-term objectives firmly on the agenda in its discussions with national policy-makers. Thank you.

# Risk and the Transformation of the Australian Financial System

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Chris Ryan and Chris Thompson<sup>1</sup>

## 1. Introduction

Financial systems in many countries have experienced tremendous growth and structural change over recent decades. Associated with this have been significant changes in the balance sheets of both households and businesses. While many of the developments have been common across countries, there are some areas in which the changes in Australia have been particularly pronounced. This paper documents the main changes in the balance sheets of households, businesses and financial institutions in Australia and discusses some of the policy issues that arise from these changes.

At the root of many of the changes in the Australian financial system has been the transformation of household balance sheets, of which two aspects stand out. The first is the substantial increase in household indebtedness, with the debt-to-income ratio of the household sector in Australia going from below average by international standards at the beginning of the 1990s, to above average now. The second is the shift in the composition of household financial assets, with a larger share of household savings being invested outside the banking system in assets that are more exposed to market risk, such as direct holdings of equities, superannuation and other managed funds. Taken together, these changes have had a significant effect on the size and structure of the financial system.

The counterpart to the strong growth in borrowing by households for housing is that financial intermediaries now hold an unusually high share of their assets in housing loans. At the same time, the reduction in the household saving rate, and reduced share of savings going into deposits, has been associated with an increased reliance by financial intermediaries on wholesale markets, particularly offshore wholesale markets, for their funding. Whereas foreign borrowing accounted for about 10 per cent of Australian banks' liabilities in 1990, this share has since tripled and is now high by international standards. Banks have also contributed to the rapid growth in the securitisation market, which is now one of the largest in the world.

The increase in household financial assets, and the increasing share of those assets invested in market-linked products, has contributed to the rapid growth of the funds management industry in Australia, which is now one of the largest in the world as a share of GDP and even in absolute terms. The growth in the funds management

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industry has also been associated with a blurring in the distinction between financial institutions as banks have diversified into this business.

Section 2 of the paper provides a brief description of the macroeconomic backdrop to these developments. Sections 3 and 4 document the main changes in the balance sheets of the household and business sectors over the past couple of decades, while Section 5 documents the associated changes in the size and structure of the financial system. Section 6 then canvasses three broad policy issues stemming from these developments:

- first, we consider the implications of the transformation of the household balance sheet for the stability of the banking system;
- second, we consider some of the implications of the increasing role and complexity of financial markets for the nature and dynamics of possible stress within the financial system; and
- finally, we look at some of the challenges posed by the difficulty of assessing risk, both at the economy-wide level and for individual households.

Our main conclusions are that: while the riskiness of banks' mortgage portfolios has increased, the banking system as a whole is very sound and well placed to weather unexpected adverse events; growth and innovation in financial markets has been beneficial in a number of dimensions but market disruptions, such as abrupt shifts in pricing, now have the potential to be more damaging than in the past; although there are some possible macro-prudential policy responses to any cyclical tendency to misprice risk, there are no easy ways to deal with this challenge; and finally, in light of the increase in the amount of risk that households are more directly exposed to as a result of the substantial growth of their balance sheet, we conclude that further steps may need to be taken to improve the risk management capabilities of households.

## **2. The Macroeconomic Backdrop**

For well over a decade, the macroeconomic environment in Australia has been very supportive of financial stability. Since 1991, the economy has experienced 16 years of uninterrupted expansion. During this period, real GDP has grown at an average annual rate of  $3\frac{3}{4}$  per cent. One consequence of this prolonged period of growth has been a gradual reduction in the unemployment rate from a peak of nearly 11 per cent in 1993 to about  $4\frac{1}{4}$  per cent currently, which is the lowest rate in around 30 years. This reduction in unemployment has underpinned solid growth in household incomes for much of the period. The long-running expansion has also contributed to strong conditions in the business sector, with profitability and investment both high as a share of GDP. Australia's inflation performance has also been very good during this period. Since the adoption of inflation targeting in 1993, inflation has averaged  $2\frac{1}{2}$  per cent – in the middle of the target – compared with the 1980s when it averaged 8 per cent. It is also noteworthy that both growth and inflation have been more stable in more recent decades (Table 1). In the current

**Table 1: Output and Inflation Volatility**  
Standard deviations

|                          | 1970s | 1980s | 1990s | 2000s |
|--------------------------|-------|-------|-------|-------|
| Output <sup>(a)</sup>    | 1.8   | 2.3   | 2.0   | 0.7   |
| Inflation <sup>(b)</sup> | 1.3   | 0.8   | 0.5   | 0.4   |

(a) Based on annual real GDP growth

(b) Quarterly CPI inflation excluding interest charges prior to the September quarter 1998 and adjusted for the tax changes of 1999–2000

Sources: ABS; RBA

decade, the standard deviations of GDP growth and inflation have both been less than half what they were in the 1980s.

Reflecting the improved inflation performance, nominal interest rates have been low and much steadier than for several decades. The policy interest rate, the cash rate, has averaged 5½ per cent since 1993, and moved within a range of just ¾ percentage points. This is a significant improvement on the 1980s when short-term interest rates averaged around 14 per cent and were significantly more volatile.

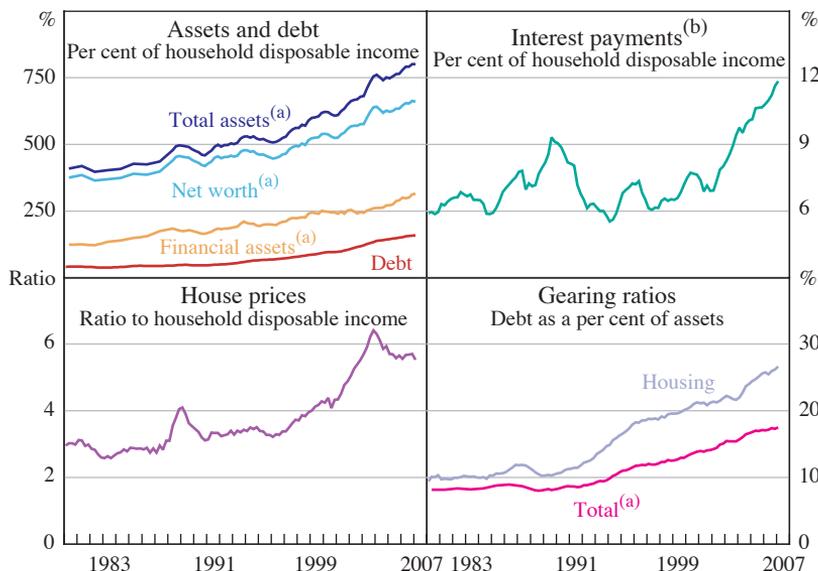
### 3. The Household Sector

As has been the case in a number of countries, it is developments in the balance sheet of the household sector, rather than the non-financial business sector, that have had the most effect on the financial system over the past decade. The most important developments in the household balance sheet have been the substantial increase in indebtedness and the change in the composition of financial assets.

#### 3.1 Growth in the balance sheet

The significant increase in the size of the household balance sheet largely reflects the pace of borrowing by Australian households, which has been unusually rapid by historical and international standards. Since 1992, household debt has increased at an average annual rate of 14 per cent, compared with average growth of 6 per cent in nominal household disposable incomes. As a result, there has been a strong upward trend in the ratio of debt to annual disposable income (Figure 1). Whereas this ratio was around 50 per cent in the early 1990s, and low by international standards, it has since increased to around 160 per cent, which is at the top end of the range seen for many other countries. This upward trend in the debt-to-income ratio has meant that the household debt-servicing ratio – the ratio of interest payments to disposable income – has also trended upward, though not nearly as markedly, reflecting a decline in the average level of interest rates (Figure 1). Total household interest costs now account for 12 per cent of income, up from an average of 7 per cent in the 1990s.

The reasons for the significant increase in household borrowing in Australia since the early 1990s have been discussed extensively elsewhere, so they are only

**Figure 1: Household Balance Sheets**

Notes: Income is after tax and before the deduction of interest payments; excludes income of unincorporated enterprises in all ratios except for household assets and net worth to income

(a) Includes financial assets of unincorporated enterprises

(b) Includes the imputed financial intermediation service charge

Sources: ABS; RBA; REIA

summarised here.<sup>2</sup> On the demand side, the most important structural factor has been the shift in the early 1990s to a low-inflation and low-interest-rate environment. The more stable macroeconomic environment that accompanied this shift also played an important role in giving households the confidence to borrow more. This increase in borrowing capacity has been reinforced on the supply side by a marked increase in the availability of finance, spurred by financial deregulation in the 1980s and the associated increase in competition among lenders. As discussed in Section 5, this manifested itself in a number of ways, including through reductions in lending margins and the introduction of products that made credit available to a wider range of borrowers and on more flexible terms.

In terms of the composition of borrowing, the vast bulk of the growth in household debt since the early 1990s has been in loans for the purchase of housing, with this component now accounting for 86 per cent of total household debt, up about 10 percentage points since 1992. Moreover, a significant portion of the growth in housing debt has been for investment purposes (that is, buy-to-let), with the investor share of housing debt doubling over the period, to about one-third. The extent of investor participation in the housing market in Australia during this period has been unusually high by both historical and international standards, which partly reflects

2. See RBA (2003a) and Macfarlane (2003). Kent, Ossolinski and Willard (this volume) examine some of the factors behind the rise in household indebtedness in an international context.

speculative demand associated with the period of strongly rising house prices and also aspects of the tax treatment of residential property investments (including negative gearing, capital gains tax concessions and depreciation allowances).<sup>3</sup>

The corollary of the surge in borrowing for housing was a period of rapid growth in house prices, particularly from around the mid 1990s to late 2003. As a ratio to average annual disposable income, house prices rose from around 3½ in the mid 1990s to a peak of 6½ in 2003. Though this ratio has since fallen moderately, it remains high by both historical and international standards (Figure 1). Together with growth in financial holdings, this rise in house prices has contributed to the rapid expansion of the asset side of the household balance sheet. Since the early 1990s, household assets have grown at an average rate of about 10 per cent per annum, rising from the equivalent of 500 per cent of annual household disposable income to 800 per cent (Figure 1). As a consequence, the household gearing ratio – the ratio of household debt to the value of household assets – has risen much less than the debt-to-income ratio and is not especially high by international standards. That said, it has almost doubled since 1992, to 17 per cent (Figure 1). Taken together, the increase in both sides of the household balance sheet has resulted in a substantial increase in the net worth of the household sector. Currently net worth is equivalent to 6½ times annual household disposable income, up from 4½ times annual income in the early 1990s (Figure 1).

It is also noteworthy that around three-quarters of household debt in Australia is at variable interest rates, a share which is fairly high by international standards and broadly unchanged for a long period. This partly reflects the fact that variable-rate loans provide greater scope for making prepayments, which borrowers in Australia tend to favour because owner-occupier interest payments are not tax deductible. Around one-half of owner-occupier borrowers are ahead of schedule on their loan repayments, with one-quarter ahead by more than a month. The tendency for borrowers to build up prepayment buffers somewhat mitigates the interest rate risk arising from their use of variable-rate loans.

While the household sector as a whole has taken on substantially more debt, it is important to note that around one-third of households have no debt at all, and two-thirds have no owner-occupier housing debt, either because they own their home outright or rent. The proportion of households with debt has, however, been increasing over time, which means that aggregate debt and debt-service payments are being spread over a larger base of payers, so average debt and repayments per indebted household have not increased as much as the aggregate data suggest. Census data from the Australian Bureau of Statistics (ABS) show that the share of households with an owner-occupier mortgage increased from 28 per cent in 1991 to 35 per cent in 2006, despite the fact that the owner-occupier home-ownership rate remained fairly steady (at around 70 per cent). The increase was greatest among middle-aged households, in part reflecting a greater propensity for households to take on additional debt later in life to ‘trade up’ their houses, and an increased willingness of households to borrow against their housing equity for consumption and other purposes. There has also been an increase in the share of households

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3. See RBA (2003b).

with investment property debt, with this increase also concentrated among middle-aged households.

Survey data also show that the bulk of household debt, particularly housing debt, has been taken on by higher-income households, who have relatively low gearing ratios, relatively low debt-servicing requirements, are more likely to have built up prepayment buffers, and hold significant financial assets.<sup>4</sup> In short, the households that have done the bulk of the borrowing appear to be well placed to repay it. This is not to say that there are not some indebted households in vulnerable positions, but their number is relatively low and they account for a relatively small share of outstanding debt.

### 3.2 Composition of assets

As noted earlier, there has been strong growth in the asset side of the household balance sheet since the early 1990s, with roughly equal growth in the household sector's holdings of financial and non-financial assets. The share of non-financial assets, most of which is housing, in total assets is fairly high by international standards, at around 60 per cent. Given that households generally own only one or two residential properties rather than a more diversified portfolio, this suggests households are quite exposed to the idiosyncratic risk of house price movements.

With regard to financial assets, the most notable trend over the past decade or so has been a shift towards assets that are more directly exposed to market risk, a trend that has been more pronounced than in a number of other countries. The household sector's total holdings of financial assets have risen from the equivalent of 170 per cent of annual household disposable income in 1990 to 315 per cent currently. Within this, holdings of cash and deposits have been relatively unchanged as a share of household disposable income, whereas assets held in superannuation (pension) funds and life offices have risen from the equivalent of 80 per cent to nearly 180 per cent of income (with a marked shift away from traditional defined benefit schemes towards defined contribution schemes), and direct holdings of equities and units in trusts have risen from 20 per cent to 60 per cent (Figure 2).<sup>5</sup> In large part, these trends reflect a greater proportion of household savings being channelled towards institutional investors and direct equity holdings, but valuation effects from buoyant asset markets have also played a role.

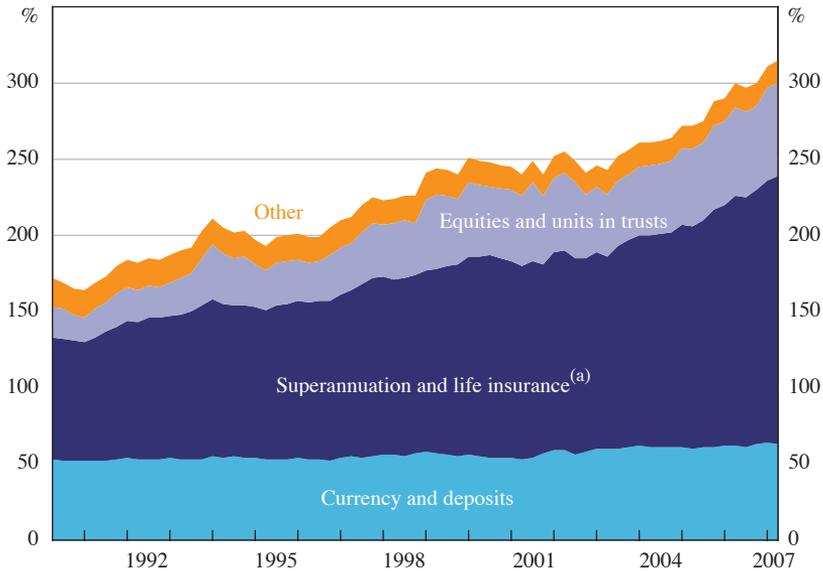
The large increase in superannuation and life office assets reflects a number of government initiatives to boost retirement incomes, including the introduction in the early 1990s of compulsory employer superannuation contributions and various tax incentives to encourage voluntary retirement savings. The shift away from

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4. The results discussed here are based on the Household, Income and Labour Dynamics in Australia (HILDA) Survey. For further details on the distribution of debt (and assets) based on the HILDA Survey, see 'Box A: A Disaggregated Analysis of Household Financial Exposures' in RBA (2005b, pp 20–22) and 'Box B: Disaggregated Analysis of Owner-Occupier Housing Debt and Assets' in RBA (2007, pp 26–28).

5. The bulk of life insurance assets relate to superannuation rather than conventional life insurance policies.

**Figure 2: Household Financial Assets**  
Per cent of household disposable income



Notes: Includes assets of unincorporated enterprises

(a) Includes unfunded superannuation

Sources: ABS; RBA

defined benefit schemes towards defined contribution schemes reflects a number of factors, including: increased voluntary contributions as a result of tax incentives; employee demand for more portable pensions given greater workforce mobility; and employer preference for defined contribution schemes because of unpredictably longer life expectancy and the greater administrative complexity of operating defined benefit funds.<sup>6</sup>

Data from the Australian Prudential Regulation Authority (APRA) on the assets of superannuation funds by benefit structure show that defined benefit funds now account for less than 5 per cent of total superannuation assets, down from one-quarter in the mid 1990s. Although cross-country comparisons are complicated by measurement differences, the share of defined benefit superannuation assets in Australia appears quite low by international standards. While the shift towards defined contribution schemes has been beneficial in increasing the portability of superannuation and reducing the idiosyncratic firm risk attached to corporate defined benefit plans, it has also exposed households more directly to market and longevity risks.

The growth in the share of market-sensitive assets in Australian household financial holdings has mostly been in equities rather than bonds. In the case of direct financial holdings, the share of fixed-interest securities has fallen over the past decade and

6. See APRA (2007a, 2007b) for a discussion of these and other trends in the Australian superannuation industry, while CGFS (2007) discusses some of the factors behind the shift towards defined contribution schemes at the international level.

is very low, while the share of equities has increased. This is consistent with the finding of the Australian Securities Exchange's surveys of share ownership that the proportion of Australian adults that directly own equities increased from around 10 per cent to 40 per cent over the 1990s, and has been relatively stable since.<sup>7</sup> Indirect holdings of assets through defined contribution superannuation funds and other managed investments have also tended to favour equities over bonds. For example, the share of superannuation fund assets held in equities has increased from 40 per cent to 60 per cent since 1990, while the share held in bonds has fallen from 20 per cent to 15 per cent.

It is also notable that there has been significant participation by retail investors in the markets for some sophisticated financial products in Australia. For example: retail and high net-worth individuals account for about two-thirds of the assets of Australian hedge funds, compared with less than one-half globally<sup>8</sup>; nearly one-half of domestic hybrid issues since the mid 1990s were initially taken up by retail investors; and between 2002 and 2005, retail investors purchased around 15 per cent of domestic collateralised debt obligation (CDO) issues (while so-called middle-market investors purchased an even greater share).<sup>9</sup> Retail participation in these markets has been facilitated by a regulatory regime that does not restrict access to any financial products as long as the provider meets certain disclosure requirements, whereas laws governing the sale of financial products to retail investors in some other countries are more onerous. In some countries, retail investors – usually defined with reference to a threshold level of income, wealth or the size of the investment – are restricted from buying certain investments, such as hedge funds in the United States. While providing retail investors with the freedom to choose from a wide range of financial products obviously has important benefits, it also raises important challenges, which we discuss in Section 6.

#### 4. The Business Sector

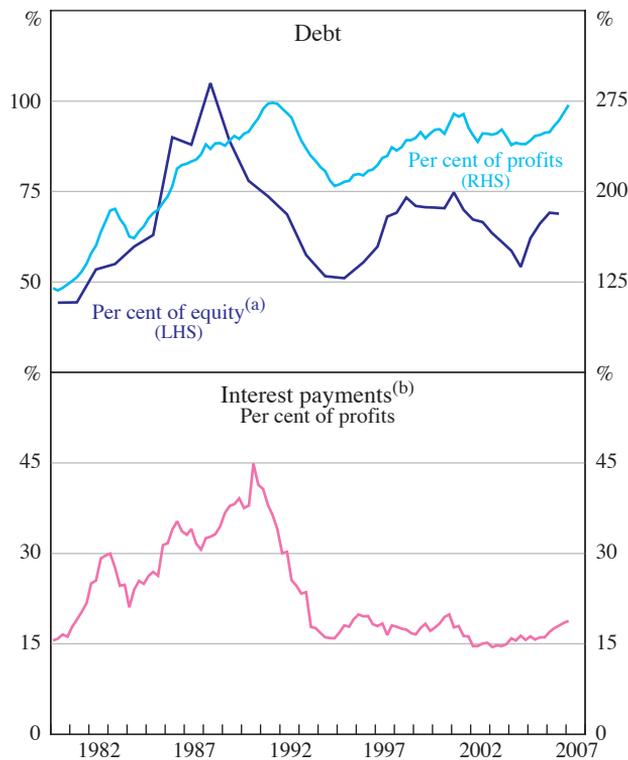
In contrast to the household sector, the business sector has not, at least to date, responded to lower interest rates and the more stable macroeconomic environment by significantly increasing its gearing. Unlike the household sector, many non-financial businesses spent the first half of the 1990s consolidating their balance sheets after the problems caused by excessive gearing in the late 1980s. While the growth rate of borrowing by businesses has stepped up in recent years, and is currently around its highest level since the late 1980s, business balance sheets overall remain in good shape.

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7. The increase in household direct shareholdings in the 1990s was partly due to the privatisation of many government-owned enterprises and the demutualisation of a number of privately-owned financial institutions.
  8. Households' indirect exposure to hedge funds has also increased as the proportion of superannuation funds investing in hedge funds has risen. According to Russell Investment Group, just under one-third of superannuation funds in Australia had invested in hedge funds in 2005, compared to almost none in 2001. Of those that had invested in hedge funds, the average allocation was also increasing, reaching 6 per cent in 2005 (see Jacobs and Black 2006).
  9. See RBA (2005a).

From an historical perspective, the second half of the 1980s stands out as a period of very rapid growth in business borrowing, driven by speculative activity associated with a boom in the commercial property market and competition among lenders following financial deregulation.<sup>10</sup> Total debt of the non-financial business sector as a ratio to profits rose from around 180 per cent in the mid 1980s to 250 per cent by the end of the decade (Figure 3). The ratio of the book value of debt to equity for listed non-financial companies, which accounted for the bulk of the borrowing, roughly doubled between 1983 and 1988.

At the end of the 1980s, a combination of high interest rates and a marked weakening of the commercial property market contributed to defaults on some of the riskiest commercial property loans, and conditions worsened in the first years of the 1990s as the economy tipped into recession and problems became more widespread. This was the catalyst for a period of more conservative balance sheet management which saw business debt as a share of profits fall to about 210 per cent

**Figure 3: Business Debt and Interest Payments**



Notes: (a) Listed non-financial corporations; excluding foreign companies

(b) Includes the imputed financial intermediation service charge

Sources: ABS; Aspect Huntley; RBA; Statex

10. See Gizycki and Lowe (2000).

by the mid 1990s. The debt-servicing ratio fell sharply over this period, though this was partly due to the reduction in official interest rates (Figure 3).

Business borrowing picked up in the second half of the 1990s and, apart from a brief period early this decade, has continued to strengthen in the past few years. This has coincided with a period of very strong profitability and a boom in business investment. Aggregate non-financial business sector profits have increased at an average rate of 9 per cent per annum since 2002, and have risen to well above the long-term average as a ratio to GDP. While this has enabled businesses to fund a significant part of their investment through internally generated funds, external fund raising has also increased, rising from the equivalent of around 5 per cent of GDP in 2003 to over 10 per cent in 2006. The bulk of this has been in the form of intermediated credit, which has recently been growing at annual rates of around 17 per cent.

While the faster pace of business borrowing in recent years has resulted in a higher ratio of business debt to profits, it is still no higher than its early 1990s peak. Likewise, the debt-to-equity ratio for listed companies has risen to around 70 per cent over the past few years, but this is below the level reached around the turn of the decade and well below that in the late 1980s. Underlying the increase in the aggregate gearing ratio of listed companies over the past few years have been some divergent trends at the sectoral level. The very strong profitability of mining companies has allowed them to finance much of their investment out of earnings while reducing their debt levels. By contrast, the gearing of companies outside the mining sector has tended to rise, though this is mainly attributable to companies that had relatively low gearing to begin with.

Despite the increase in the ratio of business debt to profits, interest payments on business debt as a share of profits have remained little changed over the past decade or so, reflecting a fall in business lending rates over the period (Figure 3).

A prominent sign of the business sector's increased appetite for debt recently has been an acceleration in leveraged buyout (LBO) activity by private equity funds, with around \$14 billion of deals completed in Australia in 2006, compared with an average of \$1½ billion over the previous five years. While this has drawn cautionary comparisons with the LBO boom in the late 1980s (which ended badly for a number of the companies involved), the activity has been fairly limited: the deals have involved only a small number of companies – less than 30 in 2006; the value of transactions undertaken has been equivalent to only about 1 per cent of the stock market capitalisation, compared with 4 per cent in 1989; and the effect on aggregate business sector gearing to date has been minor. The number of deals has already begun to wane in 2007 as the cost of debt has risen, suggesting that this has been a fairly short-lived episode.<sup>11</sup>

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11. While the recent LBO activity is unlikely to be a threat to financial stability, it does raise a number of other public policy issues. For more details, see the article 'Private Equity in Australia' in RBA (2007, pp 59–73).

There are a few other notable trends in the composition of private non-financial business debt. First, while the bulk of debt continues to be intermediated – consisting of loans from domestic and offshore financial intermediaries – there has been an increase in the proportion that is sourced directly from capital markets, from around 10 per cent in the mid 1990s to 16 per cent. This should be supportive of financial stability to the extent that it disperses credit risk more widely. Second, within non-intermediated debt, there has been a greater tendency for companies to issue longer-term securities and to issue more of these securities within Australia, rather than offshore. This reflects the greater appetite of domestic institutional investors for these types of securities and the rapidly expanding pool of funds for them to invest. Finally, in terms of the composition of intermediated debt, there has been a shift towards variable-rate loans over the past decade, which implies that businesses are more exposed to interest rate risk than in the past, though their increased bond issuance has somewhat offset this.

## **5. The Financial System**

The changes in household and business balance sheets discussed above have had significant effects on the size and structure of the Australian financial system. A number of these effects have been reinforced by increasing competition in parts of the financial system and ongoing financial innovation, particularly relating to the packaging and trading of risk. This section discusses the most important of these changes, namely: the impact of the growth in household and business balance sheets on financial institutions; the continuing strong profitability of the banking sector despite a rise in competition; and the growth of financial markets and the banks' increasing involvement within them.

### **5.1 Growth and change in the structure of the financial sector**

The transformation of the balance sheets of the non-financial sectors has shaped many of the developments in the financial sector over the past decade or so. In particular:

- the rapid growth in the size of the financial sector;
- the transformation of banks' own balance sheets, largely reflecting households' rapid accumulation of debt and shift away from saving in the form of bank deposits; and
- the strong growth in the funds management industry, again reflecting changes in the financial position of households.

#### *5.1.1 Growth of the financial sector*

The first driving force behind the expansion of the Australian financial system following deregulation in the early 1980s was the rapid growth of business credit in the second half of the 1980s. The second, and more significant, force was the expansion of households' balance sheets, in particular the rapid growth of both their

debt and financial assets, as discussed in Section 3. While it is the international norm for growth in a country's financial sector to exceed growth in nominal GDP, the disparity in growth rates has been more pronounced in Australia than in a number of other countries. Total assets of the Australian financial system have risen from the equivalent of around 100 per cent of GDP shortly before financial deregulation to around 350 per cent, or \$3½ trillion (Table 2).

While this period has seen some blurring of the distinction between different types of institutions (for example, banks are now active in funds management) there are nonetheless four clearly identifiable shifts in asset shares over the past two decades: banks have increased their share of total financial sector assets (excluding their funds management businesses) from 42 per cent to 50 per cent; securitisation vehicles have grown to account for a significant share of financial sector assets by international standards, partly reflecting the emergence of non-bank mortgage originators as a significant source of competition in the housing loan market; the funds management industry has grown rapidly; and the combined share of entities that had previously enjoyed a regulatory advantage over banks has fallen sharply.<sup>12</sup> The combined

**Table 2: Assets of Financial Institutions**

|                                      | Ratio to GDP |              |              | Share of total assets |              |              |
|--------------------------------------|--------------|--------------|--------------|-----------------------|--------------|--------------|
|                                      | 1987         | 1997         | 2007         | 1987                  | 1997         | 2007         |
| <b>Deposit-taking institutions</b>   | <b>75.6</b>  | <b>105.4</b> | <b>177.9</b> | <b>47.3</b>           | <b>48.2</b>  | <b>51.5</b>  |
| Banks                                | 66.4         | 100.4        | 172.3        | 41.6                  | 45.9         | 49.9         |
| – Major Australian-owned banks       | 45.7         | 63.7         | 107.6        | 28.6                  | 29.1         | 31.2         |
| – Other Australian-owned banks       | 13.6         | 20.4         | 26.7         | 8.5                   | 9.3          | 7.7          |
| – Foreign-owned banks                | 7.1          | 16.3         | 38.1         | 4.4                   | 7.5          | 11.0         |
| – Subsidiaries                       | ..           | 9.1          | 12.1         | ..                    | 4.2          | 3.5          |
| – Branches                           | ..           | 7.2          | 26.0         | ..                    | 3.3          | 7.5          |
| Credit unions and building societies | 9.2          | 5.0          | 5.6          | 5.7                   | 2.3          | 1.6          |
| <b>Other financial institutions</b>  | <b>84.1</b>  | <b>113.3</b> | <b>167.2</b> | <b>52.7</b>           | <b>51.8</b>  | <b>48.5</b>  |
| Registered financial corporations    | 30.7         | 22.1         | 19.9         | 19.2                  | 10.1         | 5.8          |
| Securitisation vehicles              | 0.0          | 3.7          | 23.7         | 0.0                   | 1.7          | 6.9          |
| Managed funds and life insurance     | 45.4         | 77.3         | 111.8        | 28.4                  | 35.4         | 32.4         |
| General insurers                     | 8.1          | 10.1         | 11.9         | 5.1                   | 4.6          | 3.4          |
| <b>Total</b>                         | <b>159.7</b> | <b>218.7</b> | <b>345.2</b> | <b>100.0</b>          | <b>100.0</b> | <b>100.0</b> |

Notes: Figures as at June, except for 2007, which are for March. All figures are on an unconsolidated basis. Numbers may not add up due to rounding.

Sources: ABS; APRA; RBA

12. A fall in banks' share of financial sector assets from almost 70 per cent in the early 1950s to 40 per cent in the early 1980s was broadly matched by a rise in the share of finance companies and merchant banks (now collectively known as registered financial corporations) and non-bank deposit-taking institutions (credit unions and building societies), which had been relatively lightly regulated prior to deregulation. For further details on the changing structure of the Australian financial system see Edey and Gray (1996) and the article 'The Structure of the Australian Financial System' in RBA (2006b, pp 49–61). For a history of the impact of financial deregulation, see Grenville (1991).

share of assets held by large and smaller, regional Australian-owned banks has been broadly unchanged over the past two decades, with some acquisitions of the latter by the former, while foreign-owned banks have gained market share.<sup>13</sup>

### 5.1.2 Changes in the composition of banks' assets and liabilities

Households' rapid accumulation of debt, and shift away from bank deposits, has been associated with a change in the composition of banks' balance sheets: the share of housing loans in banks' total credit has risen; and the share of their funding from household deposits has fallen, causing them to rely more heavily on offshore wholesale funding (Table 3).

**Table 3: Banks' Balance Sheets**  
Per cent, as at June

|                             | 1987              | 1997 | 2007 |
|-----------------------------|-------------------|------|------|
| <b>Share of credit</b>      |                   |      |      |
| – Housing                   | 26                | 46   | 50   |
| – Personal                  | 9                 | 9    | 9    |
| – Business                  | 65                | 45   | 42   |
| <b>Share of liabilities</b> |                   |      |      |
| – Household deposits        | 45                | 34   | 20   |
| – Other domestic            | 47 <sup>(a)</sup> | 50   | 53   |
| – Foreign                   | 8 <sup>(a)</sup>  | 17   | 27   |

(a) For June 1987 data, 'foreign' comprises only the foreign-currency-denominated, non-resident liabilities of trading banks. As such, 'other domestic' includes A\$-denominated non-resident liabilities and any non-resident liabilities of savings banks.

Sources: APRA; RBA

Over the decade to 1997, the share of housing loans in banks' total credit rose from 26 per cent to 46 per cent, reflecting the pick-up in borrowing by the household sector and the deleveraging of the business sector. Despite the fact that total housing credit has grown more strongly than business credit for most of the subsequent period, the share of housing loans on banks' books has only increased by an additional 4 percentage points. This partly reflects the fact that banks have made greater use of securitisation to fund their mortgage lending during this period, with banks' securitised housing loans now equivalent to about 12 per cent of their total on-balance sheet loans. While securitisation allows for the transfer of credit risk, the banks' primary objective in securitising housing loans has been to fund more loans and to diversify their funding sources, not to affect the average credit quality of housing loans remaining on their balance sheets.

13. Davis (this volume) discusses some of the trends and issues associated with concentration in the Australian and other countries' banking sectors. Hall and Veryard (2006) examine some of the trends in the Australian banking sector over the past decade or so.

As well as securitising loans, banks have become more reliant on wholesale funding that remains on their balance sheets, much of which has been sourced from overseas. Since 1987, foreign funding has increased from 8 per cent of banks' total liabilities to 27 per cent currently, which is high by international standards (consistent, of course, with Australia having a fairly high current account deficit). However, nearly all of the banks' offshore borrowings are hedged; this hedging results in these borrowings costing the same, on average, as domestic wholesale funding; and the foreign investor base appears to be reasonably diverse.

According to surveys by the ABS, *net* foreign currency debt on the balance sheets of Australian banks rose from A\$117 billion in June 2001 to A\$186 billion in March 2005 (Table 4). Of this, A\$168 billion was hedged in derivatives markets, mostly by cross-currency swaps but also by forward contracts, leaving a net foreign currency exposure on debt of only A\$18 billion.<sup>14</sup> After accounting for banks' foreign currency equity positions, banks had a small net foreign currency asset position. For Australian borrowers, offshore hedged issuance is a cheaper source of Australian dollar funds than domestic wholesale issuance whenever the spread to swap they pay overseas plus the premium they pay to their cross-currency basis swap counterparty is less than the spread to swap they pay in Australia.<sup>15</sup> Australian banks are extremely efficient at taking advantage of changes in the relative cost of offshore hedged funding and domestic wholesale funding with, for example, the average cost over the past six years of raising debt in the United States and swapping the proceeds into Australian dollars being almost identical to the average cost of wholesale domestic funding (Figure 4).<sup>16</sup> Despite 80 per cent of outstanding offshore debt securities having been issued in the United States or United Kingdom, the ultimate nationality of the holders of these securities is likely to be more diverse than this suggests given that 43 per cent of offshore debt securities were issued in

**Table 4: Banks' Foreign Currency Hedging**  
A\$ billion

|  | June 2001  | March 2005 |
|--|------------|------------|
| Net foreign currency position on debt                            | -117       | -186       |
| Derivative positions to hedge debt                               | 102        | 168        |
| <b>Net foreign currency position on debt (after derivatives)</b> | <b>-15</b> | <b>-18</b> |
| Net foreign currency position on equity (after derivatives)      | 26         | 23         |
| Foreign currency position (after derivatives)                    | 11         | 5          |

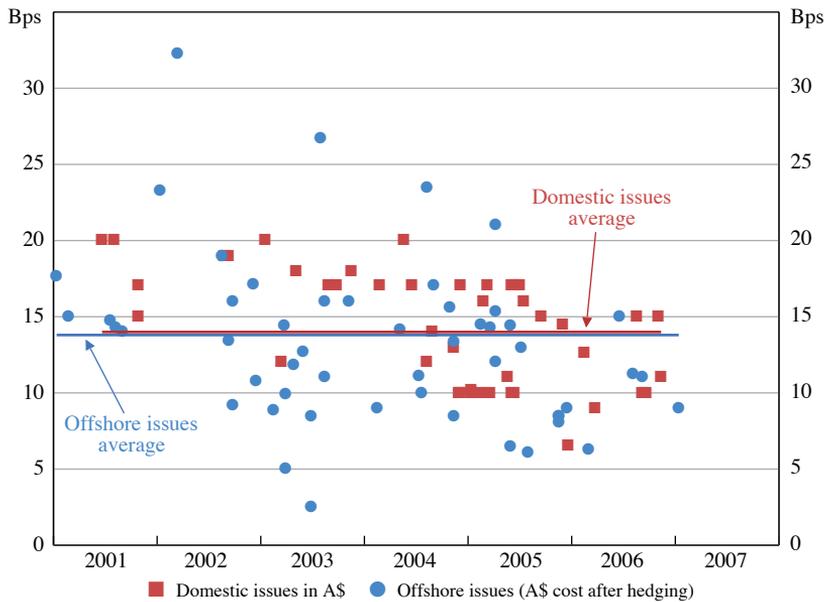
Source: ABS

14. See 'Box C: Foreign Currency Exposure and Hedging Practices of Australian Banks' in RBA (2006b, pp 42–43).

15. The main swing factor in the relative cost of the two types of funding is the cross-currency basis swap spread, which equilibrates *total* demand for Australian dollars under swap with total supply. It is quite sensitive to shifts in demand for, and supply of, Australian dollars under swap arising from debt issuance, which, in turn, is quite sensitive to changes in the spread (see Ryan 2007).

16. See RBA (2006a).

**Figure 4: Australian Banks' Domestic and Offshore Issuance Costs Spread to bank bill swap rate**



Source: RBA

US dollars, 21 per cent in euro and 11 per cent in pounds sterling. The average initial maturity of offshore bonds has also been rising, and at six years, is around the same as that for bonds issued domestically. Moreover, while in the past foreign investors have tended to be just as willing to roll over their debt securities as have domestic investors, should this prove to not be the case in the future, the Reserve Bank could provide Australian dollar liquidity in return for good collateral.

### 5.1.3 Funds management

Reflecting the transformation of household balance sheets and in particular, the rise in superannuation, the Australian funds management industry has grown rapidly over the past two decades, with consolidated funds under management of around \$1 trillion, compared with \$200 billion in 1990. Growth of superannuation funds has been particularly rapid, reflecting the introduction of compulsory employer contributions in 1992 and the concessional taxation of superannuation. As a result, superannuation funds' share of total funds under management has risen from just under 40 per cent in 1990 to around 55 per cent. But other parts of the funds management industry have also grown quickly, boosted by: increased financial consciousness and a search for higher returns; the strength of world equity markets; and the demographic trend of 'baby boomers' entering the wealth accumulation phase of their life. By international standards, the Australian funds management industry is large in absolute terms, not just as a ratio to GDP. Even taking into account the

retirement vehicles not captured by some international comparisons, the Australian industry appears to be one of the world's 10 largest.

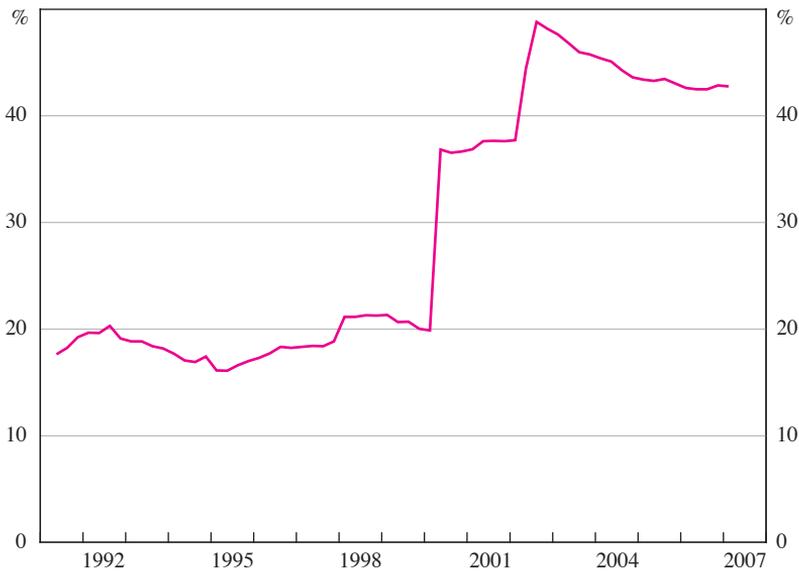
One form of managed fund that has risen to prominence in recent years has been hedge funds, which have increased their share of funds under management to around 6 per cent, largely because of a broadening of their investor base.<sup>17</sup> In Australia, hedge funds are subject to the same registration, operational and disclosure requirements as all other parts of the funds management industry. These requirements do not preclude the use of non-traditional investment strategies, even where a fund is offered to retail investors. Reflecting this, and as noted in Section 3.2, high net-worth individuals and retail investors accounted for two-thirds of hedge fund assets under management as at mid 2006, compared with less than one-half for the global hedge fund industry. In addition, superannuation funds have increased their allocations to hedge funds, with around one-third of superannuation funds now investing in them. A relatively large proportion, around one-third, of Australian hedge funds are fund of hedge funds that invest in pools of single-manager funds. Among Australian single-manager funds, the predominant strategy is the relatively straightforward one of long-short equity positions. It appears that the Australian hedge funds' exposure to structured credit instruments, such as CDOs, is low by international standards and that most of these exposures are not highly leveraged. The Australian banks' credit exposure to the hedge fund industry is also very small, reflecting two factors: the fund of hedge funds make little direct use of prime brokerage services (as opposed to the underlying, predominantly offshore, funds); and the Australian single-manager funds tend to use global investment banks as their prime brokers.

More generally, however, the Australian banks have become significant providers of funds management products themselves, with three of the four largest banks having acquired large existing funds management vehicles and the other having formed a joint venture. These asset acquisitions boosted banks' total share of retail funds under management from around 20 per cent in the 1990s to nearly 50 per cent earlier this decade, although more recently their share has fallen back a little (Figure 5). Reflecting these acquisitions and the general performance of managed funds, banks' income from funds management has risen from 1 per cent of their total income in 1995 to 13 per cent in 2006, which is fairly high by international standards.

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17. See Jacobs and Black (2006).

**Figure 5: Banks' Retail Funds under Management**  
Per cent of total



Note: Australian-owned banks

Source: Plan for Life Pty Ltd

## 5.2 Competition and profitability in the banking sector

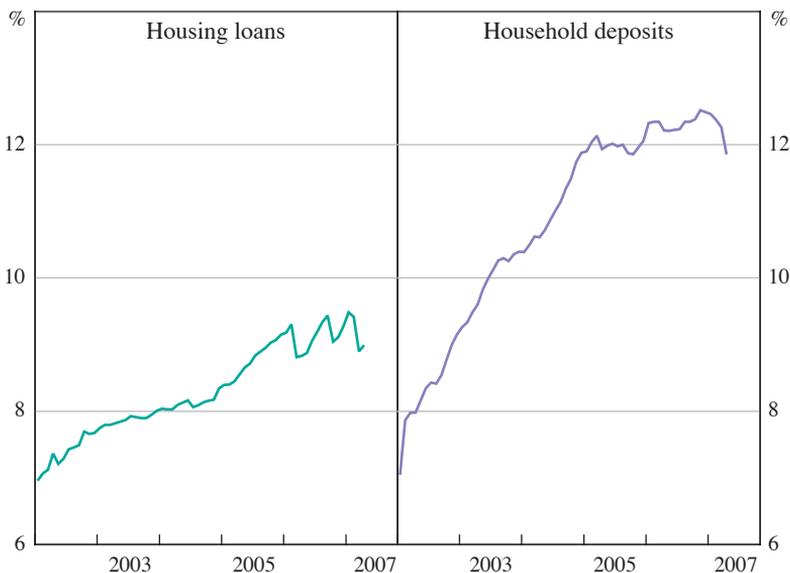
As noted in Section 3, increased competition in the market for housing loans has been a significant complement to the increase in household demand for such debt. This increase in competition has greatly increased the availability of housing finance which means that, for a given level of unemployment and interest rates, a higher share of loans is likely to be in arrears than in the past. While arrears rates have risen in recent years, they remain low by historical and international standards.

The first major wave of competition in the housing loan market occurred in the mid 1990s with the catalyst being the entry of specialist non-bank lenders (mortgage originators), who were able to undercut banks for several reasons: the banks had raised the margins on their housing loans in the early 1990s to compensate for their poorly performing business loans; the banks' extensive branch networks remained costly at a time when mortgage originators were able to circumvent the need for branches by employing mobile lenders; and the banks' funding advantage of low-cost retail deposits was being eroded by the shift to a low-inflation and low-interest-rate environment. This meant that it was no longer prohibitively expensive for mortgage originators to raise funds by issuing mortgage-backed securities at market rates. The banks responded to this competition by reducing the spread between their standard variable home loan rates and the cash rate by about 3 percentage points between 1993 and 1997. Margins on investor housing loans fell by even more, with the margin that used to exist between these loans and owner-occupier housing loans eliminated by the mid 1990s.

Competition in the housing loan market has intensified during the past decade, as has competition in the markets for a range of other banking products, such as business loans and retail deposits. One of the main factors supporting competition during this period has been the emergence of brokers, who make it easier for borrowers to compare the costs and features of different loans. In the housing loan market, brokers are now estimated to account for more than one-third of new loans and they are also now very active in the market for small business loans. Price discovery has been further improved by the increased use of online information services, which also make it easier for borrowers to compare products across different institutions. The potential for relatively high returns in the market for newer housing loans, such as ‘low-doc’ and ‘non-conforming’ loans, has also attracted competition in those segments, while the moderation in demand for housing loans in the past few years has boosted competition in the business loan market.

Foreign-owned banks have also been a stronger competitive force in retail banking markets in recent years, and continue to be very active in large business banking.<sup>18</sup> Their recent focus on retail banking has been facilitated by the more widespread distribution of banking services via the internet which has helped them overcome the disadvantage of having relatively small branch networks. Reflecting this, foreign-owned banks’ share of the housing loan and retail deposit markets picked up in the first half of the decade before levelling out as other institutions responded to the increased competition by offering similar products (Figure 6).<sup>19</sup>

**Figure 6: Foreign Banks’ Market Shares**  
On-balance sheet, per cent of total bank outstandings



Source: APRA

18. See ‘Box C: Foreign-Owned Banks in Australia’ in RBA (2007, pp 47–49).

19. Interestingly, with Australian-owned banks now competing more strongly on non-branch originated products, at least one foreign-owned bank is embarking on a significant expansion of its branch network.

Regional banks have also been marketing themselves more aggressively in recent years, including outside their home states, but have so far been less successful than the foreign-owned banks in gaining market share.

The increase in competition in the past decade has seen further reductions in margins on housing loans. Whereas the banks' standard home loan indicator rates have moved in line with the cash rate for most of the past decade, the actual margins to the cash rate have narrowed by a further 30–35 basis points, reflecting the increased size and availability of discounts being offered on housing loan indicator rates. There have also been various product innovations in the housing finance market, with lenders introducing products that better meet the needs of certain types of borrowers, such as those with irregular incomes or impaired credit histories. Examples of these products include low-doc loans, non-conforming loans and interest-only loans. Specialist non-bank lenders were often the first to begin marketing these products but banks now also offer them, although to date they have had very little involvement in the non-conforming loan market. As a result of the increased competition, the margins on many of these newer products have fallen more sharply than on standard housing loans, though, to date, they have still proved very profitable to lenders. For example, the margins to the cash rate on low-doc and non-conforming loans, of around 160 basis points and 290 basis points, respectively, compare with losses of about 1 basis point and 29 basis points, respectively, in 2006 (Table 5).

As well as price reductions and product innovations, competition in the housing finance market has also been associated with some other changes to lending practices. For example, the debt-serviceability criteria that lenders use in assessing loan applications have been eased and they have begun to make greater use of lower-cost electronic and off-site property valuation techniques.<sup>20</sup>

As is to be expected, given the increased availability of finance, there has been some increase in arrears rates on housing loans in recent years. The share of non-performing housing loans on the banks' domestic balance sheets has roughly doubled since 2003, to around 0.4 per cent, but this is still lower than it was for most of the 1990s. Arrears rates on securitised low-doc and, especially, non-conforming loans have risen by more than for standard loans over the past few years (Figure 7), but for non-conforming loans, which account for only about 1 per cent of the stock of housing loans, the arrears rate is still lower than that on US sub-prime loans.

Aside from housing loans, there has also been strong competition in other banking products in the past decade. In the business loan market, for example, competition has contributed to a reduction in the spread to the cash rate on both small and large business loans of about 250 basis points over the past decade. (The margin on small business loans fell more quickly earlier in the period, in part reflecting the increase in the share of these loans that was secured by residential property.) However, despite the increased competition for business loans, the arrears rate on these loans, at around 1 per cent, is actually lower than several years ago.

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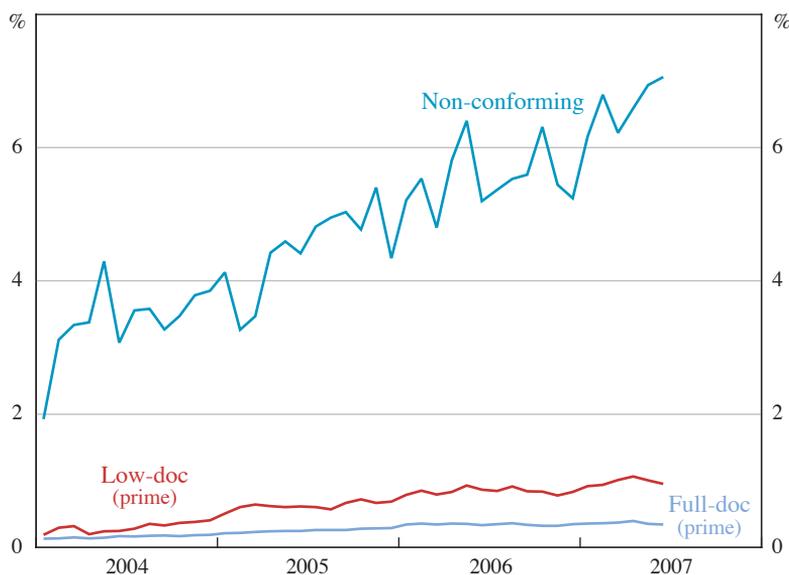
20. See RBA/APRA (2007) and Laker (2007) for further information on these and other changes in housing lending standards.

Table 5: Housing Loans

|                      | Interest margin<br>Spread to cash rate,<br>basis points |      |      |      | Losses<br>Basis points |      |      |      | Share of approvals<br>Per cent |      |      |      | Share of outstandings<br>Per cent |
|----------------------|---|------|------|------|------------------------|------|------|------|--------------------------------|------|------|------|-----------------------------------|
|                      | 2000  | 2002 | 2004 | 2006 | 2000                   | 2002 | 2004 | 2006 | 2000                           | 2002 | 2004 | 2006 | 2007                              |
| Prime loans          |   |      |      |      |                        |      |      |      |                                |      |      |      |                                   |
| – Full-doc           | 155   | 145  | 135  | 120  | 2.9                    | 1.6  | 0.7  | 0.9  | >99                            | 96   | 88½  | 88   | 92                                |
| – Low-doc            | 270   | 250  | 230  | 160  | ..                     | ..   | ..   | ..   | <½                             | 3    | 10   | 10   | 7                                 |
| Non-conforming loans | ..  | 425  | 390  | 290  | ..                     | ..   | 5.0  | 29.0 | <½                             | 1    | 1½   | 2    | 1                                 |

Sources: ABS; RBA; Standard and Poor's; banks' annual reports

**Figure 7: Housing Loan Arrears**  
90+ days past due, per cent of outstandings



Note: Based on securitised loans

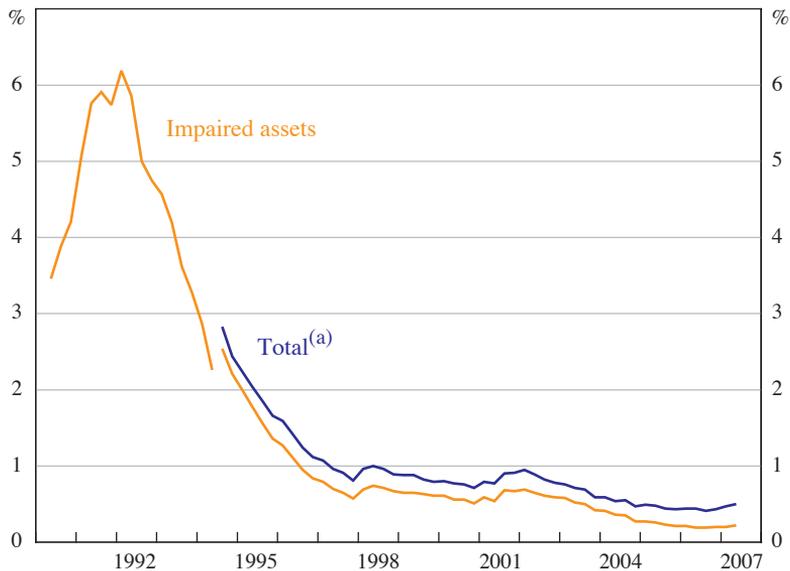
Sources: RBA; Standard & Poor's

The share of *all* loans on banks' balance sheets that are non-performing is, at just under 0.5 per cent, very low by historical standards, reflecting the shift from business to housing loans as well as the good economic conditions (Figure 8). Moreover, the share of all loans that are in arrears and not well secured by collateral, that is, 'impaired assets', remains extremely low at 0.2 per cent. International comparisons of impaired asset ratios also suggest the quality of loans on Australian banks' balance sheets is very high, though in part this should be expected given the relative performance of the Australian economy in recent years.

Despite the further increases in competition, the Australian banking sector has remained very profitable, with the pre-tax return on equity of the five largest banks averaging about 20 per cent and showing very little variation since recovering from its sharp fall in the early 1990s. The various developments discussed above have, however, resulted in significant changes in the composition of these returns (Figure 9).

The downward pressure on margins on both housing and business loans has seen the five largest banks' overall lending margins to the cash rate fall from around 3 per cent in 1994 to 1½ per cent. This, combined with some contraction in the margins on deposits in the past few years, has resulted in these banks' net interest margins falling from around 4 per cent to around 2¼ per cent. This has, however, been more than offset by the rapid growth of lending, resulting in net interest income growing at an average annual rate of just over 6 per cent since the mid 1990s. At the same time, these banks' non-interest income has grown at an annual average rate of 10 per

**Figure 8: Banks' Non-performing Assets**  
Consolidated, per cent of on-balance sheet assets



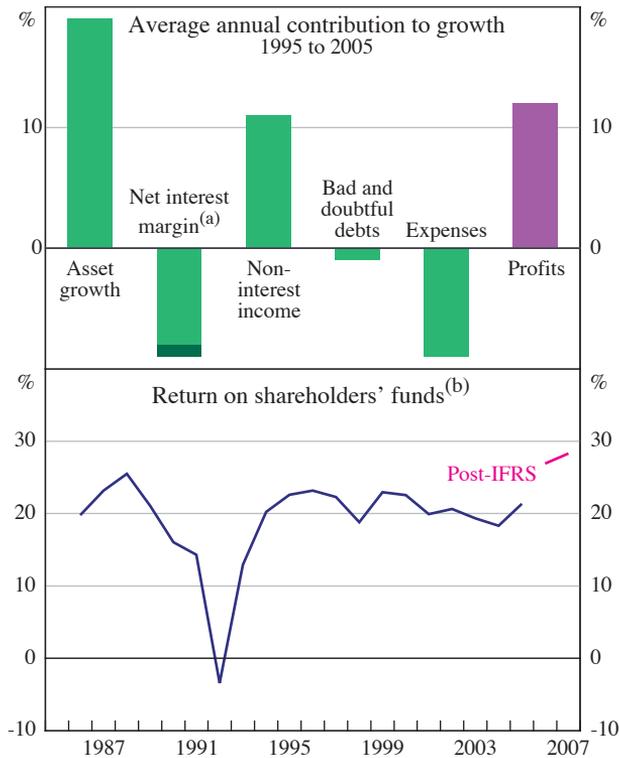
Note: (a) Includes 90+ days past-due items that are well secured

Source: APRA

cent, reflecting the strong growth in income from their wealth management activities, while write-offs from bad and doubtful debts have detracted only slightly from profits, and costs have grown at an average annual rate of a little over 5 per cent. The relatively moderate rate of growth of costs largely reflects the rationalisation of branch networks (at least until a couple of years ago) and their replacement with electronic services such as ATMs, EFTPOS terminals and telephone/internet banking, as well as the application of technology in other areas such as transactions processing and loan origination. With costs growing by about 5 per cent per annum, and total income by 8 per cent per annum, the aggregate cost-to-income ratio of these banks has fallen from a little over 60 per cent in 1995 to 48 per cent in 2006.

The returns on equity for the other Australian-owned banks have, on average, been at least as high as for the five largest banks in recent years, and the sector's overall return on equity has been higher than for the banking sectors in most G10 countries.

**Figure 9: Profit Before Tax**  
Five largest banks



- Notes: (a) The dark green area represents the cross-product term arising from the interaction between margin compression and asset growth.  
 (b) Data for 2007 are annualised half-year results; four largest banks only prior to 1993; from 2006 data are on an IFRS basis, prior years are on an AGAAP basis.

Sources: RBA; banks' annual and interim reports

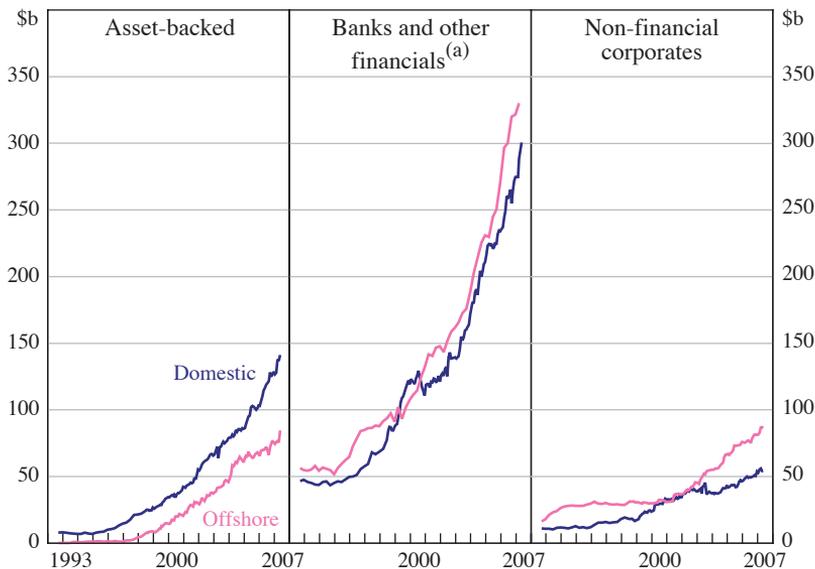
### 5.3 Financial markets and credit risk transfer

The growth of financial markets has been an important feature of the financial landscape in Australia over the past decade or so, with banks playing an ever-increasing role within these markets. An indication of the growth in financial market activity in Australia is given by the annual turnover in all financial markets, which surpassed A\$100 trillion in 2005/06, over three times the value of turnover in the mid 1990s. Much of the growth in financial markets over this period can be linked to the transformation of household and business balance sheets. As noted earlier, the rapid expansion in households' debt and the reduced share of their savings invested in bank deposits has resulted in banks and other financial institutions becoming very active issuers of securities in capital markets, and at the same time, the rapid growth in the funds management industry has provided a ready source of demand for these and other securities. Banks have also been very active in the growth of

derivative markets, both in managing the risks associated with their funding and lending activities and in providing risk management services to clients.

One of the most important aspects of the growth of financial markets in Australia has been their increasing role in facilitating financial intermediation. The clearest example of this is the rapid growth in the securitisation market, especially for residential mortgages which make up the vast bulk of securitised assets in Australia. Since the mid 1990s, the value of asset-backed securities issued in Australia has increased nearly seventeen-fold, from \$8 billion to \$140 billion, accounting for about one-quarter of the overall growth of the domestic non-government debt securities market (Figure 10). Banks have been responsible for about half of this issuance and they have also been active in issuing own-name paper to help fund their lending growth. The value of outstanding debt securities issued by all financial institutions into the domestic market has increased from about \$45 billion in the mid 1990s to \$300 billion (two-thirds of this is short-term paper, primarily certificates of deposit). Financial institutions' offshore issuance has been somewhat stronger, with around \$330 billion currently outstanding.

**Figure 10: Debt Securities Outstanding**



Note: (a) Excludes bills

Sources: ABS; APRA; Austraclear; RBA; Westpac

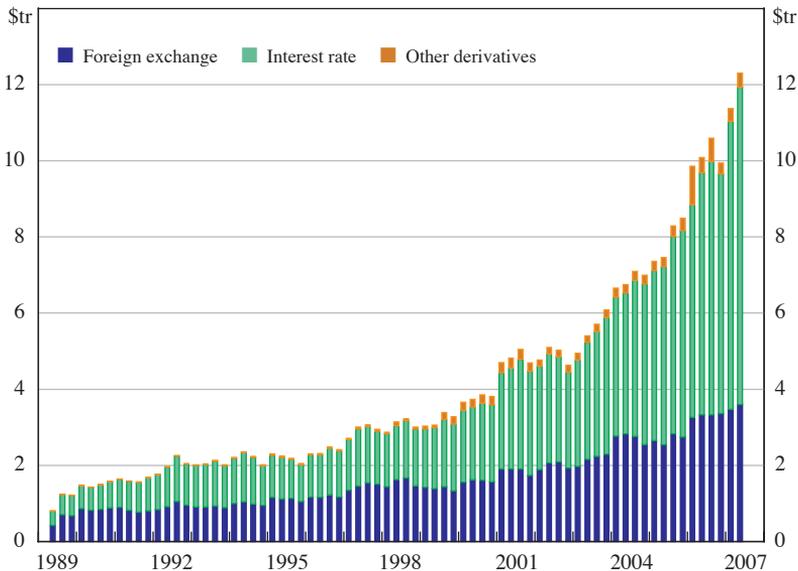
While financial markets are playing an important role in facilitating financial intermediation, they are also becoming an increasingly important *direct* source of finance for non-financial businesses. The value of non-financial corporate bonds and commercial paper issued in Australia has increased nearly five-fold since the mid 1990s, from \$12 billion to \$55 billion currently. Equity raisings have also been an important source of finance to businesses: the market capitalisation of the

Australian Stock Exchange as a ratio to GDP has risen by 80 per cent since 2000, with net equity issues accounting for roughly one-fifth of this growth. Reflecting these developments, the share of private non-financial corporations' overall funding obtained through the banking system has declined from a peak of around 55 per cent in 1990, to about 30 per cent currently.

While the share of funding sourced from financial markets has increased, this has not diminished the importance of banks within the financial system. In addition to their own debt issuance, banks have been increasingly active in providing a range of risk management and other financial services. For example, banks have been instrumental in the growth of the non-government debt markets as arrangers of debt issues by their corporate customers. Banks have also been very active in the growth of derivative markets, which they use to provide risk management services to their clients and to manage risks on their own balance sheet, such as the foreign exchange risk that arises from their offshore borrowings. An indication of the overall growth in banks' derivatives activity is provided by the gross notional principal value of their outstanding derivatives, which has risen from a little over \$2 trillion in the mid 1990s to \$12 trillion (Figure 11). This is equivalent to around 7 per cent of their on-balance sheet assets in credit-equivalent terms. As shown in Table 6, there has been substantial growth in turnover in a range of derivative markets in Australia since the late 1990s and banks have accounted for a large and, in some cases, increasing share of this turnover.

Notwithstanding the very large gross positions that banks have in derivative markets, they tend to carry only small unhedged positions and therefore have

**Figure 11: Banks' Derivatives**  
Notional principal



Source: APRA

**Table 6: Financial Market Activity and Banks' Involvement**

| Instrument              | Growth in turnover | Banks' share of annual turnover |         |
|-------------------------|--------------------|---------------------------------|---------|
|                         | Per cent           | Per cent                        |         |
|                         | 1998/99–2005/06    | 1998/99                         | 2005/06 |
| Repurchase agreements   | 243                | 47                              | 43      |
| Interest rate swaps     | 738                | 61                              | 68      |
| Cross-currency swaps    | 568                | 59                              | 63      |
| Forward rate agreements | 495                | 78                              | 86      |
| Interest rate options   | 306                | 37                              | 62      |
| Credit derivatives      | 394                | 64                              | 66      |
| Currency options        | 44                 | 84                              | 47      |

Notes: The comparison of credit derivatives turnover is between 1999/2000–2005/06. Banks' share of turnover excludes in-house transactions.

Source: AFMA

relatively little exposure to market risk. Accordingly, the market value-at-risk for the large banks has been equivalent to about 0.04 per cent of shareholders' funds for the past few years, significantly below that of some of the globally active banks.<sup>21</sup> Consistent with their low exposure to market risk, trading and investment activities account for a relatively small share, about 5 per cent, of banks' total income on average, although there is some divergence across institutions. Aside from their trading activities, banks also generate income from other financial market activities, such as broking, underwriting and syndication.

Credit derivatives have received a lot of attention globally in recent years. In Australia, this market is still quite small by international standards, though it has grown rapidly over the past few years and is likely to continue to grow strongly in the years ahead. According to data from the Australian Financial Markets Association (AFMA), there was \$77 billion of credit derivatives outstanding in the Australian market as at June 2006, compared to \$12 billion six years earlier. Annual turnover has increased five-fold over this period, with banks continuing to account for about two-thirds of turnover.

Despite accounting for a large share of turnover in credit derivatives, in net terms the major Australian banks have used these instruments to shed credit risk equivalent to only about 1 per cent of their assets, with gross positions that are not a great deal higher. Consistent with this, credit derivatives account for only about 1 per cent of banks' total outstanding derivative positions. In terms of the main types of instruments being used in the Australian market, single-name credit default swaps (CDS) that reference investment-grade entities continue to dominate. Currently, there are publicly quoted CDS prices for about 40 companies in Australia. Consistent with

21. Here value-at-risk is calculated using a 99 per cent confidence interval and a one-day holding period.

international trends, there has been some growth recently in multi-name basket and index swaps and also in total return swaps.

While credit derivatives are still a fairly small part of the Australian market, credit risk transfer has nonetheless been occurring on a significant scale by virtue of securitisation, even if its primary objective has been to fund loans. The small but rapidly growing syndicated loan market is also a form of credit risk transfer.<sup>22</sup>

Another recent development in Australia is the emergence of markets in collateralised debt obligations (CDOs) and collateralised loan obligations (CLOs).<sup>23</sup> These markets were slow to develop since the first domestic CDO issue in 1997, but issuance has picked up noticeably in the past few years, with just over \$15 billion currently outstanding. Recently there has been a shift towards synthetic structures and more complex variations, consistent with overseas trends. Overall, as with the market for credit derivatives, CDO and CLO markets in Australia are still relatively small, though developments overseas point to continued growth in the years ahead. The growth in these markets, and banks' involvement in them, raises a number of policy issues, which are discussed below.

## 6. Policy Issues

In this section we discuss some of the broad policy issues, particularly as they relate to the stability of the financial system, arising from the developments documented above.

- The first of these is the implications of the transformation of household balance sheets for the stability of the Australian banking sector. Our main conclusion here is that, while the riskiness of mortgage portfolios has increased somewhat over recent years, the Australian banking system is sound and well placed to weather unexpected adverse events.
- The second is the implications of the rapid growth of financial markets – and the banks' ever-increasing reliance on these markets – for the nature and dynamics of stress within the financial system. While acknowledging the long-term benefits of these developments, we conclude that disruptions in markets, including abrupt changes in pricing and market liquidity, have the potential to be more damaging than in the past.
- The third issue is the challenge posed by the inherent difficulty of measuring risk. We discuss two aspects of this. The first, and most important from a financial stability perspective, is dealing with periodic bouts of mispricing of risk, which have the potential to amplify the financial dimension of an economic cycle and, *in extremis*, induce financial instability. Here we touch on a couple of possibilities but conclude that there is no easy solution. The second relates to households and the challenge of equipping them with the knowledge and tools they need to manage the increased risks resulting from the transformation of their balance

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22. See RBA (2005c).

23. See RBA (2005a).

sheets. Here, we conclude that while mismanagement of this increased risk may not threaten financial stability, there may be scope for further improvements in areas such as financial literacy and financial product disclosures.

## 6.1 Implications of the transformation of household balance sheets

As discussed earlier, the strong macroeconomic conditions of the past decade and a half have provided a very favourable operating environment for Australian financial institutions, characterised by: a low and relatively stable level of interest rates; strong demand for credit; low bad debts; and strong profitability. These benign conditions, together with ongoing competition, have resulted in some repricing of risk and a relaxation of lending standards.

While the relaxation of lending standards has made banks' mortgage portfolios riskier (for given economic conditions) than in the past, the relaxation (to date) needs to be kept in perspective.

First, much of the fall in interest margins on standard housing loans most likely reflects efficiency gains rather than an under-pricing of risk, and the relatively sharp decline in margins on non-standard products, such as low-doc and non-conforming housing loans, largely reflects a correction to very high margins on these products in the past. Also, notwithstanding the fact that the past may not be a good guide to the future, margins on all types of housing loans remain many times larger than recent loss rates and in some cases higher than margins on comparable products in other countries.

Second, despite the increased popularity of non-standard loans, their share of the *stock* of all housing loans is, at least to date, still low and is an even lower share of loans on the books of the largest entities. Moreover: unlike with US sub-prime housing loans, non-conforming loans in Australia (whose share is extremely low) generally do not carry a potential shock in the form of a step-up to market rates after a period of introductory low interest rates; low-doc and non-conforming loans tend to have relatively low loan-to-valuation ratios (LVRs); and, for APRA-regulated entities, almost all loans with an LVR greater than 80 per cent have 100 per cent mortgage insurance as this is a prerequisite for a concessional capital charge.

Finally, it is important to bear in mind that survey data suggest that, despite the increase in allowable debt-servicing ratios, the majority of debt has been taken on by households who should be best able to service it. Consistent with this, arrears rates, while having risen in recent years, remain low by international standards, despite the fact that there has been some tightening of monetary policy.

Looking at the credit risk on banks' total loan portfolios, this is most likely lower than in the past. Despite some relaxation of lending standards for mortgage lending, the qualifications noted above mean that, in the absence of a further, significant, relaxation in lending standards, losses from lending for housing are still likely to be significantly lower and less variable than losses from lending to businesses. As a result, the creditworthiness of banks' total loan portfolios has benefited from the shift in their composition resulting from the rapid growth of housing credit.

In addition, even though lending to businesses is more risky than lending for housing (and business loan margins have fallen) there are a number of favourable aspects of banks' current business loan portfolios. First, business balance sheets are, overall, in good shape, so there would have to be a very sharp contraction in activity for there to be a significant decline in the credit quality in the business sector. Second, banks' risk management techniques are better than in the past: for example, business loan concentration is considerably lower than a decade or so ago; lending for commercial property, while having risen quickly of late and having been the most common form of problem lending around the world to date, has not been associated with the oversupply of commercial property that existed in the late 1980s; and loans to finance LBOs represent less than 1 per cent of Australian-owned banks' total loans.

In light of all these considerations, our view is that the Australian banking system is very sound. This view is supported by various stress tests recently undertaken as part of the International Monetary Fund's (IMF) assessment of the Australian financial system under its Financial Sector Assessment Program (FSAP).<sup>24</sup> In work undertaken jointly with the Australian authorities and the five largest banks, these banks were subjected to a stress test intended to measure their resilience to a large fall in various asset prices, a large increase in their wholesale funding costs because of a sharp deterioration in investor sentiment, and a recession. Among the various changes assumed to occur over the course of 2006 were: a 30 per cent fall in house prices; a significant depreciation of the exchange rate; higher wholesale funding costs for banks and unchanged official interest rates; a short recession in which real GDP falls by 1 per cent, driven by an unprecedented 2½ per cent contraction in household consumption; and an increase in the unemployment rate and inflation rate of about 4 percentage points and 2¼ percentage points, respectively.

In aggregate under this scenario, the banks reported a fall in profits relative to the second half of 2005 of around 40 per cent after 18 months, easing to 25 per cent after another 18 months – although there was considerable variation in the individual banks' results, none of the five banks reported a loss during the forecast period. Around one-half of the fall in aggregate profits came from an increase in bad debt expenses: households' cutbacks in consumption in order to continue servicing housing loans (together with prepayment buffers and mortgage insurance) restrained the losses on housing loans but contributed to the general slowdown in the economy, which resulted in an increase in business bad debt expenses. Most of the remaining fall in profits was due to increased funding costs and lower income from wealth management operations.

While there were some caveats associated with the exercise, one of which was the surprisingly large variation in outcomes across banks, on balance we consider the results of this stress test as providing support for our assessment that the banking system in Australia is well placed to withstand a major adverse shock.

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24. See IMF (2006) and Section 3.2 of RBA (2006c, pp 46–49). The FSAP also involved a partial update of APRA's 2003 mortgage portfolio stress test. See APRA (2003) for details of this earlier stress test.

## 6.2 Growth and innovation in financial markets

In Section 5.3, we discussed some features of the growth of financial markets in Australia, the main points being: banks have become increasingly reliant on these markets; some of the newer risk transfer markets, such as credit derivatives and CDOs, are still very small in Australia but global trends suggest they will continue to grow; and the growth in the role of financial markets has been associated with growing interdependencies between market participants.

On the whole, the growth and innovation within financial markets offers considerable benefits and should be positive for financial stability in the long run: financial markets represent an important source of funding and investment diversification; financial market innovations have increased the marketability of risk, thereby in principle allowing risk to be better priced and allocated; and the emergence of new players, such as hedge funds, which can be active risk-takers in markets for complex and illiquid instruments, increases the heterogeneity of market participants which, at least in good times, enhances overall market liquidity.

However, the growth in the role of financial markets and the rapidly expanding range and complexity of financial instruments being traded does raise a number of policy issues. These issues centre on the increased interconnectedness of financial system participants and their common reliance on the smooth operation of financial markets as well as the increased opaqueness of risk that may have resulted from the rapid innovation in risk transfer markets.

As noted earlier, financial markets now play a much greater role than in the past in the funding and risk management activities of many financial system participants and, at the same time, there has been an increase in the inter-linkages between participants through their trading and other activities. A system with more connections between participants should be more resilient to most kinds of shocks because the effect of the shock is likely to be more widely dispersed and so absorbed more easily by individual participants. For example, the securitisation of a significant proportion of Australian housing loans means that a deterioration in the credit quality of these loans would see the losses spread from a relatively concentrated group of lenders to a combination of these lenders and a large number of investors. However, as the financial system becomes more dependent on the smooth operation of financial markets, this raises the potential for market disruptions to have more wide-ranging and detrimental effects than in the past. A disruption in derivative markets, for example, could make it more difficult for institutions to hedge their risk exposures and, in certain situations, large price movements in illiquid markets could lead to significant mark-to-market losses, potentially exacerbating the problems. While the greater interconnectedness of market participants should reduce the probability of a market disruption becoming a major crisis, if a crisis was to occur, then the inter-linkages could spread the impact around the financial system more rapidly and widely than in the past. This has prompted some to suggest that we may be moving to a world of less frequent but potentially higher impact crises.<sup>25</sup>

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25. See, for example, Gieve (2007).

A challenge raised by the increasing pace and complexity of innovation in financial markets is that many of the newer products, such as credit risk transfer instruments, may not be well understood. In the transition period, it is possible that the risks associated with these products are not being measured accurately or, even if they are, not well understood by all participants. Exacerbating this is the fact that many of these products have only existed during a period of favourable economic conditions, so their market liquidity has not been fully tested under stressful conditions.

While credit risk transfer markets can help disperse credit risk more widely, they can also make the ultimate destination of credit risk within the financial system more opaque. While there is generally more information available about the risk exposures of regulated financial institutions, much less is known about the risks carried by unregulated institutions, such as hedge funds, which have become active players in credit risk transfer markets. Much of the recent discussion on hedge funds has revolved around concerns about the lack of information about them and measures that might be taken to improve this situation.

The greater use of credit risk transfer instruments can also lessen the incentives of the originating institution to monitor the creditworthiness of the end-borrower, while the ultimate holder of the credit risk exposure may lack expertise in credit assessment. This raises the concern that the longer the chain from originator to the final holder of the risk, the greater is the danger of loss of information and misaligned incentives, undermining the ability of market participants to properly assess risk.

CDOs based on US sub-prime housing loans provide a good example of a product in which the risks may not have been well understood, not well priced – indeed the CDOs were lacking liquidity even in relatively good times – and ultimately resided in some surprising places. Part of the problem with these instruments reflects the fact that tranching, and the methodology behind the credit ratings that are assigned to the individual tranches, are not fully understood by all investors. Because lower tranches of CDOs represent a buffer for upper tranches, the latter can have a AAA rating even if the underlying assets are of poor credit quality. However, some credit rating agencies have assigned ratings on the basis of the risk of the tranche bearing *any* loss. But once a tranche bears any loss, it bears all further losses until its value is wiped out. As a result, a AAA-rated tranche of a CDO is riskier than a AAA-rated untranching bond (where losses would be spread across all investors in the bond). While this is why the former carries a higher interest rate, it is not clear that the reasons for this higher return are well understood by the less sophisticated investors in the market. While the amount of CDOs issued in Australia is still relatively small, and the holdings by Australian entities of CDOs issued elsewhere in the world appears to be quite small, there is, as noted earlier, fairly active participation by retail and middle-market investors in the CDO market, who are more likely to overestimate the risk-adjusted return.

Another, important, part of the problem with CDOs based on US sub-prime housing loans was leverage. Many holders of these instruments were using them as collateral to fund additional investments. As the value of the collateral was marked-to-market and margin calls by lenders could not be met, the collateral had to be

sold, putting further downward pressure on its price. The existence of leverage thus exacerbated the problem. Spillovers into corporate bond markets more generally then saw sharp falls in the value of funds with highly leveraged exposures to the corporate sector.

The rapid expansion and innovation in financial markets can also give rise to other challenges. For example, operational risks arise if the expansion of the market's technical infrastructure lags behind the growth in volumes. This problem was evident in the market for CDS a few years ago, where deficiencies in processing and settlement systems meant that there was a significant backlog of unmatched trade confirmations. The complexity of some of the newer instruments also raises the importance of documentation and legal risks, while counterparty credit risk is also becoming a more important concern than in the past.

In conclusion, and as discussed in Borio (this volume), the rapid growth and innovation in financial markets has the potential to give rise to more frequent bouts of volatility than in the past, with intermediaries being far from sidelined from these events. Whether or not this increase in volatility leads to financial instability remains to be seen. It is encouraging that recent episodes of market volatility have largely been short-lived and fairly well contained, although it is not clear that this would be the case in a less favourable economic climate.

### 6.3 Risk assessment challenges

The fact that risk is inherently difficult to measure, and that there is a tendency (even if modest) for people to underestimate risk in good times and overestimate risk in bad times, potentially amplifies the financial dimension of an economic cycle and, *in extremis*, induces financial instability.<sup>26</sup> This is one reason why the recent widening of credit spreads in financial markets, after several years of narrowing to near-historic lows, has been welcomed by some commentators. Concerns about potential mismeasuring of risk in the upswing of the cycle have prompted some to suggest a more activist role for prudential and/or monetary policy as a counter balance.

One suggested proposal is to require banks to increase their capital during good times, when *latent* risk is building up, in order to provide a buffer of capital for the inevitable downturn and crystallisation of risk. Another proposal has been for monetary policy to be tightened, even if not required for short-term inflation control, in order to reduce the build-up of latent risk. There is, however, no consensus for either of these policy actions. First, it is extremely difficult to predict the timing of the economic cycle, as evidenced by the exceptionally long period of expansion currently enjoyed by Australia, and hence extremely difficult to judge the timing of such policy measures. Second, it is extremely difficult to calibrate changes in capital requirements or interest rates over the course of the cycle to changes in the appetite for risk. This would be true even if the extent to which the mismeasurement of risk

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26. See Borio, Furfine and Lowe (2001) and Lowe (2002) for a discussion of the difficulties of measuring the time dimension of credit risk and some of the implications.

changed over the course of the cycle was fairly consistent from one cycle to another, which it is not. Third, there is no political consensus for such policy measures.

In our view, then, activist prudential regulation, or at least activist use of capital requirements, and/or activist monetary policy would be of fairly limited use in dealing with any tendency for risk to be mismeasured over the cycle. Prudential policy more generally, however, is clearly a powerful tool for helping to ensure that financial institutions have appropriate risk management systems in place and the central bank's own communications to the public – such as the RBA's attempts to 'talk down' the housing market in 2002 and 2003 and the more general risk assessments contained in its *Financial Stability Review* – can also be useful.

This leaves us with the conclusion that, at the macro level, there is not a great deal that can be done about occasional bouts of mispricing of risk. There is, however, a more micro-oriented dimension to the difficulty of assessing risk: it is likely that not all households fully understand the risks that they are increasingly taking on, especially given the increase in the complexity and range of financial products that are available to them. While this may not necessarily threaten financial stability, it is an important issue and one for which there does appear to be scope for further progress.

The significant increase in the size and changes in the composition of the household balance sheet over the past couple of decades has left many households wealthier, but also more directly exposed to financial risks than they were in the past. While individuals have always been the ultimate bearers of risk in the economy, in the past the true incidence of risk was more opaque and typically thought of as being borne by institutions rather than households. In a defined benefit superannuation fund, for example, the market risks associated with the investment of the fund's assets are not borne by the fund's members, but are indirectly borne by those households that own shares in the fund's sponsor. By contrast, market risks are borne directly by the members of a defined contribution fund. The increased transparency and, arguably, increased concentration of risk-bearing by households therefore poses the challenge of ensuring that households have the knowledge and tools necessary to understand and manage this risk.

The scope of this challenge is illustrated by the (few) surveys of financial literacy that have been carried out in Australia, all of which show a fairly low level of financial understanding among many people.<sup>27</sup> The first national survey of adult financial literacy was commissioned by ANZ Bank in 2002 and updated in 2005.<sup>28</sup> The Commonwealth Bank also commissioned a survey in 2004.<sup>29</sup> Despite some

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27. In Australia, the recent collapses of property developers Westpoint, Fincorp, Australian Capital Reserve and Bridgecorp also raise the concern that some households may have difficulty understanding the financial risks of investment products. The debentures and unsecured notes that these companies sold to retail investors to fund their operations carried significantly higher interest rates than other fixed-interest investments, such as term deposits, but it is not clear that all their investors understood the higher risks involved. The fact that some investors had apparently devoted the bulk of their savings to these securities strongly suggests they did not.

28. See ANZ (2005). ANZ has also committed to updating this survey in 2007.

29. See Commonwealth Bank Foundation (2004).

differences, a clear finding from these and other Australian surveys, and from surveys conducted overseas, is that there is a definite lack of financial skills and knowledge among people with certain demographic characteristics.<sup>30</sup> The lowest levels of financial literacy tend to be associated with people with lower levels of education, people not working or in unskilled work, people with lower incomes and/or lower levels of saving, single people and people at the extremes of the age profile (18–24 and over 70). The finding that there is a strong correlation between financial literacy and socio-economic status suggests that educational initiatives should be targeted at these high-risk groups. They may, however, have to be very actively targeted, given that surveys also suggest that many people overestimate their level of financial literacy and therefore may be less likely to seek information or undertake further education.

Recognising the importance of raising financial literacy standards, a range of initiatives are already under way to improve financial literacy in Australia. The Australian Government established the Financial Literacy Foundation in 2005 as part of a national strategy to improve financial education and literacy standards. The Foundation has undertaken a range of measures, including: conducting a nationwide information campaign to raise awareness of financial literacy and its benefits; developing a website for financial literacy information and education resources; assisting in developing financial literacy programs in schools and workplaces; researching a range of financial literacy issues; and acting as a coordinating body for the range of initiatives being undertaken elsewhere. As the agency responsible for investor protection, the Australian Securities and Investments Commission (ASIC) has also been active in educating retail investors about financial products and retirement planning, partly through a dedicated consumer website that provides information on a range of investor education topics. As well as these actions from within the official sector, many financial institutions have launched community initiatives aimed at improving literacy levels, and a number of organisations have introduced workplace programs to improve the financial literacy of their employees. While the initiatives currently under way are undoubtedly a step in the right direction, further efforts to improve financial literacy are likely to be needed.<sup>31</sup>

Also very important is having a strong regulatory and supervisory regime for the retail financial services industry. Certainly, this aspect has attracted increased attention over the past decade, with the most important development being the introduction of the *Financial Services Reform Act 2001* (FSRA), which brought various financial products and services under a consistent licensing and disclosure regime and established standards of conduct for financial service providers dealing with retail investors. We briefly discuss two aspects of the regulatory framework: product disclosure and the financial planning industry.

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30. See Marcolin and Abraham (2006) for a discussion of the results from various financial literacy surveys undertaken in Australia, and see RBNZ (2007) for a more general discussion of financial literacy issues.

31. See OECD (2005) for a comprehensive international review of financial literacy initiatives.

In the Australian regulatory approach, disclosure plays a central role in helping to support market discipline – in principle, if retail investors are given sufficient information about a financial product then this should enable them to make an informed investment decision. But such an approach obviously places a premium on financial literacy as it relies heavily on the ability of investors to understand the information that is presented to them and make appropriate decisions based on that information. There has been some concern in Australia that the increased quantity and accessibility of financial information that comes from a disclosure-based regime may not be sufficient to help retail investors make the best investment decisions. A common criticism is that product disclosure statements and prospectuses have become long and complex, with their content driven by legal considerations rather than by the needs of retail investors. ASIC is trying to address these concerns via initiatives to help financial advisors and fund managers meet their disclosure requirements. For example, it has issued policy guidance to industry on preparing product disclosure statements, in which it emphasises the importance of the ‘clear, concise and effective’ requirement of the legislation over formulaic material intended to safeguard against legal liability. Also, in an effort to simplify product disclosures, ASIC now allows certain financial products to be sold with a shorter product disclosure statement or prospectus containing a smaller, core set of information than usual.

Going forward, there are likely to be benefits in further considering how best to provide retail investors with information about the benefits and risks of financial products. While the size of product disclosure documents is one aspect of this, another important issue is whether the language being used in these documents is appropriate for retail investors. There may also be some benefit in looking at other ways of summarising the risks of investment products. In the case of debt securities, one possibility could be to increase the role of credit rating agencies, either by requiring certain products be rated and for that rating to be disclosed in public offer documents and advertising, or requiring unrated issuers to state why they have not obtained a rating. Credit ratings have the advantage of providing a simple summary measure of the risk of an investment made by independent experts. However, any ratings-based approach would still need to ensure that investors understood what different ratings meant, and consideration would also need to be given to which rating agencies would be approved to provide the ratings and which instruments would carry the requirement.

Regarding the financial planning industry, an ongoing issue relates to the general reluctance of households to pay for financial advice on a fee-for-service basis. Instead, there is an overwhelming preference for commission-based advice, despite the conflicts of interest that can arise in this situation. In this regard, the requirement under the FSRA for financial advisors to provide their clients with a ‘statement of advice’ has been an important step in helping deal with this problem. These statements must explain the basis on which advice is given and include information about all remuneration, including commissions, and potential conflicts of interest. However, there still appears to be a further need to strengthen standards among professional advisors. A ‘shadow shopper’ survey of superannuation advice undertaken by ASIC in 2006 showed that in 16 per cent of cases, the advice given was not reasonable

in light of the client's needs (as required by law) and that unreasonable advice was more common where the advisor had a conflict of interest.<sup>32</sup>

Another policy challenge related to households' increased risk burden is to ensure that households have access to suitable financial products and tools to help them manage risk. While a discussion of the types of products that may be needed is beyond the scope of this paper, we do note that Australian households currently make relatively little use of a number of risk mitigation tools that already exist, such as fixed-rate loans and some insurance products (such as mortgage payment insurance and life insurance).<sup>33</sup> To some extent, this may reflect the accumulation of financial assets by some households as well as the prolonged period of economic expansion and low and stable interest rates, which has given people increased confidence about their employment prospects in the future. However, it is also possible that the low use of these products is due to lack of awareness or a perception that they are too complicated, costly or ill-suited to many households' needs. In the case of life insurance, for example, it would appear that product complexity has been a factor, with an increasing number of life insurance providers in Australia now moving to simplify their products and streamline the application processes. There may be some benefit in improving consumer awareness of the benefits of certain risk mitigation tools and working to ensure that such products are accessible to households.

Our conclusion with respect to the difficulties in measuring risk can be summarised as follows: while there is not a great deal that can be done at the macro level, there does appear to be scope for further progress to be made at the micro level to bolster households' risk management capabilities, including with respect to financial literacy, financial product disclosure, standards within the financial planning industry and the use of certain risk management tools.

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32. See ASIC (2006).

33. See IMF (2005) for a discussion of various investment and risk management products.

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# *Discussion*

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## **1. Saul Eslake**

Chries Ryan and Thompson have provided a thorough and thoughtful summary of the major developments in the Australian financial system and its interactions with the household and business sectors over the past 15 years.

As they see it, the most important trends to emerge in this period are:

- the substantial increase in household indebtedness, paralleled for much of the period by a decline in business gearing;
- the shift in the composition of household assets towards asset classes that are more exposed to price fluctuations as a result of market movements;
- the correspondingly greater exposure of the financial system to the household sector, and in particular to housing loans (which, in ANZ's case at least, was also partly a conscious strategic choice);
- the greater reliance of the banking system on wholesale funding and, within that category, overseas borrowings; and
- the rapid growth in the funds management industry.

I cannot think of any substantial omissions there.

One of the more important conclusions that they draw from these trends, and one that is particularly apposite given the developments in global financial markets in recent weeks, is that 'market disruptions [may] have more wide-ranging and detrimental effects than in the past' and that there may be 'more frequent bouts of volatility than in the past'.

Another, perhaps more contentious conclusion, to which I want to return anon, is that 'at the macro level, there is not a great deal that can be done about occasional bouts of mispricing of risk'.

A third important conclusion is that more could be done 'at the micro level to bolster households' risk management capabilities'.

Along the way they draw a number of other conclusions which, though not highlighted in the same way as the three I have just mentioned, nonetheless seem particularly important in view of contemporary concerns:

- the households that have done the bulk of the borrowing should be best able to service it and appear to be well placed to repay it (a point that often appears to be omitted from public discussions about the trend in household indebtedness over the past decade and a half);
- banks face a lot of competition in the retail market, including from foreign-owned banks and from mortgage brokers, as well as in the business loan market, yet (in contrast to the experience during the 1980s) arrears rates have (thus far at least) remained 'low by historical and international standards'; and

- banks' risk management techniques are better than in the past, and the Australian banking system is very sound and well-placed to weather adverse events.

The authors appropriately highlight the importance of the macroeconomic environment and financial innovation to the evolution of household balance sheets over the past 15 or so years. There are undoubtedly strong linkages between these two factors, the increase in household indebtedness and the increase in house prices since the early 1990s; and in my view 'cause and effect' run in both directions.

The combination of the sharp decline in interest rates during the 1990s and 15 years of strong growth in disposable incomes roughly trebled the maximum amount which a 'typical' home buyer could borrow without breaching the 'rules of thumb' that lenders typically use to determine the maximum amount which they are willing to lend. In addition, these 'rules of thumb' became somewhat more elastic during this period, so the borrowing capacity of the 'typical' home buyer more than trebled. Since the stock of housing and the number of households requiring accommodation increased by roughly the same amount over this period, virtually all of the increase in the borrowing capacity of households went into inflating the nominal value of the stock of housing.

Thus, by the early years of this decade, not only could would-be home buyers *afford* to borrow substantially more in relation to their income than 10 years previously – they *needed* to in order to realise their housing aspirations.

This is, of course, one of the main reasons why the increase in the ratio of debt to assets (or 'gearing') has been much more modest than the increase in the ratio of debt to income. I would argue that unless one takes a bearish view of the outlook for house prices – which I think requires a more pessimistic view of the outlook for interest rates than I think is warranted, and ignores the absence of any excess supply of housing as in the United States – then it is appropriate to take some comfort from the modest increase in the level of household gearing.

Another consequence is that, in contrast to the United States, there has not been any significant increase in home ownership rates in Australia over the past 15 years; rather, home buyers are taking longer to pay off their larger mortgages (ABS 2007a, 2007b). This is consistent with the view that, although financial innovation and enhanced competition have undoubtedly led to some relaxation of lending standards in Australia, the effect of this has in practice largely been to allow those already able to access mortgage finance to borrow bigger sums, rather than to allow significant numbers of people previously precluded from mortgage finance to gain access to it.

That, in turn, helps to explain why, as Chris and Chris point out, the increase in household debt has been concentrated among households who have the capacity to service it; and why default rates have continued to be much lower in Australia than in the United States.

Indeed, as Kent, Ossolinski and Willard (this volume) note, higher debt does not necessarily lead to greater vulnerability; and even if it does, it may still be welfare-enhancing.

However these factors do not explain why, as the authors also note, the pace of borrowing by Australian households has been ‘unusually rapid by ... international standards’. Although they do not say so, I think that this is at least partly attributable to some unusual features of the Australian tax system – in particular, the unlimited extent to which investors can offset net borrowing costs against other income for tax purposes (‘negative gearing’) which, to the best of my knowledge, has no parallel in OECD countries other than New Zealand.

Particularly following the halving of the capital gains tax rate in 1999 – which converted ‘negative gearing’ from a strategy which merely facilitated tax deferral into one which permits both deferral and permanent reduction in income tax payable – borrowing for property investment rose significantly, exceeding 45 per cent of all lending for the purchase of housing in 2003/04.

Moreover, since a larger proportion of the borrowing for investment housing than of the borrowing for owner-occupied housing has been applied to the purchase of existing rather than new housing, the investment boom exacerbated the upward pressure on dwelling prices (see, for example, RBA 2003), while doing little to alleviate the shortage of rental housing.

Another curiosity of the Australian experience which the authors note, is the relatively high proportion of household debt at variable rates, something which they attribute to the non-deductibility of interest payments by owner-occupiers leading to a preference for the capacity to make prepayments of principal.

That may be so, although it does not explain why fixed-rate mortgages have become more popular in New Zealand, where the tax treatment of interest payments is similar to Australia but where a much higher proportion of mortgages are at fixed rates, albeit for shorter periods than are common in the US or Europe. It could also result from the fact that fixed-rate mortgage products on offer in Australia are much more ‘fixed’ than those in the US, in particular effectively precluding the option of refinancing at lower rates as has been common in the US during periods of declining long-term interest rates – one example perhaps of products being ‘ill-suited to many households’, as the Chrises note later in their paper.

The trend decline in business sector gearing, which the authors note, is important in one other additional respect. Because the financial position of the business sector is, in aggregate, much less directly sensitive to fluctuations in interest rates than it was towards the end of the 1980s, aggregate employment should also be much less vulnerable to increases in interest rates than it was during that period. Indeed, although there are other reasons for the considerable strength in employment over the past five years, it has nonetheless occurred through a period of rising interest rates. The enhanced security of employment which has been promoted by, among other things, the stronger financial position of the business sector, has probably contributed to the greater willingness of households to take on additional debt and to their ability to continue to service it in the face of higher interest rates.

The banking system has become the conduit through which the bulk of the financing of Australia’s current account deficit has been accomplished. Over the past 10 years, for example, overseas borrowings by ‘depository institutions’ have financed 80 per

cent of Australia's current account deficit, compared with around 45 per cent over the preceding 8½ years; while private-sector 'financial corporations' account for 82 per cent of Australia's net foreign debt, compared with less than 30 per cent 20 years ago (ABS 2007b). As Chris and Chris note, nearly all of the banks' offshore borrowings are hedged (which was not the case when most of the net foreign debt was owed by governments or non-financial corporations two decades ago), so that a sharp fall in the exchange rate would not, of itself, have any significant consequences for the health of the Australian financial system. On the other hand, as we have seen in recent days, any diminution in overseas lenders' appetite for Australian bank debt can have implications for the exchange rate.

Let me turn finally to two of the authors' policy conclusions. As I mentioned earlier, I am not sure I entirely agree with the conclusion that 'at the macro level, there is not a great deal that can be done about occasional bouts of mispricing of risk'. For some years now there has been a minority opinion in academic and official circles suggesting that central banks could and should pay more regard to asset prices in formulating monetary policy (see, for example, Borio and Lowe 2002; Bean 2003; Cecchetti 2003; Borio 2006, this volume).

It is at least arguable (with the admitted benefit of hindsight) that the current crisis in the US sub-prime mortgage market may have been less severe had US monetary policy not been eased by as much or for as long in the early years of this decade. The contrast with the Australian experience, where the Reserve Bank did not ease monetary policy nearly as much as most other central banks (in part, to be fair, because the Australian economy was much less affected by the collapse of the 'tech bubble') and was the first central bank to begin 'normalising' interest rate settings, may be instructive on that point. But I accept that central banks may have difficulty reconciling a desire to use monetary policy to correct perceived mispricing of risk with the inflation-targeting mandate that most of them have been given by elected governments.

However, there is perhaps a role for other policy instruments in at least reducing the propensity for speculative excesses which are intrinsically associated with the 'mispricing of risk'.

As I noted earlier, in the Australian context the income tax system explicitly encourages speculative activity by providing a subsidy for the borrowing costs incurred in the course of engaging in it, and by taxing the returns to it at a lower rate than the income accruing to labour, for example – despite the fact that encouraging a higher rate of participation in the labour force is ostensibly an aim of government policy.

I do agree with the authors' conclusion that there is scope for further progress at the micro level to bolster households' risk management capabilities, and that a regulatory approach based on disclosure places a premium on financial literacy. I unhesitatingly endorse the conclusion that the proliferation of lengthy and densely-worded product disclosure statements in response to the *Financial Services Reform Act 2001* has done little to enhance understanding on the part of retail investors and consumers of the products with which they are dealing. Only last week, in response

to an application for a trauma insurance product, I received a 96-page product disclosure statement from the insurer as well as a 34-page statement of advice from the insurance broker, neither of which materially enhanced my understanding of the characteristics of the product I was contemplating.

I am a little sceptical of the Chrises' suggestion that credit rating agencies could play an enhanced role in summarising the risks attached to debt securities. As was seen during the Asian crisis, and is again becoming apparent in the context of the US sub-prime mortgage crisis, credit ratings are a lagging indicator and have not provided consistently reliable warnings of default. Moreover, credit ratings are paid for by the issuer of the securities; and, the authors correctly note, households are reluctant to pay directly for financial advice.

Research undertaken by ANZ (2005) indicates that it is not only people with low levels of educational attainment or on low incomes who lack adequate knowledge of financial matters or who find themselves in financial difficulty.

ANZ has also accepted that responsible lenders need to do more to assist customers who do get into financial difficulties and to enhance financial literacy among various segments of the population, and in recent years has introduced a number of new programs with those objectives in mind (ANZ 2007).

In Australia, at least, the relaxation of credit standards and the subsequent deterioration in credit quality has largely occurred outside of traditional mortgage lenders. Indeed the introduction at ANZ in 1999 of application and behaviour scoring, and the use of 'default' cost-of-living expenses (that is, using expenses based on data from the Australian Bureau of Statistics rather than those advised by the customer if the latter are lower) in calculating the servicing margin for mortgages resulted in practice in a tightening of credit standards.

ANZ does not actively participate in the 'sub-prime' market, and does not extend 'low-documentation' mortgages on loan-to-valuation (LTV) ratios of more than 60 per cent without mortgage insurance (in which case an LTV ceiling of 80 per cent applies). The delinquency rate on ANZ's 'low-doc' loan portfolio is actually lower than that for our traditional loan portfolio (ANZ 2007, p 3).

There is a strong case for bringing mortgage brokers and other non-traditional providers under the same national regulatory system as applies to traditional intermediaries. However I am fearful that, as was the case with the collapse of the 'tech bubble', there will be a political and regulatory over-reaction to the US sub-prime mortgage crisis and we will end up with a Sarbanes-Oxley for mortgages, with an inevitable echo in Australia. It would indeed be unfortunate if the amplitude of the swings in financial market sentiment were to be mirrored in the regulatory framework.

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## 2. General Discussion

The papers presented in this session provoked many comments about the changing nature of risk in the global financial system. The discussion began with one participant noting that there had been a general transfer of financial risk to the household sector over the past decade and that it was unclear whether this transfer had been ideal. The participant argued that, in principle, risk should be transferred to those most willing and able to bear it, which meant that households were the correct repository for long-term risks but not short-term risks. Some concern was also expressed about whether households were even fully aware of the risks that they had taken on in recent years, with one participant agreeing that policy-makers had a greater role to play in educating households about the risks to which they are now exposed. There was a brief debate about whether changes in the riskiness of individuals' income had altered their appetite for risk, with one participant pointing out that idiosyncratic income risk was actually greater than it used to be in the United States and hence could not be a reason for greater debt accumulation.

The discussion then shifted to the broader questions of whether risk in the global financial system had increased and the extent to which there had been a general mispricing of risk. One participant noted that reduced output volatility may have

encouraged the accumulation of risk and wondered whether the success of policy-makers in moderating the business cycle had helped to stimulate asset-price bubbles. Another thought was that policy-makers had successfully diagnosed the problems in the sub-prime market and other credit markets but that this diagnosis had done little to alter market behaviour. Some participants thought that rapid innovation and growth in financial markets had itself increased the incentives for market participants to favour short-term positions over long-term positions and that there was little reward for investors taking contrarian positions. There was also an acknowledgement that economists often have idealised views about how markets work, can forget that markets are sometimes ruled by waves of confidence and fear, and tend to underestimate the importance of intermediaries in the financial system.

The rest of the discussion focused on the appropriate role for policy-makers in ameliorating risk in the financial system. One participant argued that policy-makers have long known that risk is procyclical, yet policy has rarely acted to lean against this risk. The same participant went on to suggest that because financial market participants tend to be rewarded for short-term capital gains, they become advocates for a monetary policy that does not tighten during booms but does ease aggressively when the market falls; a lobbying effort that had been rewarded by the Greenspan Fed. However, this view was disputed by other participants. One argued that the problems in the sub-prime market originated in loans issued in 2005–06 – after monetary policy had been tightened – and that the apparent asymmetry of monetary policy reflected the asymmetry of financial markets. Similarly, Chris Ryan thought that central banks had implemented the monetary policy they thought was optimal, not necessarily what the markets wanted, and that sound policy was one of the reasons for good macroeconomic outcomes in recent years.

There followed a debate about the benefits of macro-prudential policy in counteracting cyclical financial risk. One line of argument broadly supported Claudio Borio's suggestion that regulators use either automatic stabilisers or discretionary mechanisms to limit the 'speed' of the financial system. However, some pointed to the practical problems with using prudential policy in this way. For example, it may be hard to design automatic stabilisers that deal with all relevant contingencies, but discretionary policy may also be problematic if there are political pressures to alter standards at inappropriate times. A number of participants also wondered about the overall effectiveness of speed limits given the role of the unregulated sector in recent developments. In this respect, one participant stressed the need for better margin requirements and a strengthening of counterparty risk management by regulated entities. Still on practical matters, it was unclear who would take responsibility for policies that would be politically unpopular, with one participant suggesting that financial institutions would find it hard to swallow such policies on macroeconomic grounds. Others questioned counter-cyclical prudential policies on more theoretical grounds. For example, speed limits could lull financial market participants into a false sense of security and encourage them to find new ways to accumulate risk. An alternative strategy would be to convince both regulated and unregulated financial market participants that bad decisions would ultimately have adverse consequences. The difficulty with this is the problem of time inconsistency,

whereby policy-makers are willing to warn of the dangers of excessive risk-taking during expansions but cannot avoid feeling pressures to respond to difficulties during downturns. In a similar vein, another participant thought that the economic costs of prudential regulations aimed at dampening financial excesses may actually exceed the cost of dealing with the occasional financial crisis.

In response, Claudio Borio argued that despite these legitimate concerns it is important that policy-makers are more aware of the issue and devote more attention to developing optimal macro-prudential policies. In his view, such policies should in principle be no more difficult to implement than monetary policy, though there was a need to avoid the potential for abuse of discretion and to find ways to overcome time-inconsistency problems and the associated risk of forbearance during bad times.

# The Rise in US Household Indebtedness: Causes and Consequences

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Karen E Dynan and Donald L Kohn<sup>1</sup>

## Abstract

The ratio of total household debt to aggregate personal income in the United States has risen from an average of 0.6 in the 1980s to an average of 1.0 so far this decade. In this paper we explore the causes and consequences of this dramatic increase. Demographic shifts, house price increases and financial innovation all appear to have contributed to the rise. Households have become more exposed to shocks to asset prices through the greater leverage in their balance sheets, and more exposed to unexpected changes in income and interest rates because of higher debt payments relative to income. At the same time, an increase in access to credit and higher levels of assets should give households, on average, a greater ability to smooth through shocks. We conclude by discussing some of the risks associated with some households having become very highly indebted relative to their assets.

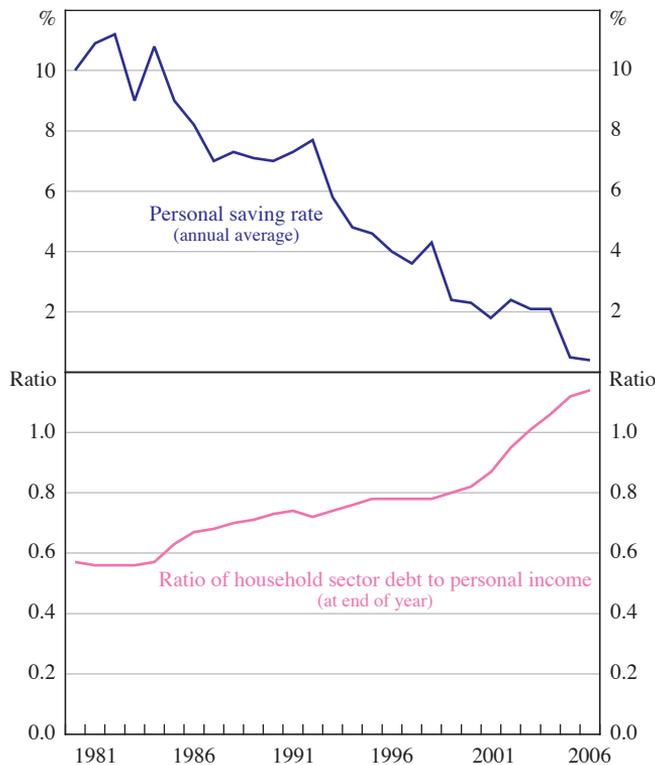
## 1. Introduction

During the past several decades in the United States, significant changes have occurred in household saving and borrowing behaviour. As shown in the top panel of Figure 1, the personal saving rate has fallen from an average of 9.1 per cent in the 1980s to an average of 1.7 per cent so far this decade. Between the same periods, the ratio of total household debt to aggregate personal income, shown in the bottom panel, rose from 0.6 to 1.0. In this paper, we consider the causes and consequences of the dramatic increase in household indebtedness. Clearly the issues surrounding household borrowing are closely related to those surrounding household saving. However, the borrowing perspective is relatively underexplored, and we think it is particularly interesting at the present time given the rapid pace of mortgage debt accumulation in recent years.

We focus first on the factors explaining the rise in household debt. Using simple models of household behaviour as our guide, we empirically explore the likely contributions of a wide range of factors. Changes in tastes, interest rates and households' expected incomes do not appear to have materially increased household borrowing, but demographic shifts can explain part of the run-up in debt. The increase in house prices – particularly, but not exclusively, over the past

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1. We are grateful to Wendy Edelberg, Doug Elmendorf, Bill English, Kathleen Johnson, Andreas Lehnert, Nellie Liang, Kevin Moore, Michael Palumbo, Karen Pence, Dave Reifschneider and David Wilcox for helpful comments. The views expressed in this paper are our own and not necessarily those of other members of the Board of Governors or its staff.

**Figure 1: The Evolution of Household Saving and Debt in the US**

Sources: Board of Governors of the Federal Reserve System, Flow of Funds Accounts of the United States (FOF); Bureau of Economic Analysis, National Income and Product Accounts

half-dozen years – appears to have played the central role. House prices can be linked to household borrowing through several different channels; distinguishing among them is difficult, although we present some suggestive evidence. Financial innovation also seems to have boosted debt, not primarily by increasing the share of households that are able to borrow but by increasing the amount of debt held by households that already had some access to borrowing.

We then turn to the consequences of higher household debt. For monetary policy-making, the key issue is whether greater indebtedness has affected the sensitivity of household spending to various economic shocks. US households have become more exposed to shocks to asset prices through the greater leverage in their balance sheets; a given change in stock prices or home prices will have a larger effect on net wealth and so on spending. With regard to income and interest rate shocks, forces push in opposite directions. On the one hand, households' discretionary cash flow has become more sensitive to such shocks because of the increased share of their incomes devoted to debt service. On the other hand, the greater availability of credit makes it easier for households to smooth through temporary downturns in income, and the rapid rise in household assets means that net worth has risen considerably

relative to income despite the run-up in debt. Empirical work suggests that, on average, US households have become less sensitive to shocks to their income, but this result should not be taken as generalising to every situation or every type of household. Of particular note, households in the upper tail of the distribution of the ratio of debt to assets are more likely to be insolvent than in the past and more likely to face financial strain. As illustrated by the recent developments among sub-prime mortgage borrowers, excessive accumulation of debt can, in some circumstances, lead to financial distress. Moreover, the reaction of financial markets to these developments raises the possibility that credit availability could be hampered for a larger group of households, which could, in turn, have effects on the broader economy.

## 2. Factors Influencing Household Debt

In a world with no borrowing constraints, households choose a path for consumption based on their expected lifetime resources, interest rates and tastes. Given some level of income at any point in time, the consumption choice immediately implies a level of saving. Households also choose their portfolio allocation, determining the amounts they hold of different types of assets and liabilities consistent with their net worth. These decisions are determined by households' risk preferences, market rates of return, tax provisions and other factors. If incomes rise over time until retirement, as they typically do, households in this constraint-free world tend to borrow, on net, when young, move into positive net worth as they age and then run down their net worth in retirement.

In this world, households' desire to take on debt can increase for a number of reasons.<sup>2</sup> Households may become less patient, less willing to substitute over time or less risk-averse – all of which flatten the optimal consumption path. A flatter consumption path, in turn, implies less saving and more borrowing when households are young. Alternatively, a reduction in uncertainty lessens the need for precautionary reserves, which tends to boost borrowing. In addition, an increase in expected future income shifts desired consumption upward, also tending to increase borrowing. As is well known, changes in interest rates affect consumption through different channels with opposing signs; as a result, the sign of the net effect cannot be ascertained by theory alone. Debt holding can also rise if households use credit cards instead of cash and cheques for a larger share of transactions, perhaps because effective interest rates or some other cost of debt use has declined.

An increase in house prices could also boost debt. First, a wealth effect may boost consumption. It might seem that a household whose home appreciates in value has experienced a matching increase in its nominal housing wealth and its cost of living and therefore would make no change in its consumption, saving or borrowing. However, if that household expects to downsize in the future and does not have a perfect altruistic link to its children, then it is indeed richer. If this household's children cannot reduce consumption in the face of the positive shock to their future

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2. Debelle (2004) also discusses factors that can lead to a rise in household indebtedness; he emphasises many of the same themes presented here.

housing costs that they have experienced – perhaps because they are too young to be active economic agents – then the aggregate effect is an increase in consumption. The resulting reduction in saving will generally lead to more borrowing. Second, when house prices rise, expenditures are more front-loaded relative to income. Like other durable goods, a home is generally purchased before the consumption of its services, and the vast majority of households borrow large amounts to make this purchase. When house prices are higher, larger amounts must be borrowed to obtain the same housing services (although the desired quantity of housing services may also adjust). Third, an increase in house prices changes the composition of household portfolios and may induce portfolio rebalancing that involves increases in debt holding. In particular, households may borrow against their house to invest more in tax-deferred retirement assets.<sup>3</sup>

Lastly, changes in demographics can boost aggregate debt in this world, even if the debt of similarly situated households does not change over time. For example, households with more education generally have steeper life-cycle income paths and therefore do more borrowing at young ages. The increase in average educational attainment of the population would then be expected to push up debt accumulation. Likewise, younger households tend to borrow more than older households, so an increase in the share of the population represented by the former would be expected to raise aggregate debt.

The preceding paragraphs discuss forces that might raise debt in a world without borrowing constraints. In the real world, such constraints exist, so households do not necessarily attain their optimal consumption given their lifetime resources. In this world, debt can increase for all of the reasons already offered, but it can also increase if some change in the economy relaxes the constraints. To start, an increase in collateral against which households can borrow – arising from either higher house prices or a shift from defined benefit to defined contribution pension plans – should make credit less expensive and could lead to an increase in borrowing (see, for example, Iacoviello 2004). In addition, a decline in inflation can relax constraints that are based on nominal interest payments relative to nominal income, as with traditional underwriting standards for home mortgages. In particular, when inflation is lower the same real interest rate will be associated with a lower nominal interest rate, which means that the ratio of nominal interest payments to nominal income on a prospective loan is less likely to be above some upper bound imposed by the lender.

Further, financial innovation may relax borrowing constraints. This relaxation can take several forms: it can give more households access to credit (sometimes termed the ‘democratisation of credit’); it can increase the amount of credit available to households that already have some credit; and it can reduce the cost of borrowing. Moreover, financial innovation can interact with the other channels described above. In particular, such innovation has made it much easier for households to

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3. Amromin, Huang and Sialm (2006) show that, given the tax-deductibility of mortgage interest and tax-exemption of qualified retirement savings, it can become a tax arbitrage to reduce mortgage prepayments and increase contributions to tax-deferred accounts.

borrow against their housing wealth and thus may accentuate the effect of house prices on debt.

So far, this discussion has focused on reasons why rational households might increase their indebtedness. However, substantial evidence suggests that households are not always fully rational when making financial decisions (Campbell 2006). One can imagine a variety of reasons why households might take on more debt than is rationally appropriate. For example, a rise in house prices might make households feel wealthier than they are, perhaps because they do not recognise the increase in the cost of housing services; as a result, they might borrow too much and be left underprepared for retirement. Alternatively, households may suffer self-control problems so that a relaxation of borrowing constraints spurs borrowing that, in the long run, lowers rather than raises utility. Or households might mistakenly extrapolate recent run-ups in house or equity prices and take on too much debt to finance investment in these assets.

### **3. Evidence on Causes of the Rise in Household Debt**

This section presents evidence on the importance of various factors contributing to the rise in household debt in the United States. We do not attempt to develop and test a formal model of the relationship between debt and its determinants; that approach seems too ambitious given the breadth of the topic and the limitations of the available data. Instead, we use summary statistics, graphs and simple regressions to document the basic relationships.

Much of this analysis is based on data from the Survey of Consumer Finances (SCF). This survey has been conducted by the Federal Reserve Board on a triennial basis for nearly a quarter-century. The SCF contains comprehensive and high-quality information about the balance sheets of US households, as well as data on their income, demographics and attitudes. We use data from the waves conducted in 1983, 1989, 1992, 1995, 1998, 2001 and 2004. The 1986 wave did not generate data comparable in scope with data from the other waves, and the 2007 wave is still being conducted. In light of the significant developments in household borrowing and credit markets since 2004, the lack of more-timely data represents an important limitation; we discuss some of these developments at the end of this paper. Each wave included between 3 000 and 4 500 households, and weights are provided to make the results representative of the full population.<sup>4</sup>

#### **3.1 Impatience**

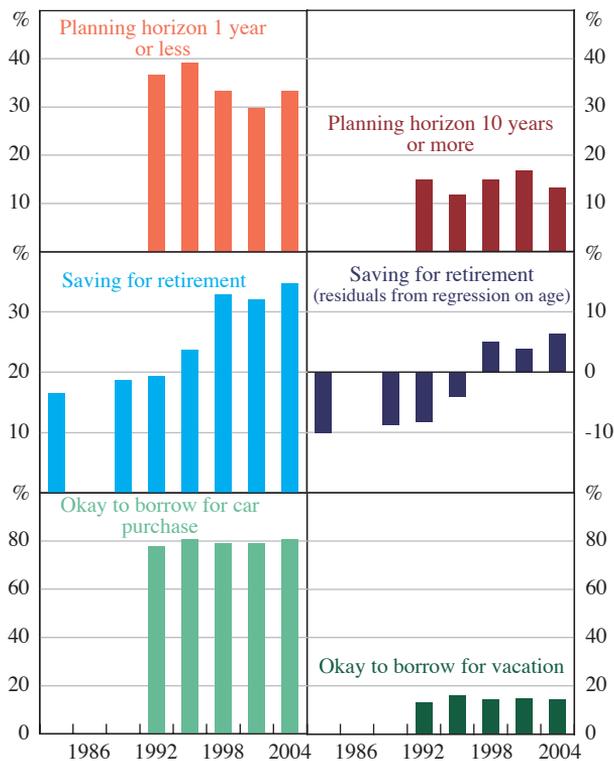
Some evidence against the hypothesis that households have become less patient over time comes from answers to SCF questions about household attitudes. Some of these questions have appeared in the survey only since 1992, but as shown in the bottom panel of Figure 1, most of the rise in debt has occurred since that time.

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4. For more information about the survey, see Bucks, Kennickell and Moore (2006).

The top panels of Figure 2 report households' views of the most important horizon for spending and saving decisions. The share of households focused on the next few months or the next year has been fairly stable between 30 per cent and 40 per cent, and the share looking beyond 10 years has hovered around 15 per cent. The middle-left panel of Figure 2 shows that retirement has become a more important motivation for saving over time, which is not consistent with greater impatience. This pattern holds true even after controlling for the changing age distribution of the population, as shown in the middle-right panel.<sup>5</sup> Moreover, households' attitudes toward the use of credit have changed little over time. Most households continue to think that borrowing is appropriate to purchase a car, as shown in the bottom-left panel, while few households continue to think that borrowing is appropriate

**Figure 2: Evidence on Impatience**  
Share of households



Note: The Survey of Consumer Finances (SCF) is a triennial survey.  
Source: Board of Governors of the Federal Reserve System, SCF

5. The increase over time in respondents reporting retirement as a motivation for saving, even after controlling for age, could reflect the shift away from defined benefit pension plans and toward defined contribution plans in that the latter may seem more like 'saving' to households than the former. See Pence (2002).

to finance a vacation, as shown in the bottom-right panel.<sup>6</sup> Of course, households' stated views may not be good predictors of their actual behaviour, so this evidence must be viewed as suggestive.

### 3.2 Precautionary saving

Households may have become a bit less risk-averse over time. The share of households asserting that they are willing to take no financial risk to earn a higher return has slipped from roughly 50 per cent in 1992 to close to 40 per cent in the past several waves, as shown in the top-left panel of Figure 3. Meanwhile, the share of households willing to take 'above-average' or 'substantial' risk has drifted up, on balance, as shown in the top-right panel. Another factor tending to reduce precautionary saving is financial innovation, which has made it easier for households to borrow during downturns in income.<sup>7</sup> On the other hand, some recent papers have found that household income has become more volatile over time.<sup>8</sup> These findings are consistent with the views of many commentators that globalisation, deregulation and the rapid pace of technological change have increased the pace of creative destruction and made the economy more dynamic and risky for individual households. Given these conflicting trends, then, households' desire for precautionary reserves may have increased or decreased over time.

A rough measure of households' interest in precautionary saving may be the share of households that report that liquidity is an important motivation for saving. As shown in the middle panels of Figure 3, this share has declined a little over time. If households are doing less precautionary saving, that decline would be consistent with greater borrowing – both because greater borrowing is one way to reduce net saving and because lower reserves of liquid assets make households facing a temporary disruption to income more likely to borrow. That said, given the small size of the change, particularly over the past 15 years, and the limitations of these attitudinal questions, more analysis is needed to draw a firm conclusion.

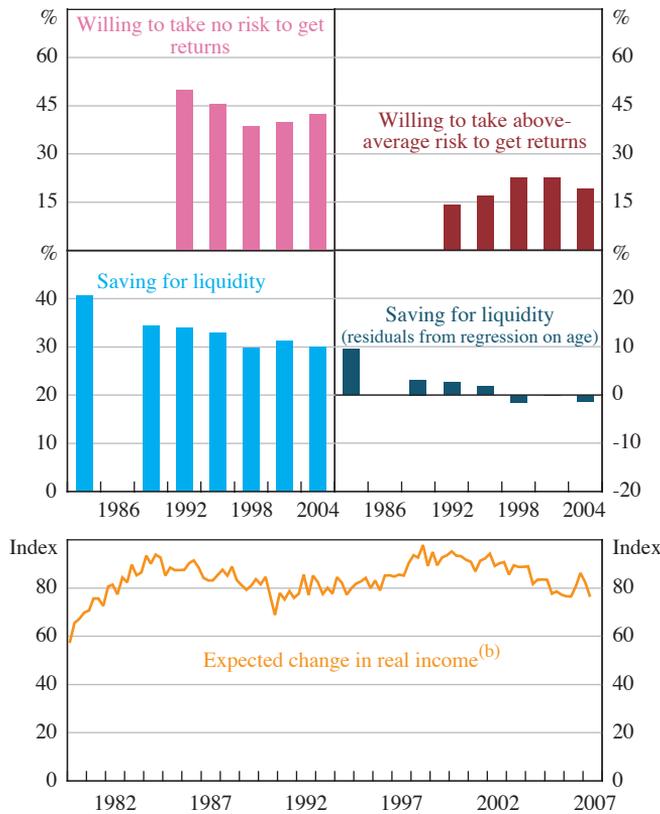
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6. Most households also think that borrowing is appropriate to finance education, and about one-half of households think that borrowing is okay when income falls. In contrast, less than 10 per cent think that borrowing to buy furs or jewellery makes sense.

7. Greater ability to borrow means that household expenditures may be less sensitive to changes in income. See Dynan, Elmendorf and Sichel (2006a, 2006b) for evidence supporting this proposition.

8. See Dynan, Elmendorf and Sichel (2007) and Hertz (2007). Note, though, that an increase in income volatility does not necessarily imply that risk has increased, as these studies do not distinguish between voluntary and involuntary income changes or keep track of changes in desired consumption such as shocks to health-care spending. An increase in income volatility at the household level is not inconsistent with the well-documented finding that the aggregate economy has become more stable over time, as the covariance of income movements across households may have changed over time (see Dynan *et al* 2006b).

**Figure 3: Evidence on Precautionary Saving<sup>(a)</sup> and Expected Income**



Notes: (a) As a share of households. The SCF is a triennial survey.  
 (b) Calculated as the share of households expecting their income to rise more than prices less the share expecting prices to rise more than their income + 100.  
 Sources: Board of Governors of the Federal Reserve System, SCF; Reuters/University of Michigan, 'Surveys of Consumers'

### 3.3 Interest rates and expected income

According to some of the empirical models of aggregate consumption used at the Federal Reserve Board, the net decline in real interest rates during the past half-dozen years can explain about 2 percentage points of the decline in the aggregate saving rate over that period.<sup>9</sup> The lower saving rate implies less asset accumulation and more debt accumulation. However, the rise in the debt-to-income ratio during the past six years is much larger than can be explained by the decline in the saving

9. We should emphasise that these models are reduced-form in nature, so the magnitude of this effect should not be interpreted as the interest elasticity. Instead, the estimated coefficient appears to be capturing both the true interest elasticity and some signalling power of interest rates for future income and other economic conditions. The coefficient does not include the effect of interest rates on stock prices and house prices because wealth appears separately in the models.

rate. If the saving rate averaged 1 percentage point lower because of lower interest rates, then lower rates explain a reduction in net worth of 6 per cent of income. Yet aggregate debt has risen by 40 per cent of income during this period, as shown in the bottom panel of Figure 1. Moreover, these models imply that movements in real interest rates had almost no net effect on the saving rate between 1990 and 2000, a decade in which debt increased a good deal relative to income. Therefore, changes in interest rates do not seem to explain much of the secular accumulation of household debt.

The relatively rapid pace of productivity growth of the past decade may have led households to mark up their expectations for future income growth even though median household income has not increased to nearly the same extent, at least as yet. Saving less and borrowing more would be a natural response to this situation. Some limited evidence against the view that households are expecting their real incomes to rise particularly rapidly comes from the Reuters/University of Michigan ‘Surveys of Consumers’. When asked whether they expect their incomes to rise more than prices over the coming year, or vice versa, the share of respondents expecting the former has actually declined in the past half-dozen years and shows little trend over the past few decades; see the bottom panel of Figure 3.

### 3.4 Demographics

Debt use varies substantially across age groups and across households with different levels of education. Therefore, shifts in the age and educational composition of the US population might explain the long-term rise in indebtedness. The top-left panel of Figure 4 shows the evolution since 1983 of the share of households in the SCF with positive debt by age group. The top-right panel shows, over the same time period, the median debt-to-income ratio for households that are holding debt. In each cross-sectional slice, debt use increases between the youngest age group and middle age but then falls off in the older group. Over the period explored, the baby-boom generation has moved essentially from the youngest group to the middle age group, which would tend to boost the aggregate debt-to-income ratio, all else being equal. At the same time, households in all age groups have shown a marked upward trend in their debt holdings, which suggests that other factors have contributed as well.

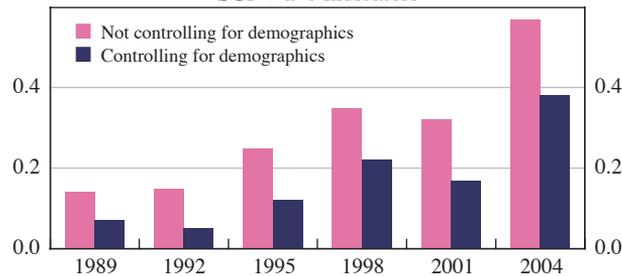
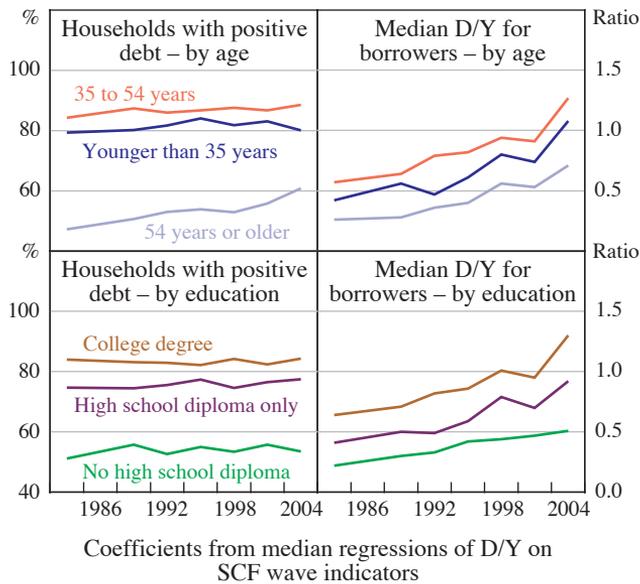
The middle panels of Figure 4 present comparable information for educational groups. Debt use increases with education, so the rising educational attainment for the population during the past several decades would tend to boost the aggregate debt-to-income ratio. Once again, however, debt use has increased within each educational group, which suggests that other factors are also at work.<sup>10</sup>

To further investigate the effects of demographics, we first estimate a regression with the debt-to-income ratio as the dependent variable and indicator variables for each wave of the SCF as independent variables (with 1983 as the omitted indicator).

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10. For both age and educational groups, the rise in the amount of debt held also shows up prominently at higher points in the debt-to-income distribution.

**Figure 4: Debt and Demographics**



Notes: D/Y is the ratio of household debt to personal income. The SCF is a triennial survey.  
 Source: Board of Governors of the Federal Reserve System, SCF

The debt-to-income variable has large outliers due to both extremely low values of income and high values of debt, so we use a median regression estimator to downweight the outliers.<sup>11</sup> We restrict the sample to households with heads under 60-years old because current income for older households is likely to be an especially poor measure of their long-term economic situation. The estimated coefficients are shown by the lighter-shaded columns in the bottom panel; reflecting the uptrend in debt holding, these coefficients increase over time and the most dramatic rise is observed at the end of the sample. Each coefficient is significantly different from

11. Beginning with the 1989 wave, the SCF uses a multiple imputation approach to deal with survey non-responses. As a result, the public data sets include five replicas of every observation. For the regressions in this paper, we use a repeated-imputation inference technique to correct the point estimates and standard errors for the presence of these replicas. See Kennickell (1998) for more information.

zero at the 5 per cent level and the increase over time is statistically significant as well.

We then estimate a regression that adds age, age-squared, age-cubed and indicator variables for high school diplomas and college degrees as independent variables (all pertaining to the household head's characteristics). The estimated coefficients for SCF waves, shown by the darker-shaded columns in the bottom panel, are still significantly different from zero and still increase significantly over time. However, they are noticeably smaller than in the regression excluding demographic variables. One caution is that the ageing of the baby boom and gain in educational attainment essentially push debt in one direction over the period examined, so the reduction in the estimated time effects may reflect not just demographic changes but also other forces that have trended over time. All told, however, the results suggest that demographic influences likely explain part, but not all, of the uptrend in debt holding over time.

### 3.5 House prices

According to data from the SCF, fully 100 per cent of the increase in aggregate debt relative to income since 1983 has taken the form of debt on households' primary residences. The ratio of aggregate debt on primary residences to aggregate household income – depicted by the shaded area in the top-left panel of Figure 5 – climbed from 0.36 in 1983 to 0.84 per cent in 2004, pushing up the ratio of total household debt to income from 0.64 to 1.12. Meanwhile, aggregate debt associated with credit cards, consumer instalment loans and other borrowing stayed just below 0.30 of aggregate household income throughout the last quarter-century.

These figures from the SCF data are broadly consistent with corresponding figures based on the US Flow of Funds (FOF) accounts, shown in the top-right panel. According to the FOF, 84 per cent of the increase in aggregate household-sector debt relative to NIPA personal income (that is, personal income as measured in the national income and product accounts) since 1983 has taken the form of home mortgage debt. A similar parsing applies to the increase in debt relative to income since 1970. The difference between the SCF and FOF figures may be attributable to a number of factors.<sup>12</sup> One important difference is the treatment of credit card debt. In the SCF, households are asked to report their credit card balances after making their last payments and thus ignore temporary balances related to transactions use of their cards, whereas the FOF measure represents the stock of outstanding debt at a given point in time and therefore includes transactions balances. Indeed, credit card debt has increased relative to income in the FOF but not in the SCF, which is consistent with rising transactions use although it may also stem from other factors.<sup>13</sup>

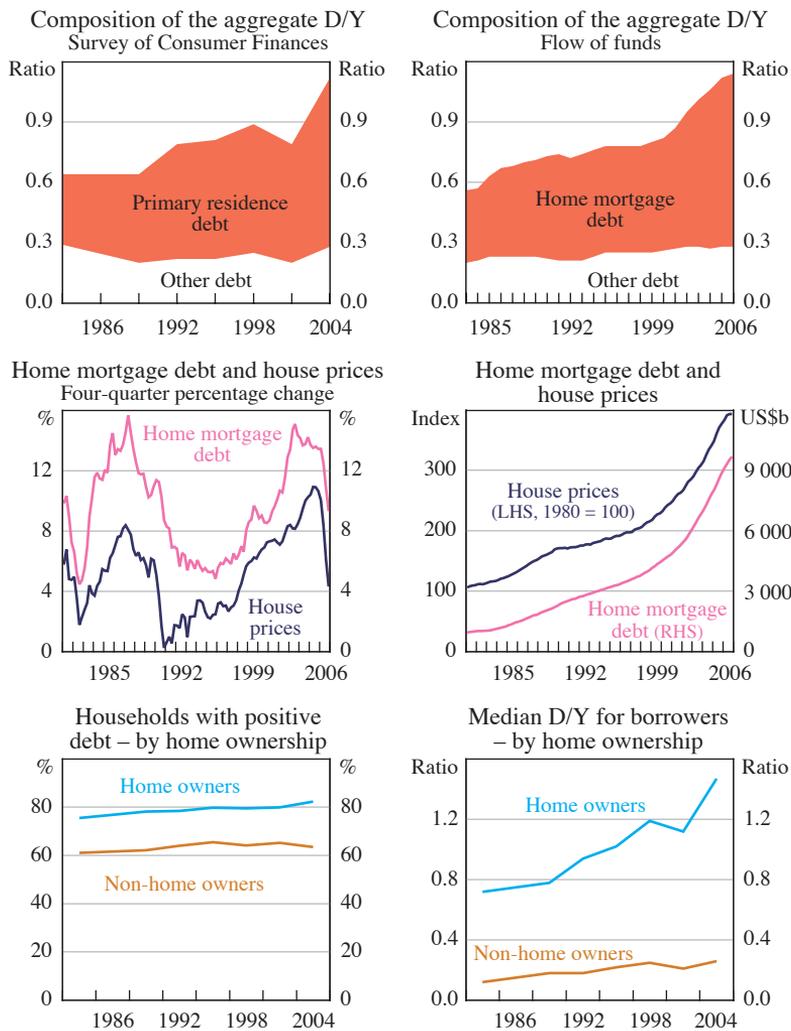
Of course, these patterns do not prove that the rise in household indebtedness is related to housing; they might reflect an increase in desired debt for other reasons,

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12. Antoniewicz (2000) explores differences between household debt as measured in the FOF accounts and household debt as measured in the SCF.

13. Johnson (2007) shows that transactions use has accounted for a material share of the rise in aggregate credit card debt.

**Figure 5: Debt and House Prices**



Notes: D/Y is the ratio of household debt to personal income. The SCF is a triennial survey.  
 Sources: Board of Governors of the Federal Reserve System, FOF, SCF; Office of Federal Housing Enterprise Oversight

with mortgages being the preferred type of debt. Some evidence for a more direct link between debt and housing is the strong high-frequency correlation between mortgage borrowing and house prices. The middle-left panel of Figure 5 shows changes in FOF mortgage borrowing and house prices, while the middle-right panel presents levels of these variables. Mortgage debt rises especially sharply when house prices rise rapidly, as over the past decade.

Furthermore, the SCF shows that the rise in household indebtedness has been concentrated among home owners, as depicted in the bottom panels of Figure 5.

More home owners have debt today than in the 1980s, which is not true for non-home owners, and the median debt-to-income ratio for home owners has increased substantially since the 1980s, which is also not true for non-home owners. These differences may be attributable, at least in part, to the rising share of home owners in the population, which may be related to changes in the financial system. We return to the role of financial innovation shortly.

Stronger evidence for the connection between house-price appreciation and borrowing comes from isolating the effect of house prices from the effect of other influences on indebtedness – such as financial innovation – that have trended over time. We regress households' debt-to-income ratios from the SCF on the level of house prices in each household's region relative to the level in that region in 1983.<sup>14</sup> As controls, we include indicator variables for waves of the SCF (again omitting the 1983 indicator), indicator variables for the nine Census divisions (omitting the first division), the same demographic variables as in the earlier regressions, the log of household income and an indicator variable for home ownership. We again use a median regression estimator and restrict the sample to households with heads under 60-years old. Table 1 shows the results, with the different columns corresponding to different sets of control variables. The estimated coefficient on house prices varies across rows, but it is highly statistically significant in all specifications. For the nation as a whole, house prices rose nearly threefold between 1983 and 2004. Applying the average of the estimated coefficients in the table of 0.05, we find that the rise in house prices can explain an increase in the aggregate debt-to-income ratio of roughly 0.1 ( $\approx .05 * [3 - 1]$ ) out of a total increase of roughly 0.5.

This estimate probably understates the link between housing assets and debt for two reasons. First, the estimated coefficient on home ownership is positive because home owners tend to have more debt than non-home owners. Accordingly, the rise in the home ownership rate over the past decade has provided a further boost to the debt-to-income ratio. Second, financial innovation may have accentuated the effect of home values on debt beyond what is captured by our simple estimates. We return to this point shortly.

We can say much less about *why* house values have such an important relationship with debt. As we discussed in the introduction, one channel through which rising house prices can boost debt is a wealth effect on consumption. Empirical estimates of aggregate consumption equations generally imply that the effect of housing wealth is statistically and economically significant. Studies using aggregate data include Davis and Palumbo (2001), which suggests that the effect of non-stock-market wealth (of which housing wealth is an important component) on consumption exceeds six cents on the dollar, and Carroll, Otsuka and Slacalek (2006), which finds a housing

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14. Information about respondents' regions is not available in the 1989, 2001 or 2004 public-use SCF data sets. Therefore, we estimated these regressions using the Federal Reserve Board's internal SCF data sets; we thank Gerhard Fries and Kevin Moore for their assistance with these regressions.

To measure house prices, we used the 'purchase-only' index from the Office of Federal Housing Enterprise Oversight. This index is available only beginning in 1990; we extended back to 1983 using the 'all-transactions' version of the index.

**Table 1: Estimation Results from Median Regressions of D/Y on Relative House Prices and Controls**

|                                    |                  |                  |                   |                   |
|------------------------------------|------------------|------------------|-------------------|-------------------|
| Constant                           | 0.221<br>(0.005) | 0.217<br>(0.020) | -0.278<br>(0.045) | -0.159<br>(0.058) |
| Relative house prices              | 0.050<br>(0.005) | 0.063<br>(0.013) | 0.076<br>(0.002)  | 0.026<br>(0.003)  |
| Region indicators included?        | No               | Yes              | No                | Yes               |
| P-value for F-test of Significance | ..               | 0.000            | ..                | 0.000             |
| Indicator for 1989 SCF             | 0.130<br>(0.004) | 0.113<br>(0.008) | 0.022<br>(0.001)  | 0.053<br>(0.002)  |
| Indicator for 1992 SCF             | 0.134<br>(0.004) | 0.127<br>(0.008) | 0.048<br>(0.002)  | 0.083<br>(0.004)  |
| Indicator for 1995 SCF             | 0.225<br>(0.003) | 0.225<br>(0.006) | 0.070<br>(0.005)  | 0.107<br>(0.004)  |
| Indicator for 1998 SCF             | 0.319<br>(0.004) | 0.307<br>(0.013) | 0.103<br>(0.003)  | 0.168<br>(0.005)  |
| Indicator for 2001 SCF             | 0.273<br>(0.006) | 0.243<br>(0.013) | 0.057<br>(0.004)  | 0.124<br>(0.005)  |
| Indicator for 2004 SCF             | 0.485<br>(0.012) | 0.456<br>(0.022) | 0.166<br>(0.002)  | 0.276<br>(0.008)  |
| Age of head                        | ..               | ..               | 0.060<br>(0.004)  | 0.064<br>(0.005)  |
| Age of head-squared                | ..               | ..               | -0.001<br>(0.000) | -0.001<br>(0.000) |
| Age of head-cubed                  | ..               | ..               | 0.000<br>(0.000)  | 0.000<br>(0.000)  |
| Head has high school diploma       | ..               | ..               | 0.095<br>(0.003)  | 0.102<br>(0.002)  |
| Head has college degree            | ..               | ..               | 0.143<br>(0.003)  | 0.143<br>(0.003)  |
| Home owner                         | ..               | ..               | 1.010<br>(0.004)  | 1.031<br>(0.006)  |
| Log(income)                        | ..               | ..               | -0.066<br>(0.002) | -0.075<br>(0.002) |
| Number of observations             | 19 957           | 19 957           | 19 957            | 19 957            |

Notes: D/Y is the ratio of household debt to personal income. Standard errors in parentheses.

Sources: Board of Governors of the Federal Reserve System, SCF; authors' calculations

wealth effect of nearly ten cents on the dollar. The Case, Quigley and Shiller (2005) analysis of regional data implies a marginal propensity to consume out of housing wealth of three to four cents on the dollar.

Translating these estimates into the effect of house-price appreciation on debt would require a further analysis of how changes in consumption and thus saving translate into changes in holdings of particular assets and liabilities. To provide a crude sense of the possible importance of this channel, suppose that the marginal propensity to consume out of housing wealth is 0.06. With the FOF data showing

that the value of residential real estate rose by about 50 per cent of personal income between 1998 and 2004, the implied decrease in the saving rate by the end of this period is 3 percentage points. Assuming that the effect rose linearly over time – in other words, the average damping of the saving rate over the six-year period was 1.5 percentage points – the implied reduction in net worth over these six years is 9 per cent of income ( $\approx 1.5 * 6$ ). If the change in net worth was completely concentrated in a change in debt holding – an extreme upper bound – wealth effects would explain close to a 0.1 rise in the debt-to-income ratio.

Another channel we noted earlier was that higher house prices should induce more front-loading of household outlays relative to income and thus more borrowing. Moreover, Merry (2006) shows that the average loan-to-valuation ratio among home owners who recently purchased a home has moved up between 0.05 and 0.1 since the early 1980s. Therefore, the average household buying a house in 2004 would have increased its debt-to-income ratio considerably more than the average household buying a house when prices were lower. However, to calculate the magnitude of this front-loading effect on the aggregate debt-to-income ratio would require keeping track of the share of households buying a house in each year, as well as changes in house values relative to home buyers' income and changes in loan-to-valuation ratios (apart from those associated with financial innovation, which we consider separately).

As described previously, rising house values can also affect indebtedness by inducing portfolio rebalancing directly and by providing additional collateral that can be used for portfolio rebalancing or for consumption. According to Canner, Dynan and Passmore (2002), households that took cash out when they refinanced their mortgages in 2001 and early 2002 reported using about one-fifth of their extracted equity for investments in financial assets, real estate or businesses, one-fourth to pay off other debt, one-third for home improvements and one-sixth for consumer expenditures.<sup>15</sup> These findings suggest that gains in home values induce some combination of rebalancing and spending, but they do not allow us to distinguish between the direct rebalancing effect and the effect of relaxing liquidity constraints, nor do they indicate whether the spending was caused by rising house values or was determined by other factors and simply financed through this mechanism.

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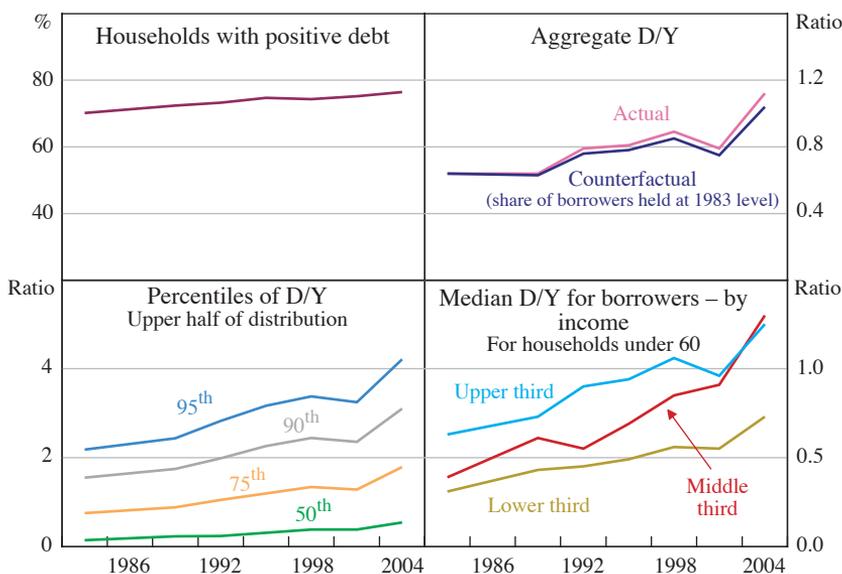
15. Greenspan and Kennedy (2007) provide estimates of the uses of home equity liquefied through cash-out refinancing and other channels. They identify the same categories as the most important uses, although the shares going to the various categories are somewhat different. Bucks *et al* (2006) report that respondents to the 2004 SCF used home equity lines of credit mainly for home improvements and debt consolidation.

### 3.6 Financial innovation

One mechanism through which financial innovation may have boosted household debt is by giving more households access to credit. Indeed, the share of households with some debt increased from 70 per cent in 1983 to 77 per cent in 2004, as shown in the top-left panel of Figure 6. Yet if new borrowers had the same debt-to-income ratio as the average borrower, this expansion of debt holding would explain a rise in the aggregate debt-to-income ratio of 10 per cent ( $= [77 - 70] / 70$ ) – only one-seventh of the actual rise. The top-right panel of Figure 6 illustrates this point graphically. Moreover, this calculation overstates the effect of financial innovation for two reasons. First, households that have only recently gained access to credit likely hold smaller-than-average amounts of debt (even relative to their incomes). Second, financial innovation probably explains only part of the expansion in debt holding. For example, the shares of different educational groups having positive debt barely edged up over time, as we showed in the middle-left panel of Figure 4; this finding suggests that the rising share of borrowers may largely reflect the rising educational attainment of the population. Thus, the ‘democratisation of credit’ appears to have played only a small role in the rise in US household indebtedness.

Financial innovation may also have boosted household debt, as we noted earlier, by relaxing quantity constraints or lowering the price of credit to households that already had some access. Clearly, the financial system has evolved in important ways over the past several decades, including improved assessment and pricing of

**Figure 6: Financial Innovation and Debt**



Notes: D/Y is the ratio of household debt to personal income. The SCF is a triennial survey. Source: Board of Governors of the Federal Reserve System, SCF

risk; expanded lending to households without strong collateral; and more widespread securitisation of loans, which has likely lowered the cost of credit. However, quantifying the effect of financial innovation on borrowing is very difficult because there are few direct measures of credit supply and because innovation has taken place gradually over time. One aspect of innovation that has received some attention is the effect of mortgage securitisation on interest rates. A number of papers find that securitisation has lowered the spread between mortgage rates and risk-free rates (for example, see Jameson, Dewan and Sirmans 1992; Kolari, Fraser and Anari 1998), while others argue that the link between securitisation and mortgage spreads is much weaker (for example, see Rothberg, Nothaft and Gabriel 1989; Todd 2001). Other empirical evidence tying increased debt use to specific financial innovations can be found in Edelberg (2006), who finds that the increased use of risk-based pricing explains a substantial share of the increases in debt levels seen across the 1990s, and Gerardi, Rosen and Willen (2006), who present results that suggest that mortgage innovation has increased the capacity of young households to purchase homes that are more in line with their expected higher future incomes.

Suggestive evidence of the importance of financial innovation for debt accumulation comes from the regression results in Table 1. After controlling for house prices and demographic variables, the estimated coefficient on the indicator variable for 2004 is much larger than the estimated coefficients on indicator variables for earlier years. A supporting indication is the very widespread nature of the increase in indebtedness. In the bottom-left panel of Figure 6, we show that the debt-to-income ratio has increased throughout the upper half of the distribution of this ratio. The median debt-to-income ratio more than tripled between 1983 and 2004, and the debt-to-income ratio at the 75<sup>th</sup>, 90<sup>th</sup> and 95<sup>th</sup> percentiles roughly doubled. The top-right panel of Figure 4 showed that the median debt-to-income ratio increased considerably for all but the oldest age group; higher percentiles of the debt-to-income ratio (not shown) increased markedly in all age groups. Similarly, as can be seen in the middle-right panel of Figure 4, the median debt-to-income ratio increased for all education groups, and higher percentiles increased as well. Lastly, in the bottom-right panel of Figure 6, the median debt-to-income ratio increased a good deal for households throughout the income distribution.

In addition, indebtedness may have been further increased by interactions between financial innovation and the climb in house prices. First, innovation that reduced the cost of liquefying housing equity enabled households to borrow against rising home values more easily; put differently, rising home values gave households additional collateral that enabled them to take advantage of financial innovation. Second, innovation may have helped to generate the sharp run-up in home values. Ortalo-Magné and Rady (2006) point out that a relaxation of borrowing constraints that enables households to buy houses with smaller down payments relative to prices will tend to push up house prices. Third, financial innovation may be endogenous to the rise in house prices. The reward to financial institutions from developing new means of liquefying housing equity is clearly larger when housing equity is larger.

## 4. The Consequences of Higher Household Debt

The sharp increase in US household indebtedness during the past quarter-century raises a number of questions for economic policy-makers. With regard to monetary policy, the crucial question is how the rise in debt has accentuated or damped the response of household spending to unexpected changes in the economic environment.<sup>16</sup> This question is the focus of the remainder of the paper.

### 4.1 Ways in which households are more vulnerable to economic shocks

The increase in debt-to-income ratios should have made at least some households more vulnerable to shocks to incomes, all else being equal. Because debt payments represent commitments whose amount and timing cannot usually be altered without a good deal of effort, reductions in income (all else being equal) reduce the cash flow available to fund current consumption proportionately more for highly indebted households. As a result, shocks to income may have larger effects on consumer spending and aggregate demand overall than they would have had in an earlier time.<sup>17</sup>

One way to gauge the magnitude of households' payment obligations is the aggregate debt-service ratio, which equals an estimate of required debt payments divided by disposable income. The aggregate debt-service ratio published by the Federal Reserve – the blue line in the top-left panel of Figure 7 – was little changed, on net, in the 1980s and early 1990s but has increased considerably during the past dozen years. The Federal Reserve also publishes a broader measure, the household financial-obligations ratio, which includes other types of regular financial commitments such as rent payments and auto lease payments and is therefore less sensitive to substitution of some financial arrangements for others, such as leasing a car rather than buying on credit (see Dynan, Johnson and Pence 2003). This ratio, shown as the red line in the top-left panel, has also risen markedly since the mid 1990s.

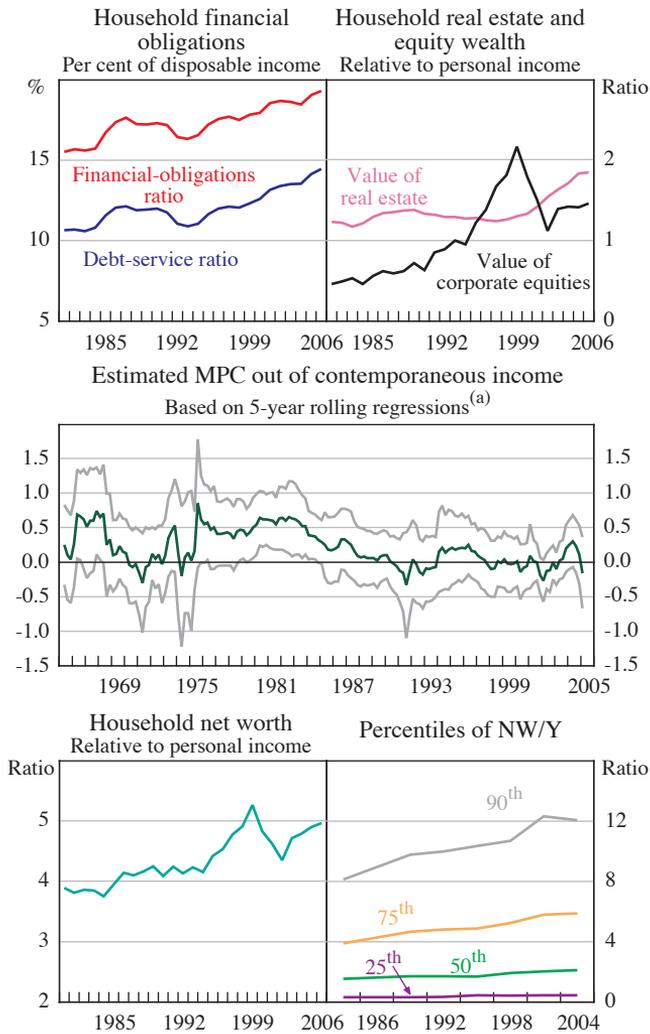
As with other aggregate data, the aggregate debt-service ratio describes the situation of US borrowers as a whole but does not help us to understand the range of conditions and vulnerability across households. We showed earlier that debt-to-income ratios have increased substantially over time for a wide range of households, whether sorted by education, age, position in the income distribution or position

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16. The response of households to the anticipated evolution of the economic environment has also likely changed with higher debt use, especially to the extent that constraints on households' ability to smooth consumption have changed. Presumably the forecasts of central banks should be able to build in such shifts in spending, so we focus on economic shocks.

17. In addition, Carroll and Dunn (1997) argue that precautionary motives make the spending of households with high debt levels more sensitive to *uncertainty* about income than the spending of households with less debt and therefore high-debt households are more likely to pull back their spending in the face of an adverse shock.

**Figure 7: Household Vulnerability to Economic Shocks**



Notes: MPC is the marginal propensity to consume. NW/Y is the ratio of household net worth to personal income. The SCF is a triennial survey.

(a) Grey lines show 95 per cent confidence intervals.

Sources: Board of Governors of the Federal Reserve System, FOF, SCF; Dynan *et al* (2006a)

in the distribution of debt-to-income ratios. Presumably, then, debt service has increased for a wide range of households.

The increase in debt-to-income ratios has also made households more vulnerable to shocks to interest rates. Movements in market rates alter the terms of new borrowing and also alter the burden imposed by previous borrowing because rates on some outstanding debt vary with current market rates. Thus, the average interest rate on

household debt responds gradually to shifts in market rates. When debts are large relative to incomes, this effect is accentuated so that a given change in interest rates has a larger effect on debt servicing and thus a larger effect on the funds available for consumption.<sup>18</sup>

Although households may be more vulnerable to interest rate and income shocks taken separately, in many cases those shocks will move in offsetting directions. In particular, exogenous shifts in desired spending may well have a smaller ultimate effect on aggregate demand when indebtedness is high because the effects of such shifts on spendable income are offset to a larger extent by the induced increases and decreases in interest rates as central banks seek to stabilise the economy and prices. To be sure, price shocks, such as a rise in the price of imported oil, would involve reinforcing movements in income and interest rates. But with inflation expectations well anchored, such shocks have had diminished effects on inflation in recent years, thereby reducing the need for policy reactions.

The rise in real asset holdings that has been associated with the increase in indebtedness has also indirectly made households more vulnerable to shocks to asset prices. As can be seen in the top-right panel of Figure 7, the ratios of equity wealth and housing wealth to personal income have both increased significantly, on net, over time. Part of these increases reflects new saving, part reflects increases in equity and home prices, and part reflects decisions by households to allocate their total portfolios between assets and liabilities in certain combinations. The rise in the leverage of household portfolios facilitated by the increase in debt means that household wealth now swings more widely in response to given fluctuations in equity and home prices. Thus, consumer spending and aggregate demand have become more sensitive to asset prices.

Lastly, the ability to borrow more easily or cheaply means that households with unreasonable expectations about future income or asset appreciation can take on more debt than may be appropriate. Dynan *et al* (2006a) note a straightforward analogy in the business sector: the high-tech investment boom of the late 1990s was fuelled by a combination of optimism about the pay-off from new information technology and a ready supply of credit to finance investment in such technology.

## 4.2 Ways in which households are less vulnerable to economic shocks

Increasing indebtedness is not the only change in households' financial situations during the past quarter-century. Other financial changes have made households less vulnerable to economic shocks.

First, the greater availability of credit, noted earlier in the paper, could lessen the sensitivity of household spending to downturns in income. Specifically, households that can borrow when their income experiences a transitory slump can better maintain

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18. Higher debt payments also imply higher interest income; however, net borrowers are likely to have higher propensities to consume out of income than net lenders.

their spending. Indeed, Dynan *et al* (2006a) found that the estimated marginal propensity to consume (MPC) out of contemporaneous aggregate income has diminished over time. The middle panel of Figure 7 reproduces a chart from that paper; the dark line shows the estimated MPC from forty-quarter rolling regressions, and the lighter lines show the 95 per cent confidence intervals. Although the confidence bands are wide, the point estimates move much closer to zero in recent years. The paper also showed that the decline in the MPC was more pronounced for income declines than for increases, which is consistent with the notion that financial innovation likely relaxed constraints on borrowing more than on saving.

Note that this smoothing effect of borrowing is not inconsistent with the disruptive effect of additional debt described earlier. As Dynan *et al* (2006a) explain, the link between financial innovation and spending volatility depends not on the average amount of borrowing but on marginal borrowing that smoothes spending in the face of income fluctuations.<sup>19</sup> Financial innovation appears to have increased both the amount of debt held during good times and the availability of additional debt in bad times; these forces push the volatility of spending in different directions. This stand-off is consistent with Johnson and Li's (2007) finding that households with high debt-service payments do not appear to be more sensitive to income shocks than those with low debt-service payments.<sup>20</sup> They argue that this result might arise because the former group has greater access to additional credit, which offsets the effect of their more restricted cash flow.

A second change that has made households less vulnerable to economic shocks is that household wealth has increased a good deal relative to income over the past several decades. Assets are much larger than liabilities, so the arithmetic gap between assets and liabilities can widen even when assets rise less rapidly than liabilities do. According to the FOF accounts and as shown in the bottom-left panel of Figure 7, the ratio of household wealth to personal income averaged 4.7 in the first part of this decade, compared with an average of 4.0 in the 1980s.<sup>21</sup>

Once again, however, movements in aggregate liabilities and assets have limited utility when considering household vulnerability. The bottom-right panel of Figure 7 plots ratios of net worth to income at the 25<sup>th</sup>, 50<sup>th</sup>, 75<sup>th</sup> and 90<sup>th</sup> percentiles of the distribution of those ratios in the SCF. The most dramatic increases have occurred at the higher percentiles, but even at the 25<sup>th</sup> percentile net worth has increased a bit relative to income. Therefore, from the perspective of the full balance sheet, most households appear to have strengthened their financial positions over time. Higher

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19. These authors also explain that greater capacity to borrow can boost the volatility of spending by giving households the wherewithal to purchase capital goods more quickly when their target stocks of those goods increase. In other words, financial innovation augments the traditional accelerator response to positive shocks to expected income or wealth. If expected income or wealth decline, perhaps because of a drop in asset prices, spending may then suffer a sharp retrenchment.

20. Similarly, Benito *et al* (2007) find evidence suggesting that higher debt levels have not raised the sensitivity of spending to income shocks for households in the United Kingdom.

21. The aggregate ratio of net worth to income in the SCF data displays a somewhat different pattern than in the FOF data, but it also increased considerably between the 1980s and the early 2000s.

net worth implies a greater ability to smooth through temporary shortfalls in income or increases in interest rates by selling or borrowing against assets.

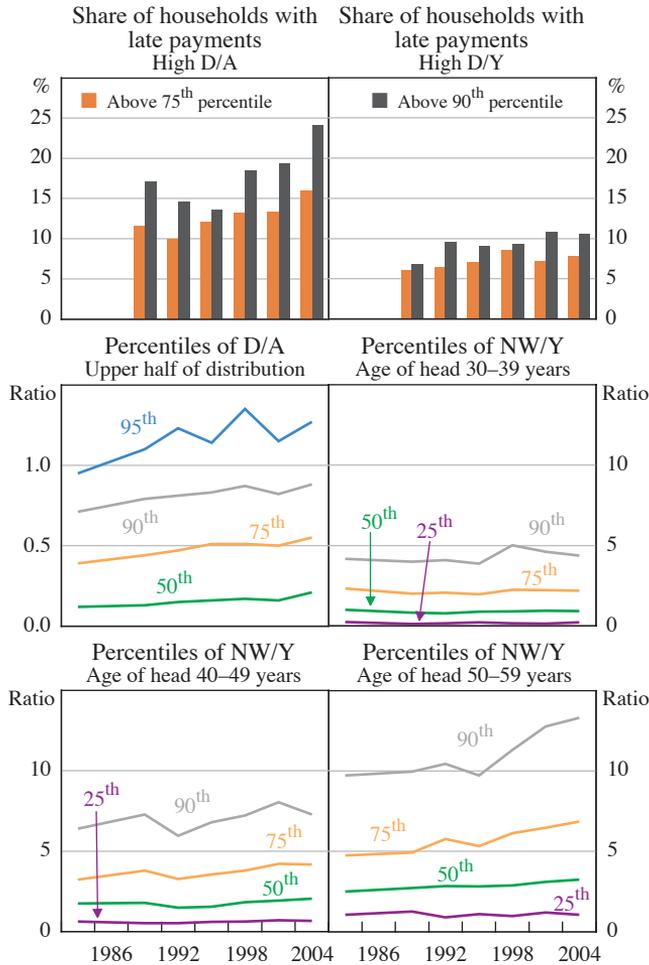
### **4.3 Debt and financial distress: evidence from the SCF**

In the 2004 SCF, 6.9 per cent of households reported having been 60 or more days late on a required debt payment over the previous year. To understand the determinants of such delinquency, we estimated logit regressions for which the independent variables were the debt-to-income or debt-to-assets ratio, an indicator variable for home ownership, indicator variables for SCF waves and the demographic variables discussed earlier. We dropped the 1983 wave because the delinquency variable was not comparable and we omitted the 1989 indicator variable to achieve identification.

The regressions showed that the likelihood of missing payments is strongly related to the amount of debt held and that the debt-to-assets ratio has more explanatory power than the debt-to-income ratio. This latter point is depicted graphically in the top panels of Figure 8, in which the darker-shaded columns refer to households above the 90<sup>th</sup> percentiles of the debt-to-assets and debt-to-income distributions and the lighter-shaded columns refer to households above the 75<sup>th</sup> percentiles. Households with higher debt-to-income ratios had only a slightly higher probability of having been delinquent (shown on the right), while households with higher debt-to-assets ratios had a noticeably higher probability of having been delinquent (shown on the left). The likelihood of missing payments is significantly lower for home owners, perhaps because they have more to lose by defaulting.

We also found that the likelihood of missing payments has increased over time. One factor behind this change is an increase in the number of households with very high debt-to-assets ratios. As shown in the middle-left panel of Figure 8, debt-to-assets ratios have risen throughout the upper half of the distribution of those ratios, but they remained fairly low at the median and the 75<sup>th</sup> percentile. However, debt-to-assets ratios climbed to just below 1 at the 90<sup>th</sup> percentile and well above 1 at the 95<sup>th</sup> percentile; these latter households are insolvent.

**Figure 8: Financial Distress and the Adequacy of Retirement Savings**



Notes: D/A and D/Y are the ratio of household debt to assets and to personal income respectively. NW/Y is the ratio of household net worth to personal income. The SCF is a triennial survey. Source: Board of Governors of the Federal Reserve System, SCF

**4.4 Debt and financial distress: recent developments in the sub-prime mortgage market**

Recent developments in the sub-prime mortgage sector in the United States provide a concrete illustration of some of the risks associated with the upper tail of the debt distribution and, relatedly, with financial innovation. By way of background, the US sub-prime mortgage market emerged more than two decades ago and then began to expand in earnest in the mid 1990s; it was spurred in large part by innovations that reduced the costs for lenders of assessing and pricing risks. This expansion made home ownership possible for households that in the past might not have qualified

for a mortgage and has thereby contributed to the significant rise in the US home ownership rate – from 65 per cent in 1995 to 69 per cent in 2006.

The most recent episode in the sub-prime mortgage sector started with a boom in lending beginning in mid 2004 and lasting through much of 2006. Sub-prime delinquency rates fell to multi-year lows in mid 2005 amid a robust housing market but then began to rise, particularly those for variable-rate loans. The rate of serious delinquencies among these loans – corresponding to mortgages in foreclosure or with payments 90 days or more overdue – has now reached 13 per cent, more than double its earlier low. This rise in delinquencies has, in turn, shown through to new foreclosures: in the first quarter of 2007, an estimated 325 000 foreclosure proceedings were initiated, up from an average quarterly rate of 230 000 over the preceding two years.<sup>22</sup>

The dramatic deterioration in the performance of sub-prime variable-rate mortgages has stemmed from several factors. To be sure, the moderation of economic growth and, in some cases, higher interest rates have probably made it more difficult for some borrowers to service their loans. However, a key determinant appears to have been the sheer amount of debt relative to the value of the house taken on by some borrowers. Many of the troubled borrowers appear to have had very high loan-to-valuation ratios particularly once second-liens or so-called piggyback loans were taken into account, a result consistent with a loosening of underwriting standards during the period in which sub-prime loans were expanding rapidly. The factors contributing to this loosening are not, as yet, fully understood, but it seems likely that at least some borrowers and lenders may have been expecting a continuation of the rapid rates of house-price appreciation seen in the preceding few years. In the event, house prices slowed sharply in 2006, leaving some borrowers who had recently originated a high loan-to-valuation mortgage with little or no equity to draw on should they have trouble making mortgage payments. Indeed, in the past, many sub-prime borrowers facing the end of the interest rate lock period on their mortgages have refinanced before their payments began to reset; in the current episode, the ability to do so has been limited by the lack of accumulated home equity.

To put these developments in a macroeconomic context, the loosening of credit standards along with unrealistic expectations for house prices probably boosted housing demand in 2005 and 2006, and the subsequent correction is contributing to the extent and persistence of the softness in the housing market. With regard to aggregate household consumption, the number of troubled sub-prime borrowers may be sufficiently small that the direct effect will be modest. That said, some households will surely face significant financial distress, and one cannot rule out the possibility that the events will materially reduce investors' willingness to provide mortgage credit to a broader group and thereby have a more significant effect on aggregate spending. A full discussion of the related developments in financial markets and of the steps being taken by policy-makers to address the problems is outside the scope

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22. Delinquency rates are based on data from First American LoanPerformance; foreclosure rates are based on data from the Mortgage Bankers Association, which have been adjusted to reflect the limited coverage of the Association's sample.

of this paper. However, the broad lesson with regard to financial innovations that enhance access to credit is that regulators need to carefully consider what additional regulations or oversight might be needed to protect consumers and promote safe and sound underwriting practices, particularly when such innovations are new and not fully understood by households and lenders.

## 4.5 Higher debt and the adequacy of retirement savings

Another consequence of the higher level of indebtedness is that households may find themselves with insufficient savings when they retire. For example, households that extract equity from their houses without recognising the long-run consequences of the reduction in net worth or that fail to recognise that the cost of shelter is rising along with the price of houses may need to make substantial adjustments to their consumption paths later in life. Whether inadequate savings is a widespread problem – or has become more widespread over time – is not clear. A substantial literature examining the adequacy of retirement savings has not reached a consensus, partly because of disagreements about assumptions and techniques and partly because savings adequacy may be evolving over time.<sup>23</sup> Resolving this question is important for entitlement and tax policy but probably not for monetary policy, because the macroeconomic effects of households' consumption responses would be gradual. Nevertheless, we can glean some casual evidence from the SCF.

Today's households nearing retirement have accumulated as much or more wealth relative to their incomes as did their forebears.<sup>24</sup> Looking at 50- to 59-year-olds during the past 25 years – shown in the bottom-right panel of Figure 8 – we see that the ratio of net worth to income has been essentially unchanged for households at the 25<sup>th</sup> percentile, has risen a little for households at the 50<sup>th</sup> percentile, and has increased considerably for households at the 75<sup>th</sup> percentile and above. Of course, this assessment does not account for many important complexities that are addressed in sophisticated analyses of savings adequacy. For example, one cannot control for the value of defined benefit pensions using the SCF without fairly complicated calculations and assumptions, and this approach makes no adjustment for the rising cost of health care.

Similar casual evidence for younger households may raise greater concern. For 40- to 49-year-olds, shown in the bottom-left panel, ratios of net worth to income have also increased over time but to a lesser extent. Moreover, one might be concerned that today's younger households might not enjoy the run-ups in stock prices and home prices that their older counterparts experienced. These points apply with even greater force to 30- to 39-year-olds, shown in the middle-right panel.

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23. For a sampling of this analysis, see Bernheim, Skinner and Weinberg (2001); Engen, Gale and Uccello (2004); Scholz, Seshadri and Khitatrakun (2006); and Love, Smith and McNair (2007).

24. For a more comprehensive examination of the relative wealth of different cohorts at different stages in the life-cycle, see Gale and Pence (2006).

## 5. Conclusion

The debt of US households has risen very substantially relative to income, especially in the past five years or so. This increase mainly reflects the efforts of households to smooth consumption over time in response to shifting perceptions about future income, wealth and interest rates, along with the effects of financial innovation that has reduced constraints on the ability of households to realise desired consumption patterns.

The information we looked at did not suggest that households have become more impatient – that they are more inclined to bring a given amount of future consumption forward. Nor did we unearth strong evidence of reduced risk aversion or perceived risk as a motive for borrowing and spending more now instead of saving. To be sure, aggregate income flows have become less volatile as part of the ‘Great Moderation’, but individual households appear to face, if anything, the potential for greater swings in earnings due to the churning associated with technological change and globalisation. Although households showed some decline in their reported need to accumulate savings for precautionary purposes, the effects of this decrease are likely to account for only a very small part of the trend in debt.

Demographics have probably contributed to greater indebtedness, through both the greater concentration now of baby boomers in the part of the life-cycle where debt use is highest and the increases in educational attainment, likely a proxy for higher lifetime earnings, as well as more sophisticated use of financial instruments. Declines in longer-term interest rates and increases in expected incomes may have also boosted debt to some extent. With regard to the latter, the step-up in productivity growth in the mid 1990s in the United States should have raised calculations of lifetime incomes. But median real incomes have not grown very rapidly in recent years, and survey responses suggest that households have not been very optimistic about their earnings in the immediate future over the past several years, when the growth in debt has been especially strong.

The most important factors behind the rise in debt and the associated decline in saving out of current income have probably been the combination of increasing house prices and financial innovation. We noted a number of channels by which higher house prices can lead to higher debt. And causality probably runs to some extent in the other direction as well, especially in light of financial innovation that has reduced the cost and increased the availability of housing finance. Innovation has opened up greater opportunities for households to enter the housing market and for home owners to liquefy their housing wealth, thereby helping them smooth consumption of all goods and services. One implication of this analysis is that a portion of the rise in debt relative to income probably reflects a shift in the level of spending that is not likely to be repeated unless house prices continue to increase as quickly as in the past and financial innovation continues to erode cost and availability constraints at a rapid pace.

With regard to the implications of greater household indebtedness, it seems unlikely that households have deliberately put themselves in a position in which they see their consumption as more vulnerable to unexpected economic developments, especially

given that risk aversion and risk perceptions among households are probably largely unchanged. Although higher debt service obligations relative to income would appear to leave households more open to unexpected changes in income and interest rates, many macroeconomic shocks involve the demand for goods and services and tend to lead to offsetting movements in income and interest rates. Moreover, the increase in access to credit and levels of assets over time should give households, on average, a greater ability to smooth through any shocks.

That said, there are a number of reasons to be cautious about concluding that rising debt levels have not increased macroeconomic vulnerabilities. For one, household spending is probably more sensitive to unexpected asset-price movements than previously. A higher wealth-to-income ratio naturally amplifies the effects of a given percentage change in asset prices on spending. Further, financial innovation has facilitated households' ability to allow current consumption to be influenced by expected future asset values. When those expectations are revised, easier access to credit could well induce consumption to react more quickly and strongly than previously. In addition, to the extent that households were counting on borrowing against a rising collateral value to allow them to smooth future spending, an unexpected levelling out or decline in that value could have a more marked effect on consumption by, in effect, raising the cost or reducing the availability of credit.

Another caution involves the distribution of credit and, in particular, a tendency for some households to become very highly indebted relative to income and wealth. The spending of those households is likely to be constrained by negative income or asset-price shocks as well as by households' capacity to service their loans. Although these households represent a relatively small share of the population, in some circumstances such developments could have effects large enough to show through to the macroeconomy.

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## Discussion

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### Chris Carroll

Nothing beats the permanent income hypothesis (PIH) as a starting point for discussing a paper on consumption and debt choices.<sup>1</sup> If total wealth  $O$  is the sum of market wealth  $b$  and human wealth  $h$ , the perfect foresight incarnation of the PIH says that spending is proportional to  $O$ :<sup>2</sup>

$$c = \underbrace{(b + h)}_{\equiv O} \kappa \quad (1)$$

where, if income is expected to grow at rate  $g$ , the human wealth component is

$$h = \left( \frac{1}{r - g} \right) \quad (2)$$

Even in this rudimentary form, the model already has an interesting implication; a change in households' beliefs about the future income growth rate could have a powerful effect on spending (the 'human wealth effect' of growth). While there is some ambiguity about the appropriate measure of interest rates, it is clear that the quantity  $r - g$  will be substantially altered by even modest changes in beliefs about growth.

This provides a first example of the authors' wide-ranging empirical methodology. Rather than indulging in vague speculations about whether perceptions of growth might have changed, or (even worse) estimating a structural macroeconomic model that forces expectations to match some currently popular theory, the authors resort to a simple alternative; they report households' actual measured expectations. (It turns out that the University of Michigan's monthly survey of consumers has asked households a direct question on this subject since the 1950s.) The results provide no support for the proposition that soaring optimism explains the decline in the saving rate in the United States depicted in their first figure; in fact, in the reported figures, the median household seems to have become marginally *less* optimistic over the relevant period.<sup>3</sup>

Another possibility implied by the equations above is that, holding growth expectations constant, a decline in real interest rates  $r$  will increase the present discounted value of future labour income, thereby encouraging more consumption today (the human wealth effect of interest rates). This possibility is given additional

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1. As a finishing point, one might want something closer to the life-cycle model; fortunately, the paper by Kent, Ossolinski and Willard (this volume) provides the complementary set of insights available in that framework.
  2. Lower-case variables reflect the level of the variable normalised by the level of permanent labour income; for example  $c = C/P$ .
  3. This is not necessarily inconsistent with aggregate developments, since much of the substantial per-capita income growth over the past 25 years, and especially much of the improvement in growth prospects, has been concentrated at the upper end of the income distribution rather than the median that the authors examine.

plausibility by a real-world fact that is not captured in the model; loan repayment rates are generally determined using nominal, not real, rates, so a decline in inflation could reduce household debt service burdens (and encourage higher debt levels) even if real rates were unaffected (Debelle 2004).

Interest rates are the one factor emphasised in every model but on which the authors offer no new evidence. They diffidently mention that according ‘to some of the empirical models of aggregate consumption used at the Federal Reserve Board, the net decline in real interest rates during the past half-dozen years can explain about 2 percentage points of the decline in the aggregate saving rate over that period’, but a footnote then undermines even this modest claim. I am sympathetic to their reluctance to say more, which I suspect reflects a justified view that the existing literature on interest rate effects is thoroughly unpersuasive. However, it would have been interesting to see some alternative evidence about interest rate expectations from the consumer sentiment surveys or the Survey of Consumer Finances (SCF) data. At the very least they could report that an examination of those sources produced nothing useful, which would itself be a useful fact.

We have not yet exhausted the implications of the PIH framework. With perfect foresight and a utility function with relative risk aversion  $\rho$ , the marginal propensity to consume out of transitory income is<sup>4</sup>

$$\kappa = (r - \rho^{-1}(r - \vartheta)) \quad (3)$$

I am satisfied that sensible calibrations of this model involve a relative risk aversion parameter that is greater than or equal to 2, in which case this equation indicates that the income effect is outweighed by the substitution effect so that a decline in interest rates should produce a net decline in spending. This goes in the opposite direction from the human wealth effect, so in principle the model’s implications about the effect of interest rates on consumption are ambiguous. In practice, however, as Summers (1981) showed, for essentially all plausible calibrations the perfect foresight model suggests that the human wealth effect should be much larger than the income and substitution effects for most households over most of their lifetimes.

Of course, arbitrary changes in the degree of impatience could explain any pattern of changes in saving rates, and many possible reconfigurations of debt. In order to rule out this possibility, the authors present what I view as among the best measures of this difficult-to-measure quantity: the answers to a survey question from the SCF in which households are asked about their ‘planning horizon’. Lusardi (2003) has recently emphasised the explanatory power of these questions for a wide variety of cross-sectional choices and behaviours. In this particular context, however, the answers to the question do not help much; despite large differences across households in planning horizons, the SCF data suggest that on average households have become, if anything, *more* rather than less patient (there is a modest increase in the number of households with long planning horizons). Similarly, the proportion of households

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4. In my comments I alternate between the discrete-time and continuous-time solutions to the PIH model, depending on the situation; one of the virtues of the benchmark PIH model is that nothing important depends on the time frame over which the problem is examined.

who admit to planning for retirement has gone up. Thus, it is difficult to make the case that an increase in impatience is responsible for the decline in saving.

The perfect foresight PIH framework has defects as well as virtues for thinking about these questions. Perhaps the most serious limitation is that the model does not predict the existence of any ‘target’ level of net worth. Patient consumers will accumulate unbounded amounts of wealth, while impatient ones will run up their debt to the point where all income is devoted to debt-servicing, and both of these behavioural patterns will take a very long time to work out, far longer than the time frame that is useful for high-frequency macroeconomic analysis.

Fortunately, these problems can be addressed using a modest but powerful extension to the model. All that is necessary is to make the model slightly more realistic in a crucial respect: relax the assumption of perfect certainty. The most transparent way to do this (following Toché 2005) is to make an extreme assumption; in every period, every employed consumer faces a risk of becoming unemployed, and in the unemployed state income falls to some fraction of its value for an employed consumer (zero, if there is no unemployment insurance; more realistic assumptions can be made at the cost of less tractability). Furthermore, unemployment is an absorbing state: nobody ever emerges from unemployment (and so perhaps retirement is a better interpretation).<sup>5</sup>

This simple modification has profound consequences. Details and derivations are beyond the scope of this discussion; Toché (2005) treats the problem in continuous time and Carroll (2007) provides a discrete-time version with ample intuition and several examples. The key point, however, is straightforward. The model assumes that consumers are sufficiently impatient that their wealth-to-income ratio would not approach infinity even in a perfect foresight world. The theory then implies the existence of a target level of wealth, because with constant relative risk aversion (CRRA) utility (and imperfectly insurable unemployment risk), the intensity of the precautionary saving motive increases as wealth falls. The target level of net worth will be the point where the degree of prudence exactly matches the degree of impatience.

Rather than working through the model in detail, I will present here only the highlights. The most important of these is the formula for the target level of net worth. Two special cases of the model capture most of the key points. The first is the case where utility is logarithmic (equivalent to  $\rho = 1$ ). In this case, there will be a target level of net worth of<sup>6</sup>

$$\bar{m} \approx 1 + \left( \frac{1}{(\gamma - r) + \vartheta(1 + (\gamma / \bar{U}))} \right) - \mathbf{d} \quad (4)$$

5. To permit the examination of human-wealth-preserving spreads in unemployment risk, we need to modify the growth rate of income to be equal to or greater than  $g$  so that a change in ‘unemployment risk’ does not change the discounted value of  $h$ .

6. See Carroll (2007) for derivations; the role of debt is an addition for the purposes of this discussion. Labour productivity is assumed to grow by a factor  $1/(1 - \bar{U})$ .

where  $\mathbf{d}$  is the borrowing limit and  $\gamma$  is the uncertainty-adjusted income growth rate.<sup>7</sup> The effect of the impatience assumptions is to guarantee that the denominator of the fraction is a positive finite number.

This equation neatly collects most of the qualitative, and even some of the quantitative, predictions of optimisation under uncertainty. For example, an increase in the time preference rate  $\vartheta$  will increase the second term in the denominator and so reduce target net worth  $\bar{m}$ . In contrast with the perfect foresight framework, however, the model says that the growth rate of consumption is not altered forever; eventually net worth will approach its new (lower) target level, after which the growth rate of consumption will again (as before) be equal to the growth rate of income, and the saving rate will stabilise at a new, lower, rate.

The human wealth effects of growth and interest rates are directly captured by the first parenthetical term in the denominator; raise  $\gamma$  or lower  $r$  and you will increase the denominator and therefore reduce target wealth.

Again, however, these are effects on the target or steady-state level of  $m$ , which is the *ratio* of net worth to labour income. A change in income growth will have an effect on the target, but in steady state the existence of a target *ratio* implies that the growth rate of net worth must eventually settle down to the growth rate of income. This is a stark contrast to the implications of the perfect foresight framework in which (in partial equilibrium) wealth levels perpetually rise or fall. (In the perfect foresight model, the growth rate of consumption is unaffected by the growth rate of income; any change in parameters results in a one-time shock to the level of consumption, making it move to the new level from which the new growth rate can be sustained perpetually.) Thus, human wealth effects are (plausibly) more limited in the perfect foresight framework.

In addition to rationalising the role of human wealth and impatience effects, the model captures the effect of uncertainty on target wealth via the  $\gamma/\bar{U}$  term. This is most easily understood by considering the consequences of unemployment risk approaching zero; assuming  $\vartheta$  and  $\gamma$  are both positive, this implies that the denominator will approach infinity, so that the target buffer stock approaches zero. This reflects the fact that so long as there is *any* positive unemployment risk, the CRRA utility function has the effect of creating a self-imposed borrowing constraint.<sup>8</sup> However, as the risk disappears almost entirely the amount by which target wealth exceeds its minimum possible value becomes arbitrarily small. Conversely, an increase in unemployment risk reduces  $\vartheta\gamma/\bar{U}$  and therefore increases target wealth.

However, the point that deserves perhaps the greatest emphasis, is that the target level of net worth moves one-for-one with movements in the borrowing  $\mathbf{d}$ . That is, if the borrowing limit increases by \$1, then the eventual new equilibrium will be at a point where the extra borrowing capacity has been fully exploited and the

7. This will be the ‘natural’ borrowing limit determined by the amount that the consumer could repay in the worst state of the world, namely unemployment starting next period. It will be a function of the unemployment insurance replacement rate, the interest rate and the growth rate.

8. A consumer who borrowed more than  $\mathbf{d}$  might be forced to consume zero and would therefore experience negative infinite utility.

consumer's net worth is lower by \$1. This suggests that any consumption-smoothing benefits of a relaxation of borrowing constraints will be temporary, lasting only until households have managed to use the new borrowing capacity to adjust their buffer stocks downward.<sup>9</sup>

While there is some debate on the subject, the consensus among labour economists seems to be that there has been a substantial increase in labour income uncertainty in the US over the time frame we are considering. *Ceteris paribus*, one would have expected an increase in precautionary saving (and an increased reluctance to borrow) as a result. On the other hand, unemployment rates have declined gradually but substantially over the period in question, and the right measure of risk is presumably at the household level rather than the individual level, so it is not entirely clear that the relevant risk levels have increased.

The authors present some interesting evidence on this question based on results from survey questions from the SCF about motivations for saving. Although this question on the survey is somewhat open-ended, the answers tend to be grouped into broad categories, of which the most frequently cited reason is not retirement but liquidity, which a broad-minded person might interpret as reflecting precautionary motives. Interestingly, in accord with their other evidence of a modest increase in credit availability, the need to save for 'liquidity' purposes seems to have declined a bit over time. Whether this is a transitory phenomenon on the road to a new equilibrium remains to be seen.

Finally, the paper presents some evidence on whether the degree of risk aversion has changed over time. Because Equation (4) was derived under the assumption of  $\rho$  fixed at 1, the role of risk aversion was not apparent. An alternative special case of the model is useful to highlight this effect; assuming  $r = \vartheta$  and introducing a term  $\eta$  that is increasing in risk aversion, the formula for target wealth is modified to

$$\bar{m} \approx 1 + \left( \frac{1}{(\gamma - r) + \vartheta(1 + (\gamma/\bar{U})(1 - \eta))} \right) - \mathbf{d} \quad (5)$$

(the difference with Equation (4) is the multiplication of the  $(\gamma/\bar{U})$  term by  $(1 - \eta)$ ). Thus, an increase in the intensity of prudence causes a reduction in the denominator and therefore an increase in target wealth.

The data that the authors report do contain some hints that the intensity of precautionary motives may have declined. For example, there is a reduced proportion of households citing liquidity motives for saving, as well as a modest increase in the proportion who say they are willing to take above-average risks to earn above-average returns. Nothing, however, suggests a sea change in risk attitudes of the kind that was entertainingly invoked at the height of the late 1990s share market bubble to argue that shares were (even then!) profoundly undervalued.

Given their systematic dismantling of most alternative explanations for the rise in debt, one senses that the authors suspect that the main explanation for the rise in debt and the fall in saving is the obvious one; financial market innovation made it

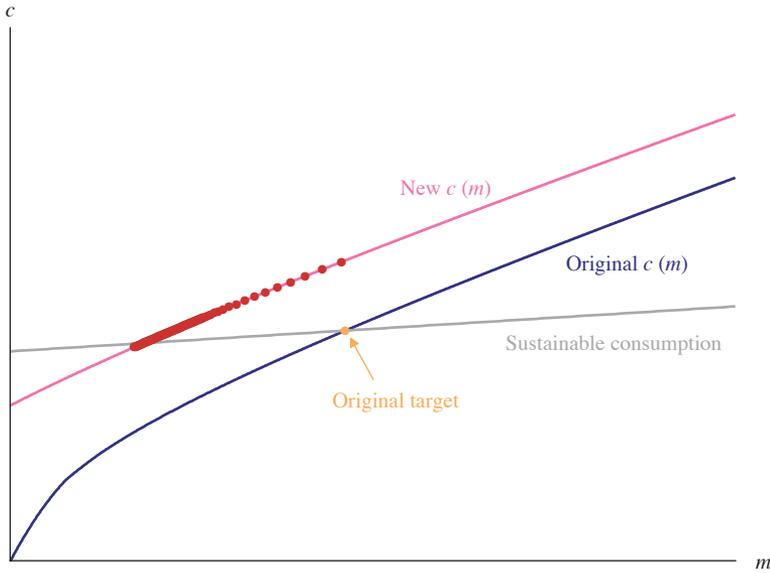
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9. This broad point comes through clearly in the much more realistically calibrated simulations in Carroll (2001).

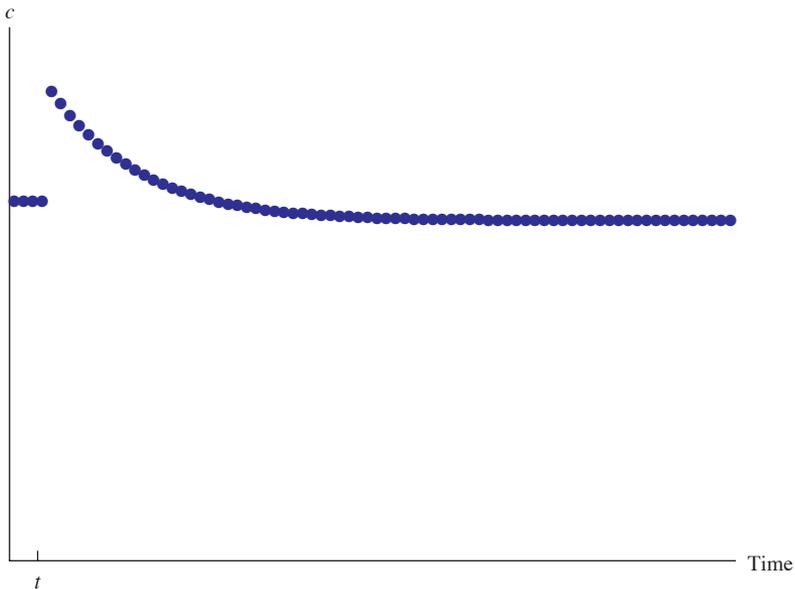
easier to borrow in the US, and in a world of impatient consumers that means that people have borrowed more.

To explore the implications of that argument, Figures 1–4 depict the dynamics of  $c$ ,  $m$  and  $c'(m)$  in response to a one-off increase in the level of the borrowing limit.

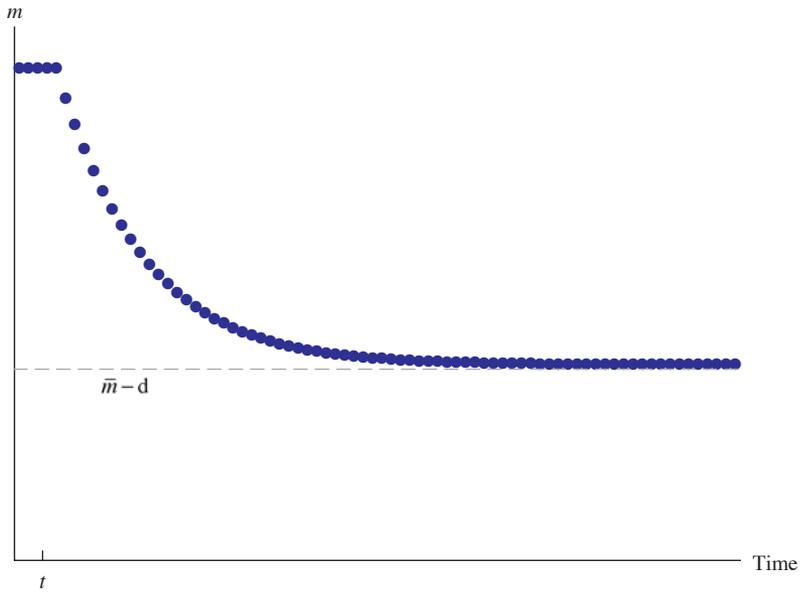
**Figure 1: The Effect of Relaxing Liquidity Constraints on the Consumption Rule**



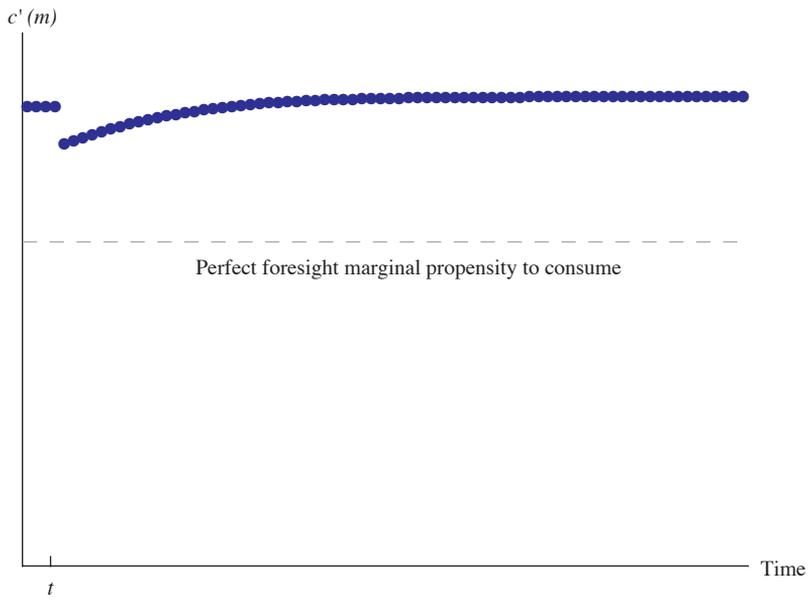
**Figure 2: Path of  $c^e$  Before and After  $d$  Rise**



**Figure 3: Path of  $m^e$  Before and After  $d$  Rise**



**Figure 4: Path of  $c'(m)$  Before and After  $d$  Rise**



Several features of the results are worth emphasising.

First, the relaxation of the constraint provokes an immediate and large consumption boom as previously constrained consumers go on a spending spree.

Second, however, the ultimate asymptotic destination for the level of consumption is very close to its pre-liberalisation level (the only reason the two are different is that the lower target level of net worth generates a lower equilibrium level of asset income).

Finally, after the initial great leap upward in spending, the transition toward the new equilibrium is quite gradual.<sup>10</sup> From the standpoint of monetary policy and financial stability, it seems safe to conclude that predictable transitional dynamics can reasonably be neglected.

These model results can be turned into a practical interpretation of US macroeconomic history by thinking about the gradual process of financial liberalisation as being like a series of small relaxations in borrowing constraints, each of which individually would have played out in a manner like that indicated in the figures. Under this interpretation, the decline in the saving rate and the increase in debt reflect a large but gradual cumulative relaxation of constraints; gradual enough that there is no single point in time at which an upward spike in consumption like the one depicted in Figure 2 would be evident, but fast enough that the period of adjustment is still ongoing.

A final point about the model is that it implies a high degree of sensitivity of current consumption decisions to households' perceptions of their economic environment. Fortunately for macroeconomic stability, actual spending decisions do not seem to dance on a string to the extent that one might anticipate from the model. The macroeconomic literature presents varying interpretations of the excess smoothness of consumption choices (with habit formation currently occupying a favoured spot), but it seems likely that the key insights of the model would not be undermined by a sensible model that was more realistic in attempting to match the quantitative details of consumption dynamics.

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10. Each dot in the figures represents a year, and the baseline parameterisation was chosen for its ability to generate illustrative figures rather than its realism – a more realistic parameterisation would exhibit even slower transitions.

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# The Rise of Household Indebtedness

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Christopher Kent, Crystal Ossolinski and Luke Willard<sup>1</sup>

## 1. Introduction

A large rise in household indebtedness has been common to many, though not all, advanced economies over the past few decades and is a key feature of the broader trend of financial deepening. This reflects a number of factors, including an easing in credit constraints following financial deregulation – which, among other things, has allowed for greater competition among lending institutions – and a decline in inflation, and nominal and real interest rates. Where these factors have been especially strong, or operated simultaneously, debt has risen rapidly and has typically been associated with a sharp rise in real house prices. For instance, in Australia, the Netherlands and the United Kingdom, the household debt-to-income ratio has increased substantially since the 1980s (Figure 1<sup>2</sup> and Table 1). In contrast, in countries such as France, Germany and Switzerland, indebtedness has increased only moderately over a similar period.

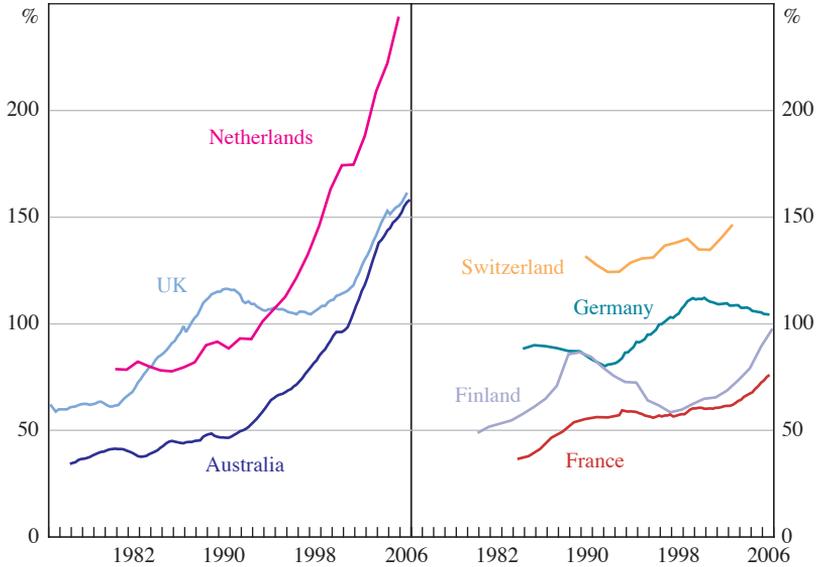
As both sides of household balance sheets have expanded, the debt-to-income ratio may give only a partial impression of the change in the household financial position. Two other key measures of the health of household balance sheets are the gearing ratio – the stock of debt relative to the stock of assets (both housing and non-housing) – and the interest-payments ratio – the flow of interest payments relative to pre-interest disposable income. Figure 2 shows these ratios for those countries for which these data are readily available. Relative to the debt-to-income ratios, these measures have tended to rise considerably less. For example, in Australia the debt-to-income ratio has trebled since the beginning of the 1990s, while the gearing ratio has doubled. The fall in interest rates in the early 1990s means that the interest-payments ratio in Australia has not risen nearly as dramatically. Indeed, the fall in interest rates is one of the reasons for the rise in debt. Similarly, in the Netherlands both the gearing and interest-payments ratios increased more slowly than the debt-to-income ratio, while in the United Kingdom, the gearing ratio and the interest-payments ratio remain below previous peaks despite further increases in the debt-to-income ratio. The relatively slow increase in gearing and fast growth in asset prices also implies that in most countries net worth has risen, both in real terms and as a proportion of income; in Australia, net worth as a proportion of income was 50 per cent higher in 2006 than in 1990. Keeping in mind these other measures of

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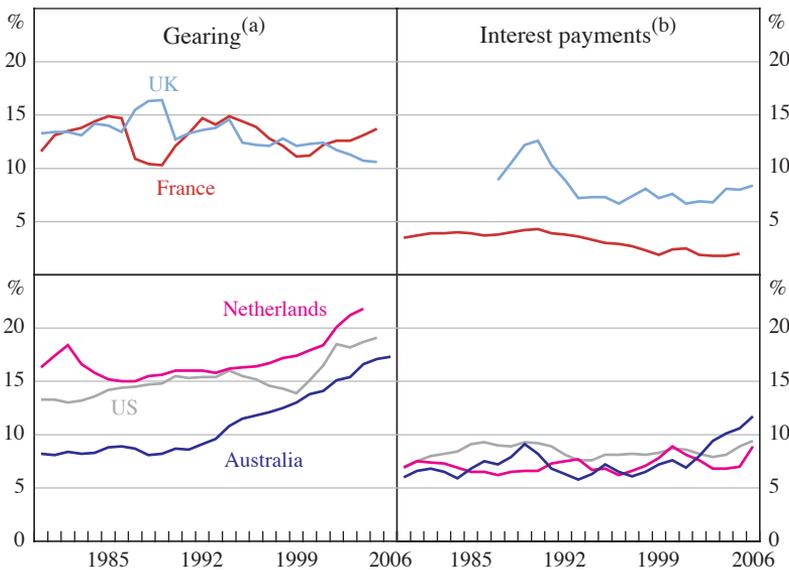
2. Details of the calculations and the sources for data can be found in Appendix A.

**Figure 1: Debt-to-income Ratios – Selected Countries**



Note: Ratio of household debt to household disposable income

**Figure 2: Household Gearing and Interest Payments – Selected Countries<sup>(a)</sup>**



Notes: Household sector includes unincorporated enterprises except for Australia and the US.

(a) Ratio of liabilities to assets.

(b) Ratio of interest payments on total debt to household disposable income. Treatment of financial intermediation services indirectly measured (FISIM) varies across countries.

**Table 1: Debt-to-income Ratios and Real Mortgage Rates**

|             | Debt-to-income ratio                   |                                   |   | Real mortgage rate               |              |   |
|-------------|--|-----------------------------------|---|----------------------------------|--------------|---|
|             | Increase over available sample (% pts) | Date of inflection <sup>(a)</sup> | Annual average change since inflection <sup>(b)</sup> (% pts) | Level at peak <sup>(c)</sup> (%) | Date of peak | Change between peak and average 2001–05 (% pts) |
| Belgium     | 6.1                                    |                                   | 0.6   | 6.2                              | 1991         | -2.8  |
| Finland     | 48.8                                   | 1986                              | 0.8   | 8.2                              | 1992         | -5.0  |
| Germany     | 17.0                                   |                                   | 0.9   | 6.3                              | 1986         | -1.9  |
| Switzerland | 14.9                                   |                                   | 1.1   | 3.6                              | 1986         | -0.9  |
| Sweden      | 28.9                                   | 1985                              | 1.1   | 6.6                              | 1992         | -2.5  |
| France      | 13.3                                   | 1986                              | 1.4   | 6.2                              | 1986         | -3.6  |
| Japan       | 37.5                                   | 1986                              | 1.8   | 6.4                              | 1987         | -3.5  |
| Italy       | 49.8                                   | 1988                              | 2.6   | 9.6                              | 1992         | -6.6  |
| US          | 75.5                                   | 1984                              | 2.7   | 8.8                              | 1982         | -5.2  |
| Canada      | 67.8                                   | 1986                              | 2.9   | 7.6                              | 1994         | -3.7  |
| Norway      | 91.5                                   | 1983                              | 2.9   | 10.0                             | 1992         | -5.4  |
| UK          | 95.3                                   | 1981                              | 3.7   | 7.8                              | 1986         | -5.1  |
| South Korea | 87.6                                   | 1987                              | 4.6   | 7.3                              | 1997         | -4.3  |
| NZ          | 91.2                                   | 1991                              | 5.8   | 8.8                              | 1988         | -3.9  |
| Spain       | 65.4                                   | 1997                              | 7.3   | 6.2                              | 1993         | -6.4  |
| Australia   | 123.8                                  | 1992                              | 7.3   | 9.3                              | 1991         | -5.5  |
| Netherlands | 156.4                                  | 1987                              | 8.4   | 7.1                              | 1979         | -4.7  |
| Denmark     | 110.5                                  |                                   | 8.8   | 9.3                              | 1990         | -6.0  |

(a) The year when the increase in the debt-to-income ratio exceeds 5 percentage points for the first time (after 1975)

(b) Or the beginning of the series if there is no obvious point of inflection

(c) Thirteen-quarter-centred average on the peak

Sources: BIS; national sources; authors' calculations

balance sheet developments, in this paper we choose to focus on the debt-to-income ratio, which is readily available across a much wider range of countries.

While the trend increase in indebtedness may continue for some time, it is not clear what constitutes a sustainable level of indebtedness over the long run, how rapidly such a level will be reached, or the implications of rising indebtedness for the ability of households to smooth their consumption and continue to meet their repayment obligations in the face of adverse shocks. We attempt to address these issues in three ways. First, we examine factors that have underpinned the rise in household debt over the past two decades or so across a range of developed economies. Second, we present some relatively simple simulations to gauge the extent to which the rise in debt may be linked to changes in the extent of credit constraints.

Third, using a partial equilibrium model we consider the endogenous response of household demand for debt to changes in the level of overall risk in the economy.

It is often said that greater debt implies greater vulnerability because it leaves households less able to smooth consumption in the face of adverse shocks and more likely to default for a large enough shock.<sup>3</sup> However, the level of debt is not a sufficient description of vulnerability because it says nothing about the likelihood of adverse shocks. This is important because the rise in indebtedness may have been due in part to a greater ability of households to service debt and an assessment by borrowers and lenders alike that the probability distribution over adverse shocks has shifted favourably. So, for example, while rising debt implies that households will be more vulnerable to a large rise in interest rates, such a rise may be less likely, particularly in an environment of low and stable inflation. It follows that unconstrained borrowers may have decided to increase borrowing, and at the same time credit constraints have eased, including via a relaxation of lending standards by financial institutions. Clearly then any assessment of the implications of debt for vulnerability will need to carefully consider the factors driving up debt.<sup>4</sup>

The remainder of the paper is structured as follows. Section 2 summarises the literature regarding the forces contributing to higher indebtedness. Section 3 builds on this by examining data from 18 advanced economies over the past three decades and establishing a few stylised facts regarding changes in indebtedness and a number of plausible explanatory factors. Section 4 presents simulations regarding changes in supply constraints in order to gauge the relative contributions of various factors to the rise in aggregate household indebtedness. Section 5 uses a simple model in which household debt is determined endogenously to consider the implications of higher debt for the vulnerability of the household sector to adverse shocks. It also introduces an explicit measure of financial system vulnerability relevant to this question. Conclusions are drawn in Section 6.

## 2. Forces Driving Indebtedness

This section sets out the key theoretical considerations and examines the factors that have been identified in the literature as having contributed to a rise in debt.

Households demand credit for a number of reasons. Perhaps chief among these is the desire to purchase residential property. This reflects the value of obtaining the services provided by owning a home, and is also an important strategy for accumulating wealth, in part because of the beneficial tax treatment afforded to the leveraged purchase of property in many countries.<sup>5</sup> The purchase of such an asset with debt may also be a device that households use to commit to a savings plan. Another reason for going into debt is to smooth consumption over the life-cycle. Subject to individual rates of time preference, and expectations about income

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3. Girouard, Kennedy and André (2007) provide a recent example of this line of argument.

4. Macfarlane (2003) makes this general point. He also suggests that in the context of the period of rapidly rising house prices in Australia, greater indebtedness had made households more sensitive to economic conditions.

5. In fact all countries afford some tax benefits to owner occupiers, who do not pay tax on imputed rents for their homes.

and interest rates, individuals will typically borrow early in life when income is relatively low and gradually repay this, building up net assets ahead of retirement. Consumption smoothing in the face of temporary adverse shocks to income may also lead some households to want to incur debt.

In equilibrium, the quantity of debt will also depend on the ability and willingness of financial institutions (and financial markets) to extend credit. This will be affected by a range of factors, including the nature of regulatory controls, the competitiveness of credit markets and the risks associated with lending, which will have a bearing on the extent of endogenous credit constraints. Credit constraints exist because of difficulties associated with asymmetric information. Lenders are unable to determine precisely the ability and willingness of borrowers to repay their debts and, therefore, may be unwilling to lend more (even at higher interest rates) for fear of attracting higher-risk borrowers. In making their decisions, lenders may use various models, rules of thumb or lending standards to guide their decisions about who to lend to, how much and on what terms. Credit constraints will not necessarily be binding for all households all of the time, but to the extent that they are binding for a large part of the population, developments that alter these constraints could have a significant impact on the supply of credit. The extent and nature of credit constraints have evolved (and continue to evolve) across a wide range of countries. One aspect of this is that various structural changes (such as to inflation) can lead to an easing in credit constraints for given lending standards. In addition, financial institutions may have modified their lending standards so as to ease credit constraints (over the course of the past decade or so) – perhaps in response to structural changes and/or their ability to better identify or control the risks associated with lending to particular households.

The literature points to a number of developments which have worked to increase both demand and supply of household credit over the past few decades. DeBelle (2004) and RBA (2003a) attribute much of the rise to a reduction in credit constraints due to financial deregulation and the decline in real and nominal interest rates associated with the moderation in inflation. In addition to these factors, the Committee on the Global Financial System (CGFS 2006) emphasises the role of other macroeconomic developments and a range of technological innovations. The key contributing factors can be summarised as follows:

- i. Financial market flexibility (or completeness). This has a number of aspects. First, there is the extent of deregulation. This took the form of easing entry restrictions for new and/or foreign banks; allowing non-bank financial institutions to compete in the mortgage market; and removing interest rate controls and lending guidelines (Table B1 in Appendix B provides country-specific details). A second aspect, for which deregulation is necessary though not sufficient, is an increase in competitive pressures leading to an easing in credit constraints and a reduction in lending margins. A third aspect, which is likely to flow from deregulated and competitive markets, is the extent of product innovation – that is, the range of different loans available, such as loans requiring limited documentation or products facilitating housing equity withdrawal.

- ii. A reduction in the level of inflation. Financial institutions use a range of criteria to determine the amount they are willing to lend to eligible borrowers. One common rule of thumb is to set the maximum loan such that initial repayments are no more than some amount of the borrowers' income.<sup>6</sup> A decline in inflation that reduces nominal interest rates will ease credit constraints by reducing this initial repayment ratio.
- iii. A reduction in the real cost of funds for financial institutions. Real interest rates declined in many countries after central banks successfully fought high levels of inflation. Greater financial market integration (both domestically and internationally) may also have helped to reduce funding costs. Furthermore, technological innovation has reduced the costs of information and administration associated with lending, driving down margins in competitive markets (CGFS 2006).
- iv. A reduction in macroeconomic volatility. For markets dominated by variable interest rate loans, a fall in interest rate volatility should reduce the risk of default for a given loan amount. It should also reduce funding costs for institutions providing fixed-rate loans. For financial institutions with a diversified pool of loans, a reduction in the volatility of aggregate economic activity could reduce the extent of non-performing loans, leading to lower lending margins in competitive markets. However, some studies suggest that greater macroeconomic stability has been associated with greater flexibility in product and labour markets which could contribute to greater volatility of individual incomes.<sup>7</sup>
- v. A fall in the unemployment rate and rise in employment growth. A fall in the frequency or expected duration of unemployment spells would be likely to increase both credit demand and supply. Lower unemployment reduces the probability of default by those who have jobs, easing credit constraints as well as lessening the motive for precautionary saving and increasing the value of illiquid assets such as housing (Carroll and Dunn 1997). Also, higher employment adds to the pool of eligible borrowers if financial institutions are reluctant to extend credit to those without savings and/or jobs and reduces the risk of lending to households that gain an extra source of income.
- vi. A rise in the expected rate of income growth. This would make it more attractive to purchase assets (such as housing) using debt. It could also increase the demand for debt relative to current income as households seek to smooth consumption, and will ease credit constraints if financial institutions also expect better economic prospects (Barnes and Young 2003). However, if and when this higher expected growth is realised, it is reasonable to anticipate a decline in indebtedness (as

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6. In Australia, this was typically around 30 per cent of gross income (RBA 2003a), although it has been relaxed more recently (Laker 2007). Debelle (2004) suggests that since the fall in inflation will erode the real value of debt less rapidly, debt-to-income ratios might be higher than otherwise. However, this implicitly assumes that repayments are a constant share of income.

7. For example, see Comin and Mulani (2004) and Dynan, Elmendorf and Sichel (2006). Peek and Wilcox (2006) note that financial deepening may help to explain the moderation in output volatility due to its potential role in enhancing consumption smoothing.

incomes rise but debts do not); otherwise indebtedness might decline through a retrenchment of debt as people revise down their expectations regarding growth prospects.

- vii. Demographic changes. Ageing of the population driven by declines in the rate of fertility may ultimately lead to a reduction in aggregate indebtedness, since older households typically hold less debt. However, increasing longevity (which also contributes to ageing) may lead households to want to hold debt over a longer period. Similarly, with longer working lives, financial institutions may be willing to lend to households later on in their lives.
- viii. Changes in taxes and subsidies may alter the demand for mortgages by owners and investors (Debelle 2004; CGFS 2006; Ellis 2006).

Many of these developments will play out over a considerable period, leading to a gradual rise in indebtedness. Even when these driving forces have stabilised, it may still take time before a new higher steady state level of aggregate indebtedness is reached. This reflects the fact that the response of older generations – particularly those who have passed their prime borrowing years – may be relatively modest in the face of changing circumstances compared with the response of generations that have yet to come of age and will take advantage of the easier credit conditions over their full lifetime.

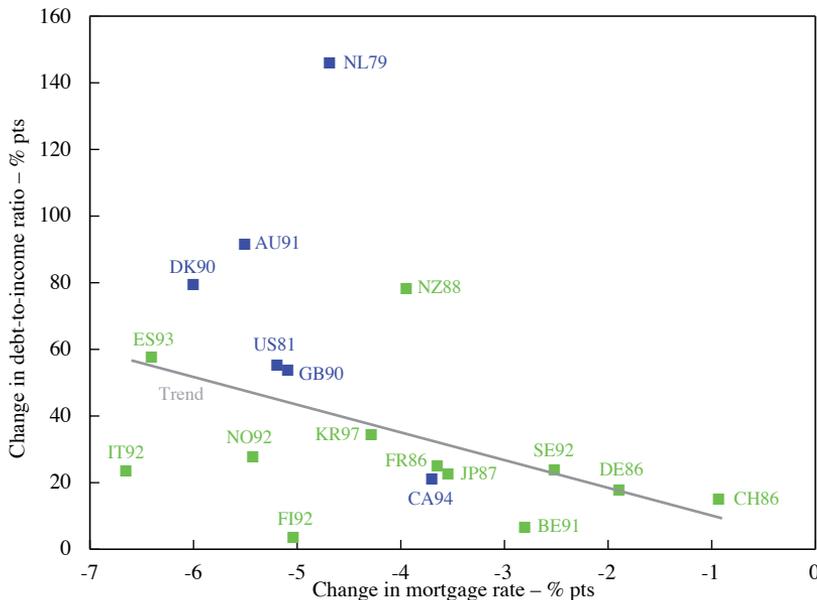
### **3. The Rise in Indebtedness – Some Stylised Facts**

In this section of the paper we examine the behaviour of the household debt-to-income ratio across 18 countries for which we have data; our sample starts in 1975 but for some countries the data begin as late as the early 1990s. Despite considerable variation, all countries in the sample have experienced some increase in indebtedness (Figure 1 and Table 1). The time at which debt begins to rise more rapidly varies somewhat, with many countries experiencing an upward inflection in the early 1980s (for example, Norway and the UK) while for others this occurred some years later. The behaviour of indebtedness around the longer-term trend also varies, with some countries (such as Australia and New Zealand) experiencing a near-monotonic increase, while others (such as Finland, Norway, Sweden and the UK) have had periods of sharp or protracted declines – associated with periods of widespread financial distress – before resuming an upward trend. Table 1 also shows the average annual change in indebtedness, starting either when the series becomes available (when the sample is limited), or from the point of upward inflection. While the correlation between the total change in debt over the available sample and the average annual change is high (at about 0.8), the latter provides a useful robustness check for the cross-country comparisons given that sample periods differ across countries.

Accompanying the rise in debt, there has been a fall in the real mortgage rate across all countries.<sup>8</sup> There is a fairly consistent trend across countries, with real mortgage rates tending to peak between the mid 1980s and early 1990s and trending down thereafter. Figure 3 shows that those countries that experienced larger declines in mortgage rates since their peaks also tended to experience larger increases in indebtedness. Hence, the rise in indebtedness will overstate the rise (if any) in the ratio of interest payments to income. Shading of the countries indicates two groups according to a measure of financial market flexibility (see below). Those with more flexible markets tend to have had larger rises in indebtedness relative to the trend shown, and vice versa for those with less flexible markets. The decline in real mortgage rates suggests that, at least over the past two decades or so, the rise in debt has been driven by supply expanding more than demand.<sup>9</sup>

With much of the additional debt channelled into housing markets, it is not surprising that in countries where the rise in debt-to-income ratios has been sizeable, real house prices have also risen substantially (Australia, Denmark and

**Figure 3: Real Mortgage Rates and Debt-to-income Ratios**  
Magnitude of change since the peak in real mortgage rate



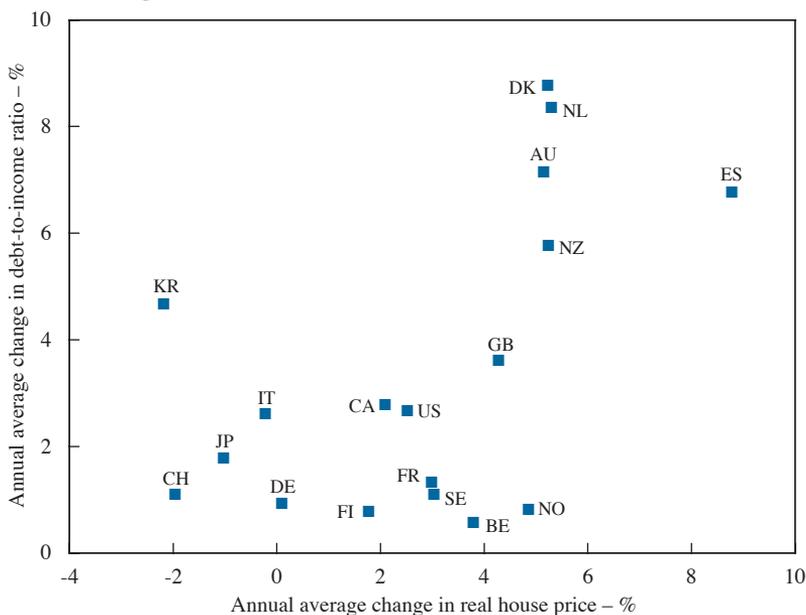
Notes: Dark blue shading indicates countries that have significant financial market flexibility; light green indicates relatively less flexibility. See Section 3.1 for further details. See Glossary for a listing of country codes.

8. The real mortgage rate is the nominal rate as at the end of the year less actual year-ended inflation. This may have some shortcomings as a measure of the cost of debt for some countries, particularly earlier in the sample period when actual inflation may be a poor indicator of expected inflation and regulations on mortgage lending imply that this measure may be too narrow; even so, mortgage debt has always been a significant component of total household debt (except for South Korea).
9. At least for small open economies, the drop in real mortgage rates is consistent with an increase in the global supply of funds as well as a significant outward shift of demand.

the Netherlands for instance – Figure 4). Likewise, countries that have had smaller rises in debt-to-income ratios have generally experienced smaller increases (and even declines) in real house prices, although there is quite a wide dispersion in outcomes across countries. As housing is not easily traded across borders, domestic factors can create considerable differences in the incentives for owner-occupiers and investors to hold housing. Relevant factors to consider include the extent of public and corporate ownership of the housing stock, the role of non-residents in housing markets, geographic features such as the concentration of the population in key cities, the ability to access housing debt for non-housing investment or consumption (that is, housing equity withdrawal) and government regulations, particularly those relating to taxation arrangements and the balance of rights between landlords and tenants, which influence incentives for investors (Ellis 2005).

**Figure 4: House Price Growth and Debt-to-income Ratios**

Change since date of inflection in the debt-to-income ratio



Notes: For Norway and South Korea, changes are based on the earliest available house price data, which post-dates the points of inflection. See Glossary for a listing of country codes.

### 3.1 Explaining the increase in debt-to-income ratios

We can exploit the variation in the behaviour of the debt-to-income ratio across countries to explore whether the factors set out in Section 2 appear to explain rising indebtedness. We use a broad-brush approach suitable for cross-country comparisons in the absence of a long time-series of indebtedness for all countries. For each of the explanatory factors identified in Section 2 for which we can obtain reasonable data, we give countries a score of 2 if that factor changed in a way so as to be likely to cause a (sizeable) rise in debt and 1 otherwise (Table 2). Thresholds for each of the first four variables shown in Table 2 are chosen so as to split the sample of countries

**Table 2: Potential Explanators of Indebtedness – ‘Scores’**  
Higher scores for the variables in the first four columns indicate  
a development conducive to rising indebtedness

|             | CPI<br>inflation <sup>(a)</sup> | Volatility<br>in output<br>growth <sup>(b)</sup> | Volatility in<br>nominal<br>mortgage<br>rate <sup>(c)</sup> | Unemployment<br>rate <sup>(d)</sup> | Financial<br>market<br>flexibility <sup>(e)</sup> | Average<br>score |
|-------------|---------------------------------|--|---|-------------------------------------|---|------------------|
| Australia   | 1                               | 2  | 2   | 2                                   | 2.0   | 1.8              |
| Belgium     | 1                               | 1  | 1   | 1                                   | 0.5   | 0.9              |
| Canada      | 1                               | 2  | 1   | 2                                   | 2.0   | 1.6              |
| Denmark     | 1                               | 1  | 2   | 2                                   | 2.0   | 1.6              |
| Finland     | 2                               | 2  | 2   | 2                                   | 1.5   | 1.9              |
| France      | 2                               | 1  | 1   | 1                                   | 0.5   | 1.1              |
| Germany     | 1                               | 1  | 2   | 1                                   | 1.5   | 1.3              |
| Italy       | 2                               | 2  | 2   | 1                                   | 0.0   | 1.4              |
| Japan       | 2                               | 1  | 1   | 1                                   | 0.0   | 1.0              |
| Netherlands | 1                               | 2  | 1   | 2                                   | 2.0   | 1.6              |
| NZ          | 2                               | 2  | 2   | 2                                   | 1.5   | 1.9              |
| Norway      | 1                               | 1  | 1   | 1                                   | 1.0   | 1.0              |
| South Korea | 2                               | 2  | 2   | 1                                   | 1.5   | 1.7              |
| Spain       | 2                               | 2  | 2   | 2                                   | 0.5   | 1.7              |
| Sweden      | 2                               | 1  | 2   | 1                                   | 1.5   | 1.5              |
| Switzerland | 1                               | 1  | 1   | 1                                   | 0.5   | 0.9              |
| UK          | 2                               | 1  | 1   | 2                                   | 2.0   | 1.6              |
| US          | 1                               | 2  | 1   | 2                                   | 2.0   | 1.6              |

(a) Score of 2 if inflation fell by more than 9.5 percentage points, 1 otherwise.

(b) Standard deviation of annual growth over five years. Score of 2 if this fell by more than 2 percentage points, 1 otherwise.

(c) Standard deviation of nominal rate over five years. Score of 2 if this fell by more than 3 percentage points, 1 otherwise.

(d) Score of 2 if unemployment rate fell by more than 5 percentage points, 1 otherwise.

(e) Score between 0 and 2, where 2 is the most flexible and 0 the least. For further details see below.

Sources: See Appendix A

in half. Qualitative results are robust to alternative thresholds that place a smaller share of the countries into the low-score category. For a discussion of the timing used in this table and the robustness of results to alternative timing assumptions, see footnote 12.

We use a more granular and somewhat more subjective approach to scoring financial market flexibility – assigning countries scores of between 0 and 2. The move to greater financial market flexibility – less regulation, greater competition and more product innovation – has followed broadly similar patterns across countries but to differing degrees. With all countries starting from fairly stringent regulations that restricted competition and product innovation in financial markets in the 1970s, the current level of financial market flexibility is likely to be a reasonable proxy for the extent of change over this period (which in turn should influence the increase in debt). Currently, those countries at the less-regulated end of the spectrum – such

as Australia, the Netherlands, the UK and the US – have experienced a wide range of reforms: both banks and non-bank financial intermediaries are able to compete in the mortgage market; interest rate controls have been completely removed; there are no longer quantitative restrictions on lending to households; and securitisation of residential mortgages is possible. Competitive pressures have also been relatively strong and product innovation extensive in these economies (Ellis 2005). We assume that an active residential mortgage-backed securities (RMBS) market indicates a more deregulated, more competitive market, so we raise the financial market flexibility score by 1 for those countries that have made extensive use of RMBS; for countries that use RMBS, but only in a limited way, we raise their score by 0.5. The availability of products that facilitate mortgage equity withdrawal (MEW) would also appear to be a reasonable proxy for a flexible market that provides a wide range of loan products, and so we add 1 to the flexibility score of these countries.<sup>10</sup> The total flexibility score across countries (Table 3) accords with qualitative information

**Table 3: Financial Market Features Indicating Flexibility<sup>(a)</sup>**

|             | Use of securitisation | Availability of MEW products | Market flexibility score (0–2) <sup>(b)</sup> | Memoranda         |                             |
|-------------|-----------------------|------------------------------|---|-------------------|-----------------------------|
|             |                       |                              |   | Loan term (years) | Loan-to-valuation ratio (%) |
| Australia   | Yes                   | Yes                          | 2.0   | 25–30             | 90                          |
| Belgium     | Limited               | No                           | 0.5   | ..                | 90                          |
| Canada      | Yes                   | Yes                          | 2.0   | 25                | 70–80                       |
| Denmark     | Yes                   | Yes                          | 2.0   | 30                | 80                          |
| Finland     | Limited               | Yes                          | 1.5   | 15–18             | 75–80                       |
| France      | Limited               | No                           | 0.5   | 15                | 80                          |
| Germany     | Limited               | Yes                          | 1.5   | 25–30             | 70–80                       |
| Italy       | No                    | No                           | 0.0   | 15                | 80                          |
| Japan       | No                    | No                           | 0.0   | 25–30             | 80                          |
| Netherlands | Yes                   | Yes                          | 2.0   | 30                | 87                          |
| NZ          | Limited               | Yes                          | 1.5   | 25–30             | ..                          |
| Norway      | No                    | Yes                          | 1.0   | 15–20             | 70                          |
| South Korea | Limited               | Yes                          | 1.5   | 3                 | 56                          |
| Spain       | Limited               | No                           | 0.5   | 15                | 70–80                       |
| Sweden      | Limited               | Yes                          | 1.5   | 30–45             | 80–90                       |
| Switzerland | Limited               | No                           | 0.5   | 15–20             | <80                         |
| UK          | Yes                   | Yes                          | 2.0   | 25                | 75                          |
| US          | Yes                   | Yes                          | 2.0   | 30                | 80                          |

(a) Where sources were inconsistent, the most recently published estimate was preferred.

(b) The sum of the scores for securitisation (1 if ‘Yes’, 0.5 if ‘Limited’ and 0 if ‘No’) and MEW (1 if ‘Yes’, 0 if ‘No’).

Sources: ABS, Household Expenditure Survey, Cat No 6530.0; CGFS (2006); Ellis (2005); Girouard and Blondal (2001); Hoeller and Rae (2007)

10. As an alternative, we also examined the extent of MEW (that is, withdrawal versus injection of equity). This has a high correlation (of around 0.9) with the availability score shown in Table 3 for 15 of the 18 countries for which MEW data are readily available.

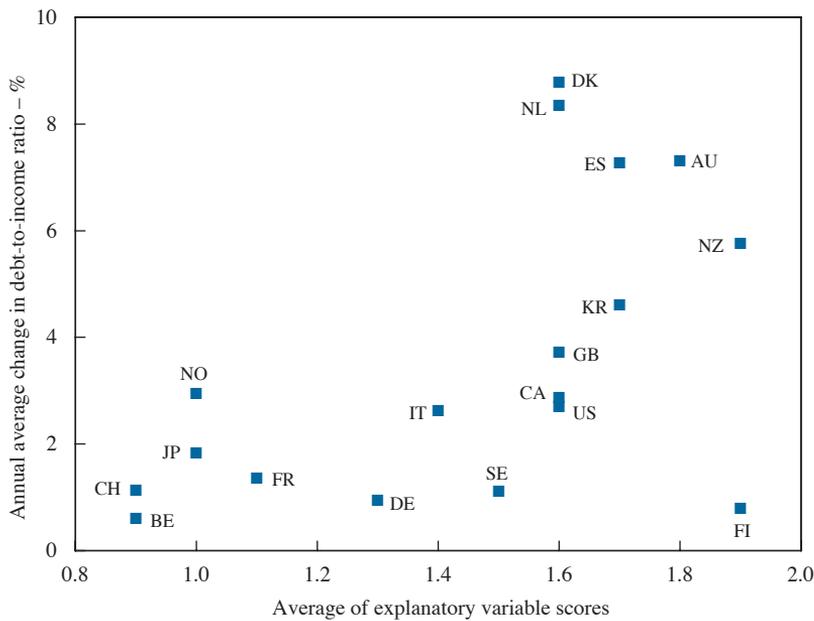
and our approach is not too dissimilar to that of the Mercer Oliver Wyman (2003) mortgage market completeness index used by Catte *et al* (2004).<sup>11</sup> Predictably, Australia, Canada, Denmark, the Netherlands, the UK and the US all receive high scores, while countries that have only recently eased the relatively tight regulations governing the lending sector, such as Belgium, France, Italy and Japan, all score quite low.

We calculate the average score across the different explanatory factors for each country and see how these correlate with changes in the debt-to-income ratios. The scores for each country are presented in Table 2, and are compared to the average annual increase in that country's debt-to-income ratio in Figure 5. There is a clear positive correlation between the average score on the explanatory variables and increases in debt-to-income ratios across countries, although even among countries with similar scores there are a wide range of outcomes. No doubt this reflects the fact that the increase in financial market flexibility and the movement toward greater macroeconomic stability has occurred at different speeds and to a different extent in each country. These results are relatively robust to dropping any one of the explanatory variables from the calculations, and to using the total increase in indebtedness (as per Table 2) in place of the average annual increase in indebtedness.

Looking separately at the correlation between each explanatory factor and indebtedness may shed further light on their explanatory power. Figures 6–8 illustrate these bivariate correlations for up to 18 countries (subject to data availability).<sup>12</sup> In each case the trend is shown excluding the Netherlands, which appears to be a consistent outlier (see Section 3.2). Each figure also illustrates financial market flexibility (see below).

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11. The mortgage market completeness index uses data on a range of market features, including loan-to-valuation (LTV) ratios, product availability, repayment structures and loan types; however, it is only available for eight European countries. The IMF (2006) constructs a broader measure of financial market structure using a similar methodology. We examined the level of the margin on mortgage lending interest rates as an alternative indicator of competitive pressures and, therefore, of the extent of market flexibility. However, because the measure of mortgage lending rates is published in different forms across countries (prime rate, all mortgages versus only new mortgages, a weighted-average actual rate rather than an indicator rate), a comparable measure in levels is not readily available. Nevertheless, changes in this margin over time roughly accord with the market flexibility scores described in the main text (with a correlation of about  $-0.2$ ).
  12. In the figures, the dates in the country labels indicate the peak in the explanatory variable. The change in that variable is measured between the date of the peak and the end of 2004, the latest date for which we have debt data for all countries in the sample. Where possible, the same time period has been used to calculate the change in the debt-to-income ratio. However, when these data are not available, a shorter time period for the change in indebtedness has been used, provided the peak was not more than 10 years before the start of the debt series. (This is consistent with the fact that the change in the explanatory variables can operate with a long lag – see Section 4.) If the peak is too far in advance of the available debt data, then we either use a local peak closer but prior to the start of the debt data (which is true for Switzerland in the case of inflation and output volatility) or omit that country from the graph (in the case of Belgium and Denmark for some graphs). In the case of inflation, we identify the local peak from 1977 onwards, as earlier peaks reflect the extreme volatility of inflation during the 1970s and occurred well before the rise in debt in most countries. Finally, the trends identified in the figures were relatively robust to alternative dating options, such as matching the period for the change in the explanatory variable to the available data for indebtedness (where this was sufficiently long).

**Figure 5: Average of Explanatory Variable Scores**  
Correlation with the increase in the debt-to-income ratio

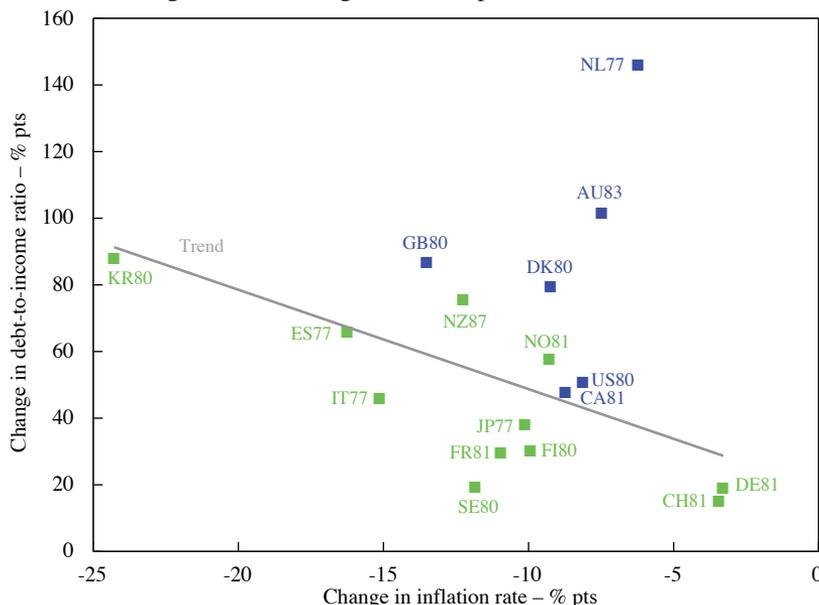


Note: See Glossary for a listing of country codes

Financial market deregulation by itself does not appear to have been sufficient to initiate a sustained increase in the debt-to-income ratio, although there are strong links for certain countries (see, for example, Casolaro, Gambacorta and Guiso 2006 for a discussion of Italy's experience). If we compare the timing of deregulation across countries with the timing of the acceleration in debt we find no strong correlation – for many countries, such as Sweden and the UK, the debt-to-income ratio began to increase before the major elements of deregulation were completed. However, less-regulated credit markets might mean that other structural changes are more likely to lead to an adjustment in borrowing and lending practices and increases in debt. Consistent with this, we find that countries with flexible financial markets (a score of 2, as indicated by dark blue boxes) tend to lie above the trend lines in Figures 6 and 7, while countries with relatively less flexibility (scores of between 0 and 1.5 – light green boxes) tend to lie close to or below the trends.

Figure 6 shows that there is a clear positive, though weak, correlation between the fall in inflation and the average annual increase in the debt-to-income ratio. In Australia, the fall in inflation has been given considerable prominence as an explanation for the rise in debt, given the widespread use of initial repayment rules by lending institutions (at least over much of the sample period). But in countries where the more binding constraint is a low maximum LTV ratio, such as in Italy

**Figure 6: Inflation and Debt-to-income Ratios**  
Magnitude of change since the peak in inflation rate



Notes: Dark blue shading indicates countries that have significant financial market flexibility; light green indicates relatively less flexibility. See Section 3.1 for further details. See Glossary for a listing of country codes.

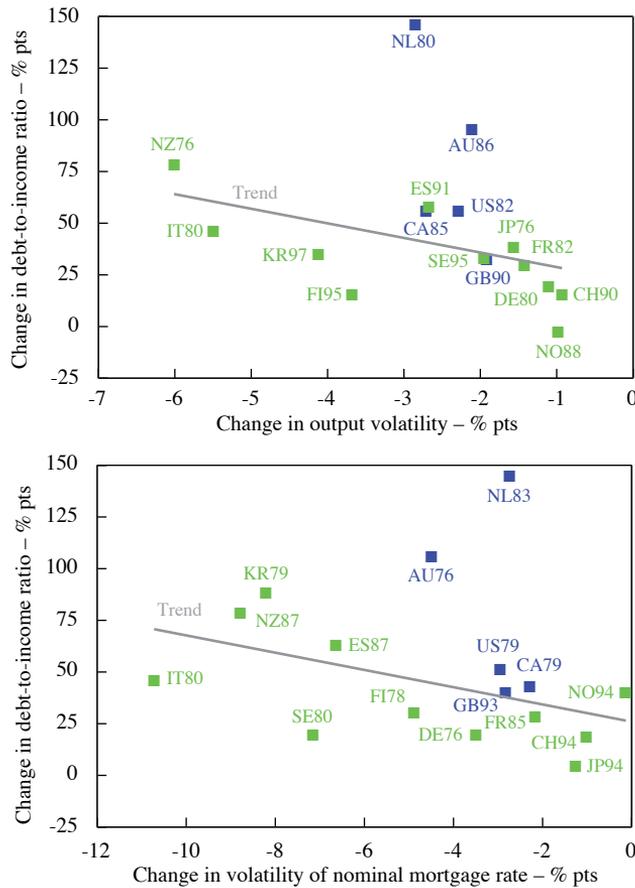
until the late 1990s, there is likely to be a much weaker direct link between the fall in inflation and the rise in debt.<sup>13</sup>

To examine the potential role of the ‘Great Moderation’ we compare the reduction in the volatility of output growth and nominal mortgage rates with the rise in the debt-to-income ratio across countries (Figure 7). There is a positive correlation between the fall in volatility (of output and mortgage rates) and indebtedness, although there is some variation around these trends. This may suggest that macroeconomic volatility has had a relatively modest effect on debt, or that the fall in volatility has coincided with a fall in the rate of nominal income growth (due to declining inflation), which may have contributed to a slower repayment of debt (for example, if households repay according to a fixed share of their income – see DeBelle 2004). It may also be that the volatility of individual households’ income has not fallen in line with the volatility of aggregate economic activity.

Figure 8 demonstrates what is perhaps a surprisingly close correlation between the fall in the unemployment rate and the increase in the debt-to-income ratio across countries. This may indicate a key role for this explanatory variable due to its

13. Until the early 1990s, Italy still had a highly regulated debt market. From 1997 to 2003, household debt in Italy has grown at a faster pace than all other euro area countries except Spain, consistent with deregulation in the 1990s (Casolaro *et al* 2006).

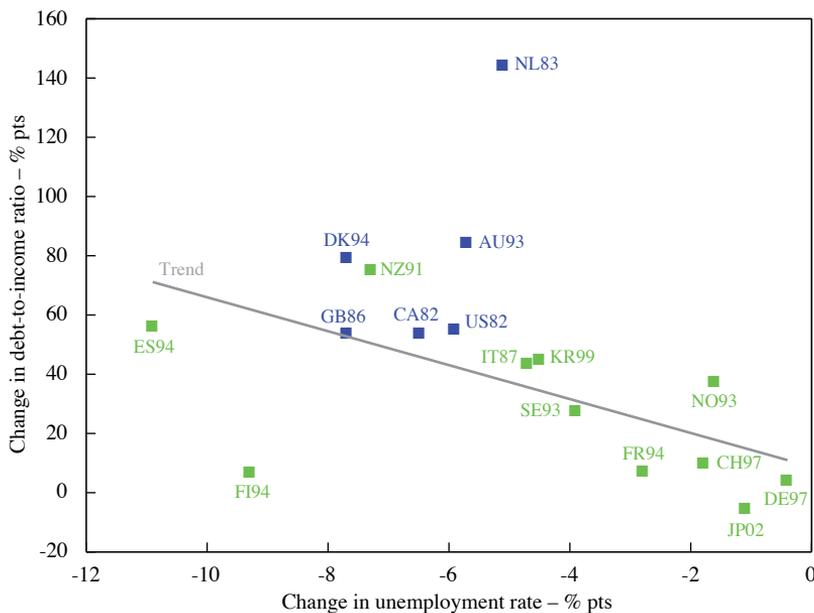
**Figure 7: Macroeconomic Volatility and Debt-to-income Ratios**  
 Magnitude of change since the peak in volatility



Notes: Dark blue shading indicates countries that have significant financial market flexibility; light green indicates relatively less flexibility. See Section 3.1 for further details. See Glossary for a listing of country codes.

potential to boost the supply of debt. It may also reflect the fact that the decline in unemployment has an especially large correlation with the extent of financial market flexibility (of about  $-0.4$  compared with close to zero correlation between each of the other explanatory variables and financial market flexibility). This may reflect a tendency for countries to deregulate and encourage greater competition across a number of different markets at the same time (indeed the financial flexibility score has a correlation of  $0.8$  with an OECD measure of product market regulation for 2003). This correlation explains why countries (other than the Netherlands) tend to be clustered more closely around the trend shown in Figure 8 (irrespective of their financial market flexibility scores) when compared with Figures 6 and 7. Finally, it could be that a decline in unemployment is also capturing important demand-side factors that have acted to boost debt.

**Figure 8: Unemployment and Debt-to-income Ratios**  
Magnitude of change since the peak in unemployment rate



Notes: Dark blue shading indicates countries that have significant financial market flexibility; light green indicates relatively less flexibility. See Section 3.1 for further details. See Glossary for a listing of country codes.

### 3.2 Differences across countries

While developments affecting indebtedness have a number of aspects that are common across most countries, important differences remain. These often reflect variation in tax laws as well as geographical and cultural factors. The Netherlands, for example, is a consistent outlier, having experienced the largest increase in the debt-to-income ratio, but only relatively average changes in many of the explanatory average changes in many of the explanatory factors considered above. This is likely to be due to the extensive credit market deregulation combined with a tax system that encourages households to expand both sides of their balance sheet. With no regulations governing LTV ratios it is common practice to borrow enough to cover all the expenses related to moving house, including the transaction costs; in 2001–02 over 70 per cent of mortgages had an initial LTV ratio of over 100 per cent (Debelle 2004). In addition, households in the Netherlands make extensive use of products designed to exploit the tax deductibility of interest payments, which promote a slow rate of repayment. Over 90 per cent of mortgagees do not repay any principal over the life of the loan. Instead, they make compulsory payments into savings or investment accounts, and use the earnings on the account to repay the loan upon completion (indeed, Debelle 2004 suggests that debt should be measured net of funds in these accounts). Finally, during the 1990s, lenders expanded the types of income they would consider for calculating the initial debt-servicing ratio, contributing to a further easing of credit constraints (Debelle 2004).

Australia also lies above the trend lines shown in Figures 6 to 8. Again, some features of the Australian housing and credit markets may help to explain this. In particular, as discussed in RBA (2003b), demand by investors played an increasingly significant role in the growth of household debt from the late 1990s, driven by a combination of an expectation of significant capital gains for property, increasingly easier access to finance for investors, and the tax treatment of investments in residential property. Ellis (2006) also points to regulations that favour the rights of landlords over tenants in Australia compared with other countries.

Finland, Norway and Sweden stand out as having experienced sharp increases in debt earlier than most countries, followed by a sharp correction in the early 1990s. Deregulation appears to have played a key role in these events, with rapid deregulation of credit markets in the mid 1980s leading to credit and asset-price booms. Taking Norway as an example, house price controls and quantitative lending guidelines were removed between 1983 and 1986, yet interest rates were held low by government guidelines and international capital movements remained regulated until 1990. As a result, there were rapid rises in both the price of domestic assets and credit until the recession and financial crisis in 1991 (Steigum 2004). In all three countries, it took over a decade for household debt-to-income ratios to return to their peak levels of the late 1980s.

#### **4. Some ‘Back of the Envelope’ Calculations Regarding Indebtedness**

The previous section provides some evidence regarding plausible factors contributing to rising indebtedness, but does not address the relative importance of each factor, the likely long-run level of indebtedness or the time it might take to reach this level. A few studies have examined these issues using calibrated models with households choosing debt optimally, though they have difficulty capturing key aspects of the data. Barnes and Young (2003) use an overlapping generations (OLG) model for the US, but suggest that an easing in credit constraints – which they do not model – may have been an important driver of the upward trend in debt since the 1980s.<sup>14</sup> Campbell and Hercowitz (2006) present a model that focuses on one aspect of regulatory change that led to an easing in credit constraints in the US in the early 1980s; although Hurst’s (2006) discussion of that paper suggests a number of other developments may have been important for rising indebtedness from the 1990s onwards. The approach we adopt in this section is instead to assume that credit constraints bind for all households and that financing and repayment behaviour follow a few simple rules of thumb. We consider likely paths of individual indebtedness over the life-cycle under different scenarios and different rules of thumb (of borrowers and lenders), and then calculate economy-wide measures of the debt-to-income

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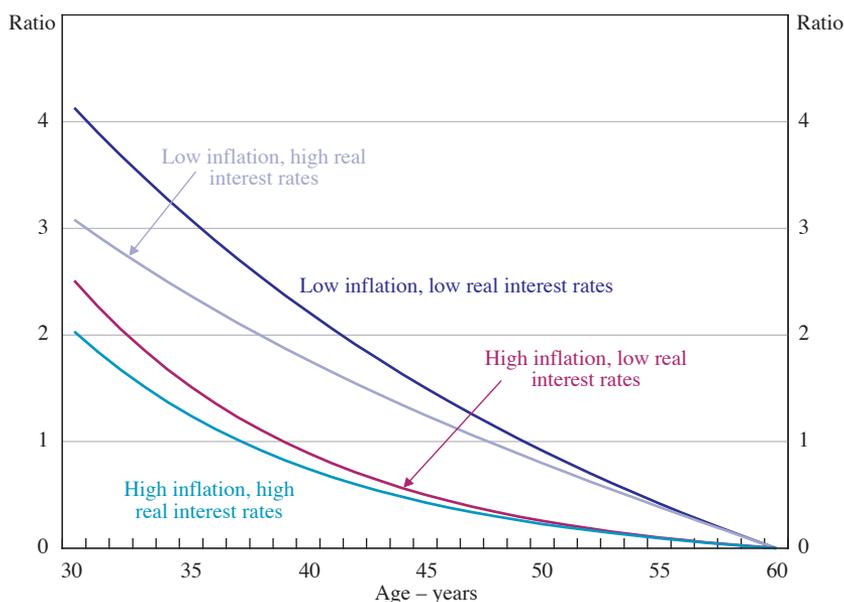
14. Tudela and Young (2005), who examine UK indebtedness using an OLG model, make an adjustment to the model of Barnes and Young, which they believe could reflect omitted factors like liquidity constraints.

ratio. This is similar to the approach used by RBA (2003a), Debelle (2004) and Ellis (2005), though the exact assumptions used vary between papers.

Key features of our OLG simulations are loosely based on the Australian market. In our benchmark scenarios all individuals work from age 20 to 64 and borrow at age 30 (we allow for re-borrowing later on). They are credit-constrained and borrow an amount such that repayments on the loan are initially 30 per cent of their income. This rule of thumb has been used by many lending institutions in Australia (RBA 2003a), although we also discuss alternatives in line with evidence that this has more recently been replaced by less-constrained rules/models (Laker 2007). In our benchmark scenarios we assume no downpayment (or LTV ratio) constraint, though we discuss the implication of such a constraint in the context of a scenario that also allows for unemployment and default.<sup>15</sup> Individuals finance their debt using a credit-foncier loan over 30 years and their incomes grow by 2 per cent in real terms per year. To obtain an economy-wide measure of indebtedness, we assume population growth such that each year the cohort entering the labour force is 2 per cent larger than the previous cohort (Appendix C outlines some of the relevant calculations for this section of the paper).

Figure 9 shows the evolution of the debt-to-income ratio over an individual's life for two key baseline scenarios. The first is a high inflation, high interest rate scenario

**Figure 9: Effect of Inflation and Real Interest Rates on Individual Indebtedness**  
Debt-to-income ratio



15. Ellis (2005) discusses the effects of downpayment constraints, including how rising demand induced by changes in inflation or real rates could lead downpayment constraints to become binding thereby moderating, at least temporarily, the tendency for indebtedness to rise.

(roughly matching the Australian experience of the late 1980s when inflation and the real mortgage rate were about 8 and 6½ per cent, respectively). The second is a scenario with low inflation (2½ per cent) and a low interest rate (3½ per cent), representative of recent Australian experience. Figure 9 also provides a sense of the contribution of each of these factors in isolation.

#### 4.1 Aggregate indebtedness under different scenarios

Table 4 shows the economy-wide steady state debt-to-income ratios obtained by aggregating these results across individuals (assuming all individuals are credit-constrained). Baseline results, shown in row I, suggest that the decline in inflation has been a major determinant of the rise in indebtedness, though the decline in real interest rates also seems to have played an important role.

One dimension in which the above simulations could be considered unrealistic is that they assume that all individuals are employed. There are a number of simple ways to incorporate the likely effect of unemployment on indebtedness in this framework. Unemployment could be viewed as affecting everyone equally with relatively short unemployment spells, which do not affect the ability to service loans or save for a deposit, but which prevent banks from granting loans. Under this scenario, unemployment has modest effects on indebtedness. Row II of Table 4 reports the case where the share of the population unable to borrow (at age 30) is equal to the unemployment rate (with unemployed persons having an income that is half the working wage).<sup>16</sup>

We might expect unemployment to have a larger effect if unemployment spells persist for some time, and in the presence of a downpayment constraint. In this case, unemployment is likely to decrease indebtedness by reducing the size of the initial loan (if unemployment occurs while saving for a deposit) or by increasing the extent of defaults (if unemployment occurs while the loan is being repaid). Defaults will act to reduce indebtedness by eliminating the debt associated with the current loan and by reducing the amount of equity available as a deposit and, in our model, the size of any new loan. However, even under these conditions, and assuming that the probability of being unemployed in any year is equal to the unemployment rate, changes in the unemployment rate have only a modest effect on aggregate indebtedness. For example, we consider a scenario that assumes that those that become unemployed after age 45 default on their debt, while those unemployed at age 30 never take out a loan. In this case, the level of indebtedness rises from 42 per cent when unemployment is 10 per cent (and inflation and interest rates are high) to 115 per cent when unemployment is 5 per cent (and inflation and interest

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16. The numbers in row II may be unrealistically high, particularly in the high unemployment case. This is because we have assumed that those with debt who become unemployed suffer from lower incomes but continue to service their debts. This effect by itself tends to imply that high unemployment leads to high debt-to-income ratios. Also, the ability to service debt is likely to be impaired by extended periods of unemployment, which are more likely during periods of high unemployment.

**Table 4: Steady State Levels of Indebtedness**  
Debt-to-income ratio, per cent

| I   | Baseline assumptions   | High inflation, high interest rates         | High inflation, low interest rates | Low inflation, high interest rates | Low inflation, low interest rates            |
|-----|------------------------|---|------------------------------------|------------------------------------|--|
|     |                        | 46  | 56                                 | 96                                 | 122  |
| II  | Additional assumptions | 10% unemployment                            |                                    |                                    | 5% unemployment                              |
|     |                        | 44  |                                    |                                    | 119  |
| III | Additional assumptions | 1989 age distribution                       |                                    |                                    | 2040 age distribution                        |
|     |                        | 49  |                                    |                                    | 121  |
| IV  | Additional assumptions | 1989 age distribution and non-uniform wages |                                    |                                    | 2040 age distribution and non-uniform wages  |
|     |                        | 45  |                                    |                                    | 110  |
| V   | Additional assumptions | 30% income share on repayments              |                                    |                                    | 30% income share on repayments               |
|     |                        | 25  |                                    |                                    | 87   |
| VI  | Additional assumptions | As per baseline above                       |                                    |                                    | One-off refinancing/trading up after 5 years |
|     |                        | 46  |                                    |                                    | 166  |

Notes: Relevant baseline assumptions apply for all columns. The additional assumptions are relevant only to the relevant rows (that is, they do not cumulate). Population distributions are those of the Productivity Commission (2005).

rates are low).<sup>17</sup> One limitation of these simulations is that they cannot account for endogenous changes in the supply and demand for credit associated with a reduction in the risk of shocks to income, including via unemployment.

The baseline scenarios can be extended by accounting for the effects of changes in the population age structure and moving away from the assumption that individuals across the age distribution earn the same income in a given year. First, we use the 1989 age distribution (for the high inflation, high interest rate scenario) and compare this

17. We also find there to be relatively small effects of unemployment in variants of the model where: (a) those who are unemployed for much of their 20s do not get loans or get smaller loans; (b) individuals can potentially get a new loan even after defaulting; and (c) the probability of unemployment in any 5- or 10-year spell is equal to the unemployment rate. Simulations like these are likely to be only guides as to the effect of unemployment on indebtedness because they impose strong assumptions on the probability of transition in and out of unemployment and the relationship between unemployment spells, default and ability to get a loan.

to the results based on the projected 2040 age distribution (for the low inflation and low interest rate scenario) based on estimates for Australia (Productivity Commission 2005). Even though the median age of the population is projected to rise by about 5 years across these two scenarios, this has only a minor impact on the aggregate debt-to-income ratios (row III). If we also assume that there is an upward-sloping wage profile over the life-cycle reflecting the benefit of experience (and matching the wage profile in Kulish, Smith and Kent 2006), the rise in the debt-to-income ratio is not as great as in the baseline scenarios, reflecting the lower debt ratios of older workers (row IV).<sup>18</sup>

Another dimension in which the baseline scenarios can be extended is to alter the speed with which debt is repaid since in practice debt tends to be paid off more quickly than the maximum specified in loan contracts (assumed to be 30 years for our purposes). If it is assumed that individuals spend a constant 30 per cent share of their income on servicing the debt over the life of the loan, then debts are repaid in roughly 15 years (the exact outcome depends on factors like inflation). As debt is paid off much more quickly in this scenario, the initial and new levels of indebtedness are both much lower (row V). Of potentially greater interest is the fact that the debt-to-income ratio associated with the move to low inflation and low interest rates under this alternative scenario is much larger in proportion to the starting value of the ratio, reflecting in part the slower rate of debt repayment when nominal income growth falls.

There are a number of other factors that could have some ongoing influence on levels of indebtedness. One is the effect of increased longevity. Exactly what the effects of increased longevity may be is unclear, but it seems likely that longer life spans might increase the retirement age and lead to a roughly proportional increase in the number of years people are willing to remain in debt. Certainly there is evidence of this in Australia, with substantial increases in the share of older households with owner-occupier debt (RBA 2006). One way of capturing this is to assume that loan periods and working lives expand so that they remain roughly constant as a share of total life spans. Under the scenario that life expectancy has risen from about 75 to 82 years, the expected retirement age would increase from 64 to about 69 years and the loan life from 30 to 33 years. This scenario would lead to only a modest rise in indebtedness to about 125 per cent (compared to 122 per cent in the baseline scenario). If instead the loan life increased without a commensurate increase in longevity, the level of indebtedness would increase to about 133 per cent.<sup>19</sup>

A factor that may have an important effect on indebtedness is the extent to which existing borrowers increase their debt either by refinancing their loan on an existing property or obtaining a new loan as they trade up to a more valuable property. While it is hard to know the extent to which this may have increased over time, some increase is consistent with evidence cited above of the rising share of

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18. For this model we assume that the growth rate of real income of the cohort entering the labour force is 2 per cent.

19. In reality, observed increases in loan duration could also be due to lower risk aversion of more recent generations of borrowers.

older households with owner-occupier debt, as well as a rise in refinancing as a share of total credit in Australia over recent years and a trend increase in MEW. Among other things, this behaviour might reflect the effect of rising longevity. Again this is speculative but, given available information, it is plausible that households refinance their initial loan after five years such that the new loan is 1.4 times the size of the outstanding balance of the loan (during the year prior to refinancing).<sup>20</sup> If the contract is for another 30 years and inflation and interest rates are low, the steady state level of indebtedness would be 166 per cent.

What about the effect of an easing in credit constraints due to financial institutions altering the rules of thumb or lending standards they use to determine eligibility for, and the magnitude of loans? In Australia, as elsewhere, there is certainly evidence that financial institutions have been providing credit more readily than in the past (at least up until the period of financial market turmoil in the second half of 2007; on the earlier relaxation of credit constraints, see Laker 2007 for the case of Australia; Fernandez-Corugedo and Muellbauer 2006 discuss the UK; and Bernanke 2007 discusses the US). This has involved lenders altering the basis of their lending standards in a number of ways that do not translate readily into rules based on initial repayment ratios. Nevertheless, the effect of these adjustments will be proportional to the effect that they have on the initial repayment ratio (for credit-foncier fixed repayments). So, for example, if the repayment on the loan were to rise from 30 to 40 per cent of initial income (and all households borrow according to this relaxed standard), the steady state level of indebtedness would rise from 122 to 163 per cent (under baseline assumptions with low inflation and low interest rates).

## 4.2 Transition between steady states

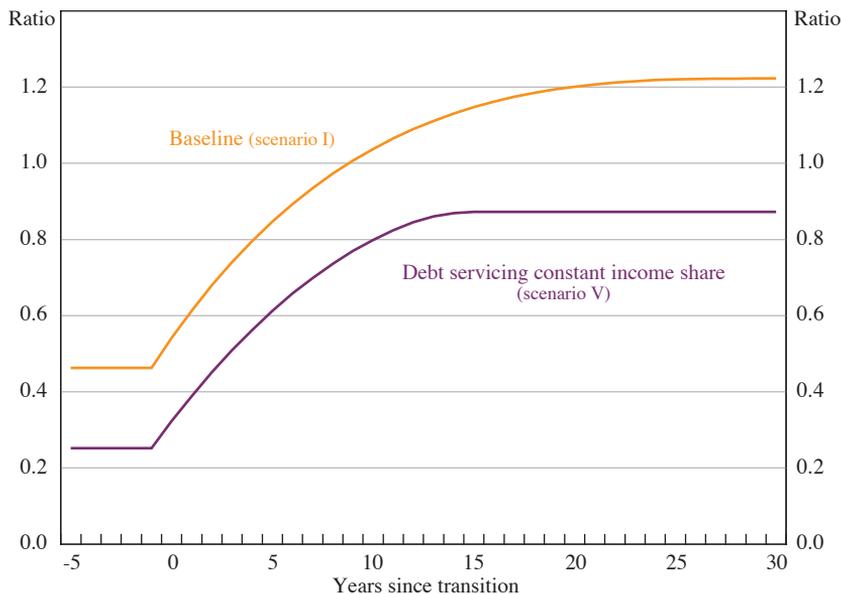
It is worth considering the likely transition path between different steady states since OLG models imply that it will take time for indebtedness to adjust to changing conditions. This is because an unexpected relaxation of credit constraints is less relevant for older households that have typically accumulated assets and paid down their debts, while it will provide new opportunities for younger borrowers to increase and possibly maintain higher levels of debt than would otherwise have been the case. Also, to the extent that contracts are fixed (either in terms of the interest rate or the ability to change the length of the loan or the amount borrowed), the capacity to adjust will be limited. This implies a gradual transition to higher levels of indebtedness as new generations take advantage of easier credit as they come of age. A simple scenario to consider is a one-off shift where existing borrowers do not adjust their level of borrowing but maintain the same life of the loan and loan rates are fixed (obviously this is not realistic for Australia, where loans are typically based on flexible interest rates, but it simplifies the calculations significantly and is likely to have only a small effect on the transition between steady states).

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20. This is broadly consistent with revenue data from some Australian State governments. It is also roughly comparable to the increase in borrowing that would occur if households refinanced after five years according to the 30 per cent repayment ratio rule of thumb, but applied to current nominal income, which increases considerably over five years.

Under such an assumption and assuming a 30-year contract, it takes 30 years for complete adjustment under the baseline scenarios (as it takes this long for debts incurred during the old regime to be repaid). However, about 80 per cent of the adjustment occurs within 12 years. If instead individuals spend a constant 30 per cent share of their income on servicing the debt over the life of the loan (as per the scenario outlined in row V of Table 4), complete adjustment to the new steady state occurs within about 15 years and about 80 per cent of the adjustment occurs within 10 years (Figure 10).

**Figure 10: Aggregate Debt-to-income Ratio**



In summary, these simulation exercises suggest that declines in inflation and, to a lesser extent, real mortgage interest rates (which have fallen by less in percentage point terms) have made a sizeable contribution to the rise in indebtedness in Australia. It seems likely that the effects of the decrease in inflation played out over a number of years but that they have probably largely flowed through to aggregate indebtedness. It is plausible that other factors like lower unemployment and increased longevity have also played some role, although the effect of these types of changes cannot be fully captured without considering the endogenous response of demand and supply to these factors. The trend of general reductions in credit constraints across a number of countries over recent years (and notwithstanding events of recent months) may continue to increase indebtedness for some time.

## 5. Implications for Consumption Behaviour and Financial Stress

In this section of the paper we attempt to assess the implications of rising household indebtedness for the vulnerability of the household sector to adverse shocks. We do this in a framework that explicitly defines financial vulnerability and models the household's decision regarding their optimal level of debt, incorporating their preferences for, and understanding of, the degree of risk and how it might be changing over time. This part of the modelling exercise is not dissimilar to that performed by Barnes and Young (2003) for the United States and Tudela and Young (2005) for the United Kingdom. While these papers present more complex models, which are calibrated so as to match both aggregate and individual level data, they do not consider changes in credit constraints or the degree of uncertainty, which we attempt in a simple way.

### 5.1 A definition of financial system vulnerability

Before presenting the model of the household's decision, we define a measure of financial system vulnerability (or risk) and highlight its relevance to developments affecting the household sector. For a policy-maker charged with maintaining financial system stability, perhaps the chief concern with respect to the household sector is to avoid situations of widespread financial distress. At the very least, such distress can lead to a curtailment of household consumption with adverse consequences for the macroeconomy.<sup>21</sup> In cases of more acute and widespread distress, a large share of households may find themselves unable (or unwilling) to service their debts, leading to the possibility of a forced sale of assets and significant losses for lending institutions, both of which could act to trigger and/or exacerbate a macroeconomic downturn.<sup>22</sup> The framework we adopt loosely matches that described in Kent and Debelle (1999). In particular, the policy-maker cares about macroeconomic losses (to be defined more carefully below) associated with financial stress that could occur in various adverse states of the world. Though our focus is on households, the concept is broadly consistent with Schinasi (2004) who emphasises the ability of the financial system to facilitate economic transactions, manage risks and absorb

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21. Maki (2000) summarises the literature exploring the link between consumption and credit and concludes that there is little empirical evidence that household debt service burdens or other credit quality variables are negatively related to future consumption in the short run. However, this is consistent with households raising debt in response to a reduction in the risk of adverse shocks. Also, it says nothing about the implication of large rises in debt for the behaviour of consumption over the longer term.

22. Most financial/banking crises have been related to problems in the commercial property market, corporate or international lending, rather than to the household sector. Since household default rates tend to be low, the magnitude of any reductions in consumption provides a measure of the size of adverse shocks and the desire to avoid default (Barrell, Davis and Pomerantz 2006; CGFS 2006).

shocks.<sup>23</sup> As well as allowing for the possibility that financial institutions may be weakened to the extent that they can no longer provide sufficient funding to meet the demands of households, our definition also allows for the possibility that household expenditure may be constrained or even substantially curtailed if they are unable to borrow sufficient funds in the face of a temporary adverse shock.

We assume that the macroeconomic losses that occur in adverse states of the world (indexed by  $i$ ) can be quantified as  $L(i|\Omega_t)$ , where losses are conditioned on  $\Omega_t$ , which summarises the state of the world at time  $t$ . This feature allows the losses to be path-dependent, such as on the current level of debt, for example. If necessary, losses measured in units of output could be transformed in order to capture the preferences of the policy-maker, who may be averse to the risk of especially large losses. In any case, losses could be based on the cumulative deviations of output below some threshold level, with output above this being assigned a loss value of zero, representing relatively benign states of the world. Such a threshold could be specified in terms of potential output with strictly positive losses arising when output was sufficiently far below potential.<sup>24</sup> This captures the notion that macroeconomic cycles are normal events that policy-makers cannot help to avoid altogether, but that they would like, where feasible, to avoid periods of especially weak economic activity associated with financial instability. Of course, in practice it may be quite difficult to distinguish between financial stability concerns and more general macroeconomic stability concerns.

To complete the definition of financial system vulnerability requires us to account for the likelihood of different states of the world. We assume that these can be described by a probability density function,  $f(i|\Omega_t)$ , where again the distribution is conditioned on the current state of the economy. Combining these two elements we can in principle construct an index of financial system vulnerability as follows:

$$V = \int_i L(i|\Omega_t) f(i|\Omega_t) di \quad (1)$$

In short, this is the expected macroeconomic loss resulting from adverse shocks, which is over and above the loss associated with a 'standard' economic cycle reflecting the effect of financial distress. Such an index accounts for the notion that conditional on a shock of a particular type/size, higher current levels of debt might imply a larger macroeconomic loss. However, it also allows for the possibility that the probability of such a shock may have diminished, and that this may have helped to spur the rise in debt in the first place.

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23. Schinasi (2004) discusses some key issues relevant to financial stability/vulnerability and provides a useful summary of recent definitions by a range of academics and central bankers. While many of these definitions are impressionistic, they broadly accord with our more explicit formulation. See also Haldane *et al* (2004) and Allen and Wood (2006) for a recent summary of this literature.

24. This accords with the characterisation by Cecchetti (2006) of the preferences of central bankers charged with maintaining economic and financial system stability and the notion of 'GDP at risk'.

## 5.2 A model of household debt

This section of the paper presents a very simple two-period partial equilibrium model in which the motive for debt is to smooth consumption over the life-cycle. We briefly discuss other motivations for debt later in the paper – in particular, consumption smoothing in the face of temporary shocks – but do not model these explicitly. Households are assumed to live for two periods, derive utility from consumption in each period ( $c_1$  and  $c_2$ , respectively), and earn (non-interest) income in both periods,  $w_1$  and  $w_2$ . For simplicity only the latter is subject to uncertainty as follows:

$$w_2 = \begin{cases} w_2^h & \text{with probability } (1-p) \\ w_2^l & \text{with probability } p \end{cases} \quad (2)$$

where  $w_2^h$  is strictly greater than  $w_2^l$ . To ensure that aggregate consumption varies over states of the world, we assume that the forces leading to low income operate equally across all households – that is, the shocks are not independently distributed. (We also incorporate an idiosyncratic shock to income in the second period conditional on the bad state of the world,  $l$ , in order to allow for default.)

Preferences and parameter values are such that households borrow in period 1, up to a limit  $\tilde{d}$ . The household's problem is to choose debt in the first period ( $d_1 \equiv c_1 - w_1$ ) to maximise expected utility:

$$\max_{d_1} u(c_1) + \beta E u(c_2) \quad \text{subject to} \quad (3)$$

$$c_1 - w_1 \leq \tilde{d} \quad \text{credit constraint} \quad (4)$$

$$(c_1 - w_1)(1+r)(1+\rho) \leq w_2 - c_2 \quad (5)$$

where:  $\beta$  is the discount rate;  $r$  is the risk-free interest rate;  $\rho$  is the premium that compensates lenders for expected losses;  $u(\circ)$  is the within-period, strictly increasing utility function, which displays some degree of risk aversion; and  $E(\circ)$  is the expectations operator.

We allow for the possibility of default in an elementary way by assuming that in the low-income state of the world an individual household experiences default with probability  $q$ . Specifically, in the low-income state of the world, households are susceptible to an idiosyncratic adverse shock that would reduce their income below  $w_2^l$ , by an amount equal to a share  $\alpha$  of their debt. We assume that by defaulting, the same value of their debt is forgiven – that is, their disposable income after default is the same as it is for non-defaulters.<sup>25</sup> Lenders charge a premium,  $\rho = \frac{pq\alpha}{1-pq\alpha}$ , so as to satisfy a zero expected profit condition.

A certainty-equivalent level of consumption in period 1,  $\hat{c}_1$ , can be derived by assuming that households receive income in period 2 equal to  $E(w_2)$  and that credit

25. These assumptions simplify the solution at the expense of some realism – namely, that default is costly.

constraints do not bind. With log utility, households would consume a share,  $1/(1 + \beta)$ , of the expected net present value (NPV) of lifetime income:

$$\hat{c}_1 = \frac{1}{1 + \beta} \left( w_1 + \frac{E(w_2)}{(1 + r)(1 + \rho)} \right)$$

where for  $\beta = 1$ ,  $\hat{c}_1 = \hat{c}_2$ . However, with uncertain income and risk aversion, consumption in period 1 will be less than the certainty equivalent. This difference,  $I \equiv \hat{c}_1 - c_1$ , can be thought of as a measure of self-insurance against the possibility of low income in period 2, and is inversely related to the degree of consumption smoothing. If the probability of the low-income state of the world declines, households will have an incentive to respond by increasing debt. In this way, the fall in the risk of low income is ‘offset’ by households taking out less insurance against that outcome (borrowing more), leaving them more vulnerable if that low-income state of the world actually occurs.<sup>26</sup> Households will also increase debt if binding credit constraints are eased, again leaving them more vulnerable to adverse shocks. These are two key features of this model.

The response to an easing in credit constraints may appear to run counter to the idea that such an easing may better enable borrowers to smooth consumption in the face of temporary shocks to income. To consider such shocks formally would require the model to be extended to at least three periods. However, the key results of the two-period model will still be relevant in the following way. In a three-period extension of the model, borrowing in period 1 would help to smooth lifetime consumption while borrowing in period 2 could occur in the event of a temporary adverse shock. Because both of these possibilities will be valued by households, we would expect that an easing in (binding) credit constraints would be used on both fronts – that is, borrowing more in period 1 to allow for more life-cycle consumption smoothing, but holding some borrowing capacity in reserve to help insure against a temporary adverse shock in period 2. It would be worth exploring how this extra borrowing capacity would be apportioned to these competing demands and the implications of this for consumption smoothing in further research. One important practical consideration here though is that financial institutions may be reluctant to extend credit in the face of an especially adverse temporary shock that affects a large share of the household sector, reducing the scope for consumption smoothing and increasing the value of liquid assets and products that allow households unconditional access to extra debt.

Returning to the two-period model, we suppose that the losses relevant to the instability index,  $L(i | \Omega_t)$ , are zero in the high-income state of the world (that is,  $L(i = h | \Omega_t) = 0$ ) and are proportional to the fall in consumption from period 1 to period 2 in the low-income state of the world. In what follows, we assume that  $L(i = l | \Omega_t) \equiv c_2^l - c_1$ . We abstract from the costs associated with default since the lending premium is such that lenders are fully compensated for expected losses.

26. Murphy (1999) presents evidence on the precautionary saving motive that suggests that agents borrow more under lower uncertainty.

At the expense of increased complexity, we could assume that default is a costly option for households, thereby providing them with an incentive to cut back on consumption in the second period of their lives if they were otherwise at risk of default. This would imply lower consumption for households that are close to, or in default, leading to a larger loss  $L(i|\Omega_i)$ .

In the following sections we consider the implications of this model for the degree of consumption smoothing (that is, the inverse of  $I$ ), financial vulnerability ( $V$ ) and welfare ( $EU$ ) in the face of developments that would lead to a rise in debt. We illustrate key features of the model by assuming log utility and using the following baseline parameterisation:  $w_1 = 1$ ;  $w_2^h = 1.5$ ;  $r = 0.2$ ;  $\beta = 0.83$ ;  $q = 0.2$ ; and  $\alpha = 0.5$ . We consider a range of values for the probability of the low-income state of the world,  $p$ , and for the level of  $w_2^l$  (from 0.3 to up to 1.4).

### 5.2.1 An easing of credit constraints

Consider the effect of an easing of the credit constraint (a rise in  $\tilde{d}$ , from 0.05 to 0.2); we discuss why this might occur below. To the extent that the constraint was initially binding, households will borrow more and increase the degree of their consumption smoothing; that is, the level of insurance,  $I$ , against low consumption in period 2 will fall. Obviously, this easing in the constraint increases welfare ( $EU$  rises). However, because debt rises, the loss in period 2 associated with the low-income state,  $L(i = l | d_1)$ , increases.

The impact of this on the index of financial vulnerability,  $V$ , will depend crucially on factors that have driven the change in the credit constraint. At one extreme is the case where the probability of the low-income state is unchanged. This could occur via competitive pressures leading to reductions in  $\tilde{d}$ , independent of other factors affecting risk in the economy. In this case, the index of financial vulnerability,  $V$ , will rise. This is not to say that this is necessarily a bad thing, since social welfare and the measure of vulnerability are not one in the same. By focusing on adverse outcomes, the measure of vulnerability fails to account for the value to the household of being able to raise consumption in period 1 at the expense of risking lower consumption in period 2.<sup>27</sup>

Another case to consider is one in which credit constraints  $\tilde{d}$  are relaxed by either a regulator or by lending institutions responding to factors that imply a reduction in the risk of adverse shocks. If such a change is consistent with what a well-informed and prudent borrower would choose to do in the absence of binding constraints,

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27. This highlights the fact that minimising financial vulnerability is not equivalent to maximising welfare, since policy-makers also need to consider the benefits associated with debt. One way to do this is for policy-makers to maximise some index of financial efficiency subject to maintaining vulnerability below some level. In practise, this sort of approach would make sense if it was easier to derive suitable measures of efficiency and vulnerability than to characterise expected utility. Kent and Debelle (1999) discuss the trade-off between efficiency and vulnerability in a model of banking consolidation. Schinasi (2004) touches on this point, but notes that much work remains to be done in this area; the nature of the benefits associated with financial deregulation and other financial system developments affecting the household sector are highlighted by CGFS (2006).

then it need not imply an increase in financial vulnerability and will enhance social welfare. However, an easing of constraints that goes beyond this may be of concern, particularly if households are not well-informed about the risks they face.

### 5.2.2 A decline in ‘risk’

The effect of a decline in the probability,  $p$ , of the low-income state of the world can be considered more explicitly as follows (with  $d$  unrestricted and other parameters as above). This change may reflect a number of structural changes that increase the likelihood of higher income in period 2. One possibility is a decline in macroeconomic volatility, although this would not necessarily impinge favourably upon  $q$  (as discussed in Section 2). Nevertheless, the decline in  $p$  has the effect of lowering the premium,  $\rho$ , required to compensate lenders for expected losses (Table 5).

Debt rises monotonically as the probability of low income in period 2 declines. In contrast, the relationship between the extent of consumption smoothing and  $p$  follows a U-shaped pattern (for constant  $w_2^l$ ), with the least amount of consumption smoothing (maximum insurance,  $I$ ) occurring at intermediate levels of  $p$  (in the case where  $w_2^l < w_1$ ). These points are shaded in Table 5 for selected values of  $w_2^l$ ; the upper-right portion of the table indicates combinations of  $p$  and  $w_2^l$  consistent with debt. If we consider only those parameter values for which the household is willing to take on debt, the extent of consumption smoothing increases as  $p$  declines (from sufficiently low levels). Because debt rises unambiguously with the decline in  $p$ , so too does the loss,  $L(i = l | d_1)$ . However, for low enough  $p$  this is more than offset by the decline in the probability of the low-income state so that the index of

**Table 5: Index of Self-insurance**

$$I \equiv \hat{c}_1 - c_1 = \frac{1}{1 + \beta} \left( w_1 + \frac{Ew_2}{(1+r)(1+\rho)} \right) - c_1$$

| $p$  | $\rho$ | $w_2^l$ |       |       |       |       |       |       |
|------|--------|---------|-------|-------|-------|-------|-------|-------|
|      |        | 0.3     | 0.4   | 0.5   | 0.6   | 0.7   | 0.8   | 0.9   |
| 0.05 | 0.005  | 0.119   | 0.084 | 0.058 | 0.040 | 0.027 | 0.018 | 0.011 |
| 0.10 | 0.010  | 0.150   | 0.114 | 0.085 | 0.061 | 0.043 | 0.030 | 0.020 |
| 0.15 | 0.015  | 0.165   | 0.130 | 0.100 | 0.075 | 0.055 | 0.039 | 0.026 |
| 0.20 | 0.020  | 0.172   | 0.138 | 0.109 | 0.083 | 0.062 | 0.045 | 0.031 |
| 0.25 | 0.026  | 0.174   | 0.142 | 0.113 | 0.088 | 0.066 | 0.049 | 0.034 |
| 0.30 | 0.031  | 0.172   | 0.142 | 0.114 | 0.090 | 0.069 | 0.051 | 0.036 |
| 0.35 | 0.036  | 0.168   | 0.139 | 0.113 | 0.090 | 0.069 | 0.052 | 0.037 |
| 0.40 | 0.042  | 0.161   | 0.134 | 0.110 | 0.088 | 0.069 | 0.052 | 0.037 |
| 0.45 | 0.047  | 0.153   | 0.128 | 0.106 | 0.085 | 0.067 | 0.051 | 0.037 |
| 0.50 | 0.053  | 0.143   | 0.121 | 0.100 | 0.081 | 0.064 | 0.049 | 0.036 |

Notes: The upper-right region is one of indebtedness; the lower-left region is one of saving. Shading indicates maximum self-insurance.

**Table 6: Index of Financial System Vulnerability**

$$V = \int_i L(i|\Omega_t) f(i|\Omega_t) di$$

| $p$  | $\rho$ | $w_2^l$ |        |        |        |        |        |        |
|------|--------|---------|--------|--------|--------|--------|--------|--------|
|      |        | 0.3     | 0.4    | 0.5    | 0.6    | 0.7    | 0.8    | 0.9    |
| 0.05 | 0.005  | -0.044  | -0.043 | -0.041 | -0.038 | -0.035 | -0.031 | -0.027 |
| 0.10 | 0.010  | -0.075  | -0.073 | -0.071 | -0.067 | -0.062 | -0.056 | -0.049 |
| 0.15 | 0.015  | -0.097  | -0.096 | -0.093 | -0.088 | -0.082 | -0.075 | -0.066 |
| 0.20 | 0.020  | -0.114  | -0.112 | -0.109 | -0.104 | -0.097 | -0.089 | -0.079 |
| 0.25 | 0.026  | -0.125  | -0.124 | -0.120 | -0.115 | -0.108 | -0.099 | -0.088 |
| 0.30 | 0.031  | -0.132  | -0.131 | -0.127 | -0.122 | -0.115 | -0.105 | -0.094 |
| 0.35 | 0.036  | -0.135  | -0.134 | -0.130 | -0.125 | -0.118 | -0.108 | -0.096 |
| 0.40 | 0.042  | -0.135  | -0.133 | -0.130 | -0.125 | -0.117 | -0.107 | -0.096 |
| 0.45 | 0.047  | -0.131  | -0.130 | -0.126 | -0.121 | -0.113 | -0.104 | -0.092 |
| 0.50 | 0.053  | -0.124  | -0.123 | -0.119 | -0.114 | -0.107 | -0.098 | -0.086 |

Notes: The upper-right region is one of indebtedness; the lower-left region is one of saving. Shading indicates maximum self-insurance.

vulnerability,  $V$ , declines with  $p$  (for values of  $p$  less than 0.35 for the parameters underlying Table 6). Expected utility is always increasing with the decline in  $p$ .

Now consider a fall in the lending premium associated with a decline in the share,  $q$ , of borrowers in default in the low-income state (from 0.2 to 0.1) and in the loss-given default  $\alpha$  (from 0.5 to 0.25). This may reflect a more benign macroeconomic environment, such as a decline in the structural unemployment rate. The impact of this on the lending premium increases roughly in proportion with  $p$ , hence the increase in debt in response to this change is much larger for higher values of  $p$ . However, the rise in debt is not so large as to offset the positive impact on income (after interest payments) for debtors in period 2. For this reason the loss associated with low income in period 2,  $L(i=l|d_1)$ , declines. Accordingly, the measure of vulnerability,  $V$ , also declines.<sup>28</sup>

### 5.2.3 Accounting for structural differences across countries

We briefly discuss three differences in the structure of credit and housing markets across countries that could have important implications for these types of models (a formal treatment is beyond the scope of this paper). The first is the role of assets, both housing and financial. Much of the rise in debt across a range of countries appears to have been used to purchase housing. In some countries, tax incentives (and/or direct subsidies) have encouraged leveraged purchases of property (including for the purpose of pure investment). These incentives may also encourage households

28. Our measure of consumption smoothing declines in response to the lower lending premium for low values of  $w_2^l$ , reflecting the influence of the falling cost of borrowing on the NPV calculation. If instead we base the NPV solely on the risk-free interest rate, the measure of self-insurance declines (implying increased consumption smoothing) in response to the reduced risk of default.

to maintain debt for longer than might otherwise be the case. However, this does not necessarily imply higher net debt, since households may choose to accumulate wealth in the form of financial assets. But whatever the motivation behind greater gross (mortgage) debt, the liquidity of housing and financial assets, and the risk of sharp reductions in their prices, will have increasingly important implications for financial vulnerability in countries with higher indebtedness.<sup>29</sup>

A second and related issue is that structural features of debt and asset markets may have important implications for financial vulnerability via their effect on credit constraints, liquidity, the likelihood of default and loss given default. Ellis (2006) provides a cross-country comparison of tax, financial and legal systems with regards to their impact on housing and debt markets. One key difference is whether households with debt secured against property pay off debt and accumulate housing equity relatively rapidly, or instead maintain debt for longer and accumulate financial assets. The former tends to occur where flexible interest rate mortgages are the norm, and interest costs cannot be offset against income tax. In these countries, households with debt are susceptible to interest rate shocks. However, working in the other direction, they tend to accumulate prepayment buffers, which provide the option of ‘payment holidays’ or housing equity withdrawal at times of stress. And unlike financial assets, consumption can be funded in this way without liquidating assets, which would otherwise put downward pressure on asset prices when they may already be under pressure from an economic downturn.

A third important issue for financial vulnerability is the distribution of debt and assets across different households. In a number of countries that have experienced rapid rises in debt over the past decade or more, much of this is held by higher-income households who spend a small share of their disposable income servicing that debt (Debelle 2004; Girouard, Kennedy and André 2007; RBA 2007).

### 5.3 Factors to consider beyond the confines of this model

In the model presented above, households that take on more debt are assumed to account for the additional risk that this implies in an optimal way. Indeed, aside from a purely exogenous reduction in credit constraints, many other developments would have reduced risk at unchanged levels of debt. Not surprisingly then, households have taken on more debt and financial institutions have eased credit constraints. For reductions in credit constraints that are unrelated to changes in structural factors affecting risk, the degree of vulnerability rises but from a level that may have been sub-optimal.

Given this endogenous response of debt so as to maintain an optimal degree of risk, what might cause a policy-maker to be wary of the effect of rising indebtedness on financial stability? Perhaps the foremost concern is that in a world of imperfect information, households and financial institutions may misjudge the true risks

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29. It is worth noting that new financial products that make it easier for mortgagors to gain access to housing equity may have increased the liquidity of housing assets. This itself may have encouraged households to take on more debt.

they face. They may give too much weight to recent experience, leading them to underestimate risks during benign periods and overstate risks following adverse shocks. At the same time, individual household and financial institutions can adversely affect others in ways that they do not account for when making their decisions. These two features can lead financial system developments to amplify business cycles.

Amplification arises in large part because of the existence of financial market frictions, the extent of which can vary in response to different shocks. The extent of credit constraints, which can be ameliorated by the use of collateral, is one such example.<sup>30</sup> In this case, the extent of constraints can be affected by changes in the prices of collateral, which are determined in forward-looking asset markets and depend in turn on the availability of credit. Amplification can affect our measure of vulnerability in two ways:

- i. accelerator effects will increase  $L(i | \Omega_t)$ , since an adverse shock can lead to a larger fall in asset prices, tightening credit constraints as well as increasing the likelihood of default ( $q$ ) and the loss given default ( $\alpha$ ). A tightening of lending standards in response to adverse shocks can compound these effects; and
- ii. while the likelihood of adverse shocks may have declined over a long period of time, households and financial institutions may perceive a larger reduction in risk than has actually occurred. Hence, the true probability distribution of states of the world,  $f(i | \Omega_t)$ , may be less benign than that embodied in the perceptions of private agents. Following adverse shocks, these perceptions can overshoot in the other direction, leading to excessive caution by private agents, which can exacerbate the initial adverse shock.

For these reasons, the index of vulnerability could increase by more during expansionary phases than would be the case in a world of perfect information. In practise it will be difficult to measure an increase in vulnerability in real time given the range of structural changes that are likely to have been responsible for triggering the rise in indebtedness in the first place. Even so, empirical evidence suggests that expansions accompanied by the following developments may be more risky than others:

- a. financial deregulation – where financial institutions, households and the regulator(s) are learning rapidly about a new regime with more readily available credit (CGFS 2006);
- b. rapid growth of asset prices and credit (Borio and Lowe 2002, 2004); and
- c. especially vigorous competition between financial institutions attempting to maintain market shares.

In short, it may take time (and experience) to accurately assess the true nature and extent of sustainable structural change. Therefore, very rapid rises in debt may

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30. See Haldane *et al* (2004) and references therein for a discussion of models of financial frictions and their role in financial stability.

indicate excessive risk-taking by private agents throughout the economy, leaving them more vulnerable to adverse shocks than they expect.

## 6. Conclusions

Most, though not all, advanced economies have experienced a substantial rise in indebtedness over the past two decades or so. This has been accompanied by a decline in real mortgage rates, suggesting that much of the rise in debt can be attributed to supply-side factors. This paper makes use of the considerable variation in the extent of the trend rise in debt-to-income ratios across countries over a long period to examine the role of a number of potential explanatory factors identified in the literature. In particular, we show that countries that experienced larger trend increases in indebtedness can be roughly characterised as having had larger declines in inflation, macroeconomic volatility and unemployment. They also tend to have less regulated, and more competitive and innovative mortgage markets.

We examine simulations based on the assumption that households are credit-constrained to explore the relative importance of various factors for the rise in indebtedness. This analysis suggests that the decline in inflation may have been relatively more important than the decline in real interest rates, at least for countries in which maximum repayment ratios are an important feature of credit constraints. And while aggregate indebtedness is likely to have adjusted gradually over the course of a decade or so, the bulk of these effects are likely to have run their course by now. Falling unemployment and a willingness of households to refinance and hold debt for longer has also played some role. This latter effect may in part reflect the effect of rising longevity, which is likely to have an ongoing effect. In addition, there is evidence of a further relaxation of lending standards in a number of countries over recent years, which if sustained would imply some further expansion in indebtedness.

Using a model in which household decisions regarding debt are made optimally with regard to various factors affecting risk, we explore the implications of rising debt for the vulnerability of the household sector. If the risks affecting the ability of households to service their debts have shifted over the longer term so as to become more benign, then it makes sense for debt to rise. For this reason, higher debt does not necessarily imply an increase in vulnerability. Yet even if vulnerability does rise, this may well be welfare-improving (particularly if credit had previously been unduly restricted). In either case, higher debt means that, *ex post*, an adverse shock of a given size will imply greater costs for households and, potentially, financial institutions. In this respect, higher indebtedness can have important implications for the transmission of monetary policy. From the perspective of policy-makers charged with maintaining financial system stability, a key concern is that financial institutions and households may tend to underestimate the true degree of risk. If they are ill-informed and base their decisions on recent experience then vulnerability may be rising after a period of relatively favourable economic conditions, particularly if competition has intensified and debt has been rising especially rapidly.

## Appendix A: Data Definitions and Sources

### *Debt-to-income ratios*

Total household debt as a percentage of household disposable income. For most countries the data for debt and income are sourced separately and the measure available uses SNA93 definitions, so that debt includes all liabilities of households and unincorporated enterprises and disposable income is measured after interest payments and includes the income of unincorporated enterprises. Exceptions are detailed in Table A1.

### *Real mortgage interest rates and their volatility*

Data are monthly and sourced from the Bank of International Settlements (BIS) through DBSONline for: Belgium, France, Germany, Italy, Japan, Sweden, Switzerland, the UK and the US. A discontinued series (also sourced through DBSONline) with the most similar definition and coverage was additively spliced to the current series for each of: Belgium (November 2003), Germany (December 2002), Italy (December 1994), Japan (March 1986) and the UK (December 1983). The sources of data for other countries are (splice dates are shown in brackets): Australia – RBA; Denmark – Danmarks Nationalbanken and (prior to 2003) Bloomberg; Finland – Finlands Bank and (prior to 2003) IMF *International Financial Statistics (IFS)* (through Datastream); South Korea – IFS (through Datastream); Netherlands – CGFS (2006) and (prior to December 1984) IFS (through Datastream); NZ – RBNZ and (prior to June 1998) IFS (through Datastream); and Norway – IFS (through Datastream). For Denmark and NZ, the splice series is the 3-year swap rate, not the historical mortgage rate. The real mortgage rate is the nominal rate deflated using the rate of realised consumer price inflation.

Volatility is calculated as the rolling five-year end-of-period standard deviation of the nominal mortgage rate.

### *Consumer price inflation*

Based on the consumer price index from national statistical agencies through Datastream. Exceptions are: Australia – CPI less interest charges prior to the September quarter 1998 and adjusted for the tax change of 1999–2000 (RBA); South Korea – OECD.Stat; Japan – Management and Coordination Agency (through Datastream); US – Bureau of Labor Statistics (through Datastream).

### *Unemployment rates*

Data are sourced from national statistical agencies through Datastream. Exceptions are: Australia – ABS; Finland, Italy, South Korea, Netherlands, Norway and Spain – OECD (through Datastream); Japan – Ministry of Health, Labour and Welfare; US – Bureau of Labor Statistics (through Datastream).

### *Real house prices*

Data on nominal house prices are sourced from the BIS through DBSONline. Exceptions are: Australia – ABS; Finland, France, Norway, Switzerland – national statistical agencies through Datastream; Germany – BulwienGesa AG through Datastream;

Japan – Japan Real Estate Institute through CEIC; South Korea – Kookmin Bank through CEIC; NZ – Real Estate Institute of New Zealand through Datastream and backcast (prior to March quarter 1992) using data from the BIS; UK – Nationwide through Datastream; US – Office of Federal Housing Enterprise Oversight through Datastream. The nominal house price is deflated by the CPI for each country.

#### *Volatility of real output growth*

Rolling five-year end-of-period standard deviation of annual real GDP growth. Calculation uses real GDP data sourced from national statistical agencies through Datastream. Exceptions are: Belgium, Netherlands – OECD sourced through Datastream; Denmark, Finland, Norway, Switzerland – BIS through DBSONline; Australia – ABS Cat No 5206.0, South Korea – CEIC. If historical data were unavailable from this source, data from the World Bank *World Development Indicators* were used to backcast the series. The splice dates are: 1989 – Denmark; 1974 – Finland; 1977 – France, Norway; 1979 – Spain, Sweden; 1980 – Switzerland; 1986 – NZ; 2000 – Italy. Exception: Japan – spliced backward between 1980 and 1970 using SNA68 data and prior to 1970 using OECD data.

#### *Gearing*

Measured as the ratio of total household debt to total household assets (financial and non-financial assets). Data for debt are sourced as for the debt-to-income ratio. Data on assets are sourced from: Australia – RBA *Bulletin*; Netherlands – CPB Netherlands Bureau for Economic Policy Analysis and Statistics Netherlands; UK – Office for National Statistics; US – Board of Governors of the Federal Reserve System ‘Flow of Funds Accounts of the United States’. Debt and asset data for France are published in OECD *Economic Outlook* Statistical Annex, Table 58 as a percentage of disposable income – the gearing ratio is calculated as the debt-to-income ratio divided by the assets-to-income ratio.

#### *Interest-payments ratio*

The ratio of interest payments on total household debt (including unincorporated enterprise debt) to disposable income before the deduction of interest payments. Exceptions: Australia, US – interest payments on housing and consumer debt only; disposable income excludes the income of unincorporated enterprises. Sources: Australia – RBA *Bulletin*; France – National Institute for Statistics and Economic Studies (INSEE); Netherlands – Statistics Netherlands; UK – Office for National Statistics; US – Bureau of Economic Analysis.

#### *Product market regulation*

Countries are classified on a 0–6 scale from least to most restrictive for each regulatory and market feature of the seven non-manufacturing industries: airlines, railways, road, gas, electricity, post and telecommunications. Data are from Conway and Nicoletti (2006).

#### *German data*

German data refer to West Germany prior to 1991.

**Table A1: Debt-to-income Ratio: Definitions and Sources**

| Country     | Sources  | Definition of debt and disposable income  | Time period |
|-------------|--|---|-------------|
| Australia   | RBA <i>Bulletin</i>  | Debt: excluding UE<br>HDI: before interest payments; excluding UE                                   | 1976–2006   |
| Canada      | Bank of Canada; Statistics Canada through Datastream   | SNA93   | 1975–2006   |
| Denmark     | Statistics Denmark; Statistics Denmark through Datastream  | SNA93   | 1995–2005   |
| Finland     | Statistics Finland   | SNA93   | 1990–2004   |
| Germany     | Deutsche Bundesbank  | SNA93   | 1984–2005   |
| Netherlands | CPB Netherlands Bureau for Economic Policy Analysis; Statistics Netherlands; unpublished data from De Nederlandsche Bank | SNA93   | 1970–2006   |
| NZ          | RBNZ   | HDI: before interest payments   | 1990–2005   |
| Norway      | Norges Bank <i>Financial Stability</i>   | Loan debt as a percentage of liquid disposable income less estimate of reinvested dividend payments | 1987–2006   |
| UK          | Office for National Statistics   | SNA93   | 1975–2005   |
| US          | Board of Governors of the Federal Reserve System Flow of Funds Accounts of the United States                             | HDI: excluding UE; before deduction of mortgage interest payments                                   | 1975–2006   |
| France      | ] OECD <i>Economic Outlook</i> , Vol Nos 78–81, Statistical Annex Table 58   | SNA93; published as a ratio of debt to income   | 1993–2005   |
| Italy       |  |   | 1980–2005   |
| Japan       |  |   | 1984–2004   |
| Belgium     | ] CGFS (2006)  | Exact treatment of components not stated; provided as a ratio of debt to income                     | 1993–2003   |
| South Korea |  |   | 1984–2004   |
| Spain       |  |   | 1984–2004   |
| Switzerland |  |   | 1990–2003   |
| Sweden      |  |   | 1984–2005   |

Notes: UE is unincorporated enterprises; HDI is household disposable income.

## Appendix B

**Table B1: Credit Market Reforms**

| Country     | Year    | Reform   |
|-------------|---------|--|
| Australia   | 1980    | Bank specialisation requirements abolished for large domestic banks  |
|             | 1982    | Quantitative lending guidance eliminated                             |
|             | 1986    | Removal of ceiling on mortgage interest rate                         |
|             | 1988    | Securitisation first adopted   |
| Canada      | 1967    | Ceiling on interest rate on bank loans eliminated                    |
|             | 1967    | Restrictions on banks' participation in mortgage financing abolished |
|             | 1980    | Banks allowed to have mortgage loan subsidiaries                     |
|             | 1987    | Securitisation introduced  |
| Denmark     | 1982    | Liberalisation of mortgage contract terms                            |
|             | 1982    | Interest rate deregulation   |
|             | 1989    | Elimination of restriction on mortgage bond issuance                 |
|             | 1991    | Enhanced freedom of entry  |
| Finland     | 1984    | Funding quotas from the Central Bank to commercial banks eliminated  |
|             | 1986    | Interest rate deregulation   |
|             | 1987    | Guidelines on mortgage lending removed                               |
|             | 1989    | Securitisation introduced  |
| France      | 1984    | Bank specialisation requirements reduced                             |
|             | 1984    | Ending of priority lending/sectoral guidelines                       |
|             | 1987–89 | Elimination of credit and exchange controls                          |
|             | 1999    | Removal of monopoly right to issue mortgage bonds                    |
| Germany     | 1967    | Interest rate deregulation   |
|             | 1992    | Enhanced freedom of entry  |
| Italy       | 1983    | Interest rate deregulation   |
|             | 1983    | Credit ceilings eliminated   |
|             | 1993    | Enhanced freedom of entry  |
|             | 1994    | Separation of long-term and short-term credit institutions abolished |
| Japan       | 1993    | Bank specialisation requirements reduced                             |
|             | 1994    | Interest rate deregulation completed (begun in early 1980s)          |
|             | 1994    | Interest rate deregulation completed (begun in early 1980s)          |
| South Korea | 1982    | Direct government control of banks removed                           |
|             | 1984    | Entry and operations restrictions eased                              |
|             | 1991    | Interest rate controls completely removed                            |
| Netherlands | 1980    | Interest rate deregulation   |
|             | 1992    | Enhanced freedom of entry  |
| NZ          | 1984    | Credit allocation guidelines removed                                 |
|             | 1984    | Interest rate deregulation   |
| Norway      | 1984    | Lending controls abolished   |
|             | 1985    | Interest rate deregulation   |
| Spain       | 1986    | Entry of foreign banks   |
|             | 1987    | Interest rates deregulated   |
|             | 1990    | Credit ceilings eliminated   |
| Sweden      | 1985    | Interest rate deregulation   |
|             | 1985    | Lending controls for banks abolished                                 |
| UK          | 1979–80 | Abolition of exchange and credit controls                            |
|             | 1981    | Banks allowed to compete with building societies for housing finance |
|             | 1981    | Minimum lending rates abolished                                      |
|             | 1986    | Guidelines on mortgage lending removed                               |
|             | 1987    | Securitisation introduced  |
| US          | 1971    | Securitisation introduced  |
|             | 1980    | Beginning of four-year interest rate deregulation                    |
|             | 1980    | Elimination of portfolio restrictions for thrifts                    |

Sources: Girouard and Blondal (2001); G10 (2003); Hao, Hunter and Yang (1999)

## Appendix C: Calculations from Section 4

The credit constraint requires that the constant repayment is a set percentage of income where the repayment is given by:

$$w = \frac{Vi}{1 - (1+i)^{-N}}$$

where:  $i$  is the annual nominal interest rate;  $V$  is the value of the loan; and  $N$  is the duration of the loan. Assuming that the loan is a credit-foncier and individuals only take out a loan when they are 30, then the aggregate debt to income ratio can be derived from:

$$\frac{D_t}{Y_t} = \frac{\sum_c w_{ct} D_{ct}}{Y_t} = \frac{\sum_c w_{ct} L_c \delta_{ct}}{\sum_c w_{ct} Y_{ct}}$$

where:  $D$  is nominal debt;  $L$  is the loan taken out at 30;  $Y$  is income;  $c$  is a cohort identifier;  $w$  is the population size of the cohort;  $t$  identifies a particular year; and  $\delta$  indicates the fraction of the original loan still outstanding, which can be calculated as:

$$\delta_{ct} = (1+i)^s + \frac{1 - (1+i)^s}{1 - (1+i)^{-N}}$$

where:  $N$  is the length of the loan; and  $s$  is how long the loan has already existed at time  $t$  (that is, cohort  $c$ 's age at time  $t$  minus 30).

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# *Discussion*

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**Jack Selody**

## **Introduction**

This paper provides a well thought out answer to the question: has the run-up in household indebtedness experienced by many OECD countries over the past decade reduced the resilience of the financial system? The paper is well executed, and provides useful insights into this very difficult question.

I should start by noting that in what follows my interpretation of the results in the paper will be less nuanced than those offered by the authors since my role is to provoke discussion.

My reading of the paper is that it broadly supports the view that the run-up in household indebtedness observed in some countries has not adversely affected the resilience of their financial systems. First, the authors find that the most likely cause of the run-up is that households can now carry a higher level of debt comfortably because of the lower nominal interest rates that accompany low inflation. Since lower inflation is likely to persist, higher levels of household indebtedness should be sustainable. Second, they find that persistent factors such as low inflation and the demographic composition of the population are sufficient to explain almost all the run-up in household indebtedness; there is no 'excess' indebtedness that needs to be explained. Third, even if indebtedness is now somewhat higher by historical standards, we should not be too concerned because households are wealthier and credit may have been unduly restricted in the past.

I do not find these observations surprising or contentious. The question I would like to pose is the following: would a sceptic be convinced by the analysis offered in the paper? I will discuss three areas where I think more research would be helpful in convincing a sceptic.

## **Underlying behaviours**

The identification of low inflation, lower unemployment and lower output growth volatility as the main explanations for the run-up in household indebtedness is based on correlation analysis. However, because these variables are highly endogenous, and we know that correlation between highly endogenous variables does not imply causation, an unidentified third factor may be responsible for the coincident movement in inflation and household indebtedness. The paper would be more convincing if it identified the underlying behavioural determinants of the coincident movements in these variables.

For example, changes in the monetary policy framework (such as the move to inflation targeting in many countries) may have caused the reduction in inflation, unemployment and output growth volatility, which in turn caused the increase in

household indebtedness. In this case a sceptic should be convinced that the run-up in household indebtedness is sustainable since it is highly likely that the better monetary policy framework will be maintained.

Alternatively, the reduction in inflation may be the result of a positive supply-side shock, with changes to the monetary policy framework little more than a sideshow. Hence, the rise in household indebtedness might be the result of the cyclically relaxed credit constraints that typically accompany positive supply shocks. This makes it harder to be certain that the run-up in household indebtedness is sustainable.

More worrisome, it may be that the positive supply shock created an unusually long string of good news that led to a bout of 'irrational exuberance' in housing prices. Given this possibility it might be difficult to convince a sceptic that the run-up in household indebtedness is sustainable.

Clearly, knowing the behavioural determinants of co-movements in interest rates and debt is important for determining whether the current situation will be sustained.

## **The supply of funds**

The paper provides convincing analysis that households can support these higher levels of indebtedness provided interest rates stay low and their access to funds does not again become restricted. The demand-side of the household borrowing equilibrium does not seem to be out of line with fundamentals. This is important because it suggests that we are unlikely to see a large wave of household defaults, provided economic conditions remain favourable.

However, the demand-side story starts with the assumption that households have taken on more debt because they can afford to. The paper uses a model, correctly in my view, that some households are credit-constrained. In this case, households have taken on more debt partly because they are able to – the credit constraint has been relaxed. But what is the probability that the credit constraint will stay relaxed? What would be the effect on the financial system if this supply-side constraint tightens again?

The relaxing of credit constraints has been facilitated by the aggregation and restructuring of household loans so that the resulting asset is more desirable to investors. But, is this financial innovation durable? Is there a chance that investors will lose their appetite for this new asset class? Is it possible that a bout of financial instability could begin with problems in the market for mortgage-backed assets and spread so as to constrain households' ability to borrow and spend?

The paper would benefit from a deeper analysis of the financial developments that have caused credit constraints to become more relaxed so that the sustainability of the changes can be assessed. A sceptic would want to know that investors would continue to be willing to supply credit to households at low interest rates.

## **General equilibrium**

The analysis in the paper focuses almost exclusively on the sustainability of household indebtedness independently of the changing debt levels of other important economic agents in the economy – commercial enterprises, governments and foreigners. Although this approach is useful for analysing the isolated effect of a single factor, it is less useful for determining whether the system as a whole is suffering from a build-up of unsustainable pressures.

I like to think of the financial system as a balloon – if you push in one place it will bulge in another. Similarly, the stress placed on the financial system by the rise in household indebtedness could show up in its effect on other borrowers whose traditional sources of funding have dried up. Alternatively, the euphoria created in the housing market by easier access to mortgage credit could spill over into other financial markets, leading to inappropriate relaxation of lending standards more generally. The bottom line is that it is difficult to know the resilience of the financial system to a shock in one area without knowing the linkages between that area and the rest of the financial system.

# Finance and Welfare States in Globalising Markets

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Giuseppe Bertola<sup>1</sup>

## Abstract

It is theoretically clear and may be verified empirically that efficient financial markets can make it less necessary for policy to try to offset the welfare effects of labour income risk. The literature has also pointed out that, since international competition exposes workers to new sources of risk at the same time as it makes it easier for individuals to undermine collective policies, international economic integration makes insurance-oriented government policies more beneficial as well as more difficult to implement. This paper reviews the economic mechanisms underlying these insights and assesses their empirical relevance in cross-country panel data sets. Interactions between indicators of international economic integration, government economic involvement and financial development are consistent with the idea that financial market development can substitute for public schemes when economic integration calls for more effective ways to smooth household consumption. The paper's theoretical perspective and empirical evidence suggest that to the extent that governments can foster financial market development by appropriate regulation and supervision, they should do so more urgently at times of intense and increasing internationalisation of economic relationships.

## 1. Introduction

Regulatory and tax-transfer policies play an important role, alongside financial market access, in smoothing income and consumption and protecting households from labour market and other risks such as family breakdown and ill-health. The configuration of policies and markets differs across countries, and interacts with changing economic circumstances. New types of income risk became relevant when industrialisation led to increased specialisation, and urbanisation made it necessary to replace family and village-level safety nets with trading in financial markets or with collective welfare schemes. The evolution of markets and institutions was shaped by political and social factors in each country, which featured, and still feature, different combinations of public and private risk-sharing frameworks.

When and where collective institutions play a predominant role – in the form of education and pension schemes, progressive taxation, unemployment and employment

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1. University of Torino. This paper is tightly related to past and ongoing joint work with Winfried Koeniger. It has benefited from his comments as well as those of the paper's discussant – Guy Debelle. I gratefully acknowledge the valuable assistance of Luigi Bocola and Stella Capuano, and support by the Reserve Bank of Australia and the Italian Minister of University and Scientific Research (MIUR – PRIN 2005).

protection schemes – it is not necessary for households to access markets in order to finance human capital accumulation, fund retirement, and smooth out labour income fluctuations. Conversely, in economic systems where access to efficient financial markets makes it possible for households to manage income risk with private instruments, there is less need for economic policies to reduce the intensity and frequency of labour income shocks or to buffer their implications for household consumption. Differences across countries in these respects interact importantly with ongoing changes in the nature of risk and in the relative efficiency of private and public institutions. In the post-War period, new risks have arisen from deeper international economic integration and the related process of de-industrialisation in advanced countries (Rodrik 1998; Iversen and Cusack 2000). Social protection schemes based on youth education and lifelong employment lose some of their ability to stabilise labour income in times of heightened international competition and intense structural change.

This paper focuses on interactions between the internationalisation of markets, national public redistribution schemes and private financial market development. As pointed out by Rodrik (1998), Agell (2002) and others, the risks related to international trade and specialisation may encourage governments in more open economies to introduce more redistributive policies. If the relevant risks can be covered by financial market instruments, however, more intense international competition need not be accompanied by larger government budgets and more intense redistribution. And while economic integration may well increase demand for redistribution in countries where financial markets are a poor substitute for government policies, international tax competition also makes it difficult to implement collective redistribution policies.

Section 2 outlines theoretical interactions between sources of risk and different risk-sharing frameworks. Private markets are generally unable to provide insurance against labour income risks and, to the extent that governments cannot provide costlessly the same insurance that markets fail to provide, redistribution policies need to trade off consumption stability and production efficiency. The shape of the relevant trade-off depends on structural factors. Among these, the scope of international economic interactions affects both the incidence of market-driven income risk and the power of governments to enforce collective schemes in the face of international systems competition. Section 3 brings the resulting perspective to bear on differences and changes in cross-country and time-series country data on international openness, governments' economic involvement and financial development. The interaction between these features is consistent with the idea that a suitable financial infrastructure is a key determinant of a country's willingness to open its economy to international market influences, and forego some public policies that have the ability to shape citizens' incomes and consumption. The concluding Section 4 discusses implications for policy and for further research.

## 2. Risk, Markets and Redistribution

Economists are justifiably fond of complete, competitive markets as a useful reference paradigm. When realisations of risk have different implications for different individuals and (because of risk aversion) fluctuations in consumption around a given path decrease welfare, it would be efficient to arrange for resources to be transferred from lucky to unlucky individuals *ex ante* so as to ensure that *ex post* (after the realisation of risk) marginal utility varies across individuals in predetermined ways.<sup>2</sup> But economists are also keenly aware that, in reality, smoothing consumption in the face of shocks to income is very difficult across individuals and over time for a given individual.

### 2.1 Incentives and information

Implementation of the ‘contingent transfers’ that would efficiently redistribute risky income faces major information and enforcement hurdles, especially in the case of the most important and least insurable risk for households – namely that of seeing their labour income disappear, temporarily or permanently, when product markets turn against their occupation or profession. Differences in labour income across industries and regions for similar workers, and for differently skilled workers within each region and industry, are at least partly explained by the fact that mobility towards higher-paying jobs, across occupations and geographic locations, is costly. Since labour mobility cannot arbitrage away job-specific wage differentials, higher volatility of labour demand will then imply wage differentials that are not only more volatile, but also more widely distributed at a point in time because temporary wage differentials need to be larger when they are less permanent to motivate mobility (Bertola and Ichino 1995; Ljungqvist and Sargent 1998). Wider and more volatile wage differentials have important welfare implications when individual workers cannot rely on private financial instruments or collective schemes in order to finance their mobility towards higher-paying jobs. When labour demand variability needs to be absorbed by individual resources, rather than aggregate ones, trends and fluctuations in labour demand will be primarily reflected in the level and volatility of workers’ consumption. Not surprisingly, in fact, earnings and consumption data track each other quite closely at the individual level, especially at the low end of their distributions (Attanasio and Davis 1996; Blundell and Preston 1998).

Much as it would be desirable for households to obtain insurance against job loss, private markets cannot supply it as easily as insurance against earthquakes. Job loss, like many health problems and other life events, can result from the individual’s own behaviour as well as from objective circumstances. To the extent that the former cannot be observed and the latter are hard to verify, an insurance contract specifying the circumstances where a worker would be entitled to compensation when fired would be exceedingly complex to write, and essentially impossible to enforce privately. Workers covered by private insurance contracts would not work

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2. See Bertola, Foellmi and Zweimüller (2006, Ch 8) for an exposition of this perspective, and of its limitations.

as hard and would be fired so much more promptly than uninsured workers as to make insurance either unprofitable for the issuer, or so inefficient as to be too costly for purchasers.

Governments have obvious enforcement advantages (and indeed supply legal and contract enforcement services to facilitate market interactions) and may exploit better information about individual circumstances and interactions across agents. When market interactions cannot exploit sufficiently broad and reliable information, taxation of lucky individuals and transfers to unlucky ones can potentially fulfil the same need for insurance as missing financial contracts. If it does succeed in serving the same purpose that markets would pursue, redistribution need not decrease productive efficiency, and may well increase it if it encourages risk-taking behaviour. For example, unemployment subsidies can allow workers to prolong their search for jobs and improve the productivity of the job they will eventually accept (Acemoglu and Shimer 1999). Labour market institutions and regulation can perform much the same role as explicit taxation and transfer payments, and may be more easily administered in some countries. For example, employment protection legislation can substitute for unemployment insurance schemes and may trigger retraining or severance payments that private markets would not be able to fund or enforce (Bertola 2004).

But policies would only be able to maximise welfare in much the same unrealistic circumstances of perfect information and enforcement that would support perfect and complete markets for contingent transfers. Like real-life markets, real-life policies also face serious problems in their attempts to buffer income shocks.

On the one hand, if political processes are charged with implementing redistribution, they may do so not for *ex post* insurance purposes but on an *ex ante* basis, in favour of politically strong groups. *Ex ante* redistribution may be grounded in shared feelings of solidarity, but is also influenced by political power and rent-seeking, so it is generally not equally supported by all individuals. Conversely, the expectation that shocks disturbing mean income will be offset by policy improves welfare for all risk-averse individuals, regardless of their mean income. In practice, it is not easy to disentangle the two sets of policy motivations and effects, which are pursued by a single set of imperfect policy instruments. Implementation of *ex ante* redistribution cannot rely on lump-sum instruments, and that of *ex post* redistribution cannot be based on realisations of exogenous risk: both have to be defined in terms of observed income, which depends on exogenous circumstances as well as on individual effort.

On the other hand, just as information problems can prevent financial markets from providing insurance, they can also imply that policies will reduce aggregate production at the same time as they share it. As the State does not know all, its policies suffer the same incentive effects that prevent private companies from offering insurance against bad luck in the labour market. For example, workers will not work as hard to avoid job loss and to find new jobs when they are insured against unemployment. Also, making it difficult for employers to fire redundant workers

stabilises workers' labour income, but it also slows down labour reallocation towards more productive jobs, thus reducing production and profitability.

The configuration of redistribution-motivated institutions is different across countries, in ways that largely reflect the historical development of nation-states. In European countries, legislation meant to endow workers with some bargaining power and to insure them against poor health, unemployment and old-age was introduced at times of actual or feared social unrest, in Bismarck's industrialising Germany or in Lord Beveridge's post-War United Kingdom. The institutional structure of labour markets and welfare schemes is distinctively different not only across the US, Japan and Europe as a whole, but also across countries within Europe, where labour market policies play different roles in different welfare-state models (Bertola *et al* 2001). Scandinavian countries offer universal welfare benefits and feature a very important role for active labour market policies (including job creation in the public sector). In comparison, the Bismarckian model of continental European countries such as France and Germany is firmly rooted in labour market regulation, with centralised wage determination and stringent employment protection legislation, and an important role for mandatory pension, health and unemployment insurance programs administered by government entities.

The Beveridgian model of the UK features comparatively light regulation of wage determination and employment relationships and general entitlement to safety-net benefits financed by general taxation, rather than insurance pay-outs financed by contributions. In the Anglo-Saxon welfare states, collectively administered schemes do not address insurance needs. This leaves room for development of private financial markets which, as pointed out by Bertola and Koeniger (2007), can make it less necessary to rely on government redistribution in order to smooth consumption in the face of individual shocks. Some of the relevant cross-country heterogeneity is related to the effectiveness of their legal and administrative frameworks in supporting markets and administrations. A large and influential, if controversial, body of work views market development and regulatory interferences as determined by countries' 'legal traditions', as defined and measured by La Porta *et al* (1998). While the flexible common law system of Anglo-Saxon countries appears more suited to support contractual relationships, the code-based systems of continental European and other countries influenced by the French legal tradition seem to stifle development of private markets at the same time as perhaps fostering relatively efficient bureaucratic administration of government schemes.

## 2.2 International risk and policy competition

Over time, the breadth and intensity of international economic interactions has tended to increase, driven by improvements of transportation and communication technologies, and to improve the overall efficiency of production patterns. However, the speed of economic integration differs across countries and periods because policy and politics have to deal with its implications for within-country income distribution and for the feasibility of redistribution.

In theory, deeper international integration may or may not influence the volatility of relative demand across jobs (industries, regions and occupations). More intense product market competition increases the responsiveness of labour demand to labour costs, and shocks have sharper wage and employment implications when employers enjoy access to wider international substitution possibilities. Shocks also occur within closed economies, however, and while barriers to international economic interactions protect domestic producers from foreign shocks, they also clog channels of adjustment to local shocks. Income fluctuations need not be larger in a closed economy than those occurring in an economy open to the influence of foreign shocks that are imperfectly or negatively correlated with those that originate in the domestic economy.

The relationship between economic integration and labour income risk is therefore an empirical issue. On the basis of observable outcomes, it is not easy to assess whether integration increases labour income instability (see OECD 2007) as it occurs simultaneously with other relevant phenomena, and is not exogenous. However, interesting relationships can be detected between trade exposure and labour income volatility in micro data (Krebs, Krishna and Maloney 2005). There is also even clearer survey evidence that individuals do perceive international economic integration as a risk, as their attitudes towards it are related to their personal and economic characteristics in theoretically sensible ways (see Mayda, O'Rourke and Sinnott 2007). For example, workers with low skills more strongly oppose immigration than workers with high skills in countries where immigrants are less skilled than residents.

More interestingly for this paper's purpose, there is evidence of significant interactions between the generosity of welfare-state provisions and attitudes towards immigration. In advanced countries with more generous welfare schemes, highly skilled individuals are less favourable to immigration, quite possibly because, as relatively high-income taxpayers, they feel that inflows of relatively poor individuals will increase welfare-system financing needs. As to the relationship between economic integration and labour income risk, more intense foreign direct investment (FDI) activity is associated with satisfaction or dissatisfaction with the respondent's present job security in the British worker survey analysed by Scheve and Slaughter (2004). They find that variation of indicators of FDI activity over time within a sector, controlling for the aggregate cycle, has an effect on perceptions of job security that is statistically very significant and roughly twice as strong as that of worker unionisation, education and income.

If more labour income risk is generated as labour and product markets widen across national borders, and financial markets remain unable to smooth that risk's implications for individual consumption, more intense international trade should be associated with more pervasive regulation and redistribution (Rodrik 1998). But while international economic integration increases the desirability of redistribution, it also makes it more difficult to implement. National tax policies face more elastic tax bases when potential taxpayers can move income between countries, rather than just reduce labour supply, and national subsidy policies are more expensive when they attract recipients from other constituencies. Similarly, labour market

institutions lose some of their power to shape labour incomes as markets become more powerful, collective bargaining is undermined by employers' better outside options, and the negative productivity impact of employment protection has more pronounced effects on internationally mobile investments.

When factors can be substituted in production across countries' borders, and prices and costs have stronger effects in more competitive markets, then not only product market shocks have stronger effects on wages or employment, but also policies interfering with *laissez-faire* labour market outcomes elicit stronger market reactions. International competition in product and labour markets and cross-border tax arbitrage make it more important and easier for private agents to avoid the cost implications of taxation. If market interactions across the borders of policy-making entities can work around policy constraints, uncoordinated policy interventions cannot effectively bind individual options, and regulatory competition across countries' borders threatens the effectiveness of policies that need to rely on compulsory rules based on collective rather than individual choices.

Policies are weakened when international economic relationships offer opportunities to opt in and out of redistributive schemes. But as long as policy addresses economic and political problems left unsolved by imperfect markets interactions, then barriers to economic interactions across the boundaries of political constituencies are natural elements of policy intervention packages. Just as economic integration creates new sources of opportunity and risk for producers and households (and more open countries have historically tended to have somewhat larger government budgets), it also makes it more costly or impossible for collective schemes to provide effective protection against those risks.

Thus, international economic integration affects both the demand and supply of social protection by national policy frameworks (Agell 2002). Which is the stronger effect depends on a variety of factors that may differ across countries. Among these, it is interesting to consider those that also influence the accessibility and efficiency of household financial instruments.

### **3. Openness, Government and Finance in Country Panel Data**

Social policy should play a smaller role when and where weaker safety nets are needed. This may be because: financial markets can play much the same role; implementation is difficult; or international competitiveness considerations make it costly. This perspective can offer a useful interpretation of the differences across countries and over time of social policy, international economic integration, and financial development. To the extent that financial markets allow individuals to pool and offset risk, they reduce the negative welfare implications of income uncertainty. Thus, better financial markets can be expected to be associated with less support for tax-transfer policies meant to decouple disposable income from market outcomes, and for policies meant to interfere with market outcomes so as to reduce the extent and frequency of shocks to labour income.

The relevant relationships between these aspects and the underlying structural and political factors are intricate, and the limitations of available data make it impossible to specify and estimate structural parameters and causal relationships. The evidence can at best provide a descriptive picture of interactions between three relevant dimensions – risk, redistribution and financial development – that are poorly measured and jointly endogenous to underlying, largely unobservable country-specific and time-varying factors.

The extent and character of the observed redistribution, as discussed above, reflects administrative efficiency, political tensions and decision processes, as well as the desire to offset the *ex post* consumption fluctuations induced by uninsurable shocks stemming from international competition and other determinants of individual income. International economic integration is driven by technological improvements that make it increasingly less costly to ship goods and transmit information across countries, but also by policy choices regarding trade and factor-movement liberalisation, which may in turn aim at relieving international market pressures on redistribution systems and other policies meant to correct market failures.

As for measurement, the ratio of imports plus exports to GDP (or ‘openness’) may – as in earlier contributions – serve as a proxy for individual-specific risk. But it is far from trivial to define and measure financial markets’ completeness and efficiency on a comprehensive basis. One would ideally want to use information about the dynamics of marginal utilities (or consumption) across individuals within potentially integrated economies, but no suitable internationally comparable data are available. Some limited information is available regarding the magnitude and changes of overall income or consumption inequality across countries and over time, but the theoretical link between such statistics and financial markets is tenuous. Theoretical considerations (see Bertola *et al* 2006) and what little empirical evidence can be gathered from available data (see Clarke, Xu and Zou 2003; Bonfiglioli 2005) suggest that financial market development is not monotonically related to inequality outside the unrealistic extreme case of perfect and complete markets. Liquidity constraints and decreasing returns to investment lead to income convergence, while borrowing and lending opportunities foster divergence across individuals as uninsurable permanent-income shocks lead to equally permanent changes in assets. In addition, access to loans and stocks can imply wider *ex post* income differences across investors by making it easier to undertake risky investments.

To assess interactions between openness, redistribution and financial markets’ structure and development, it can be instructive to consider simple regressions with government policies as the left-hand side variable. The explanatory variables include not only openness, as in Rodrik (1998), but also financial market variables. The most relevant features of financial markets are those that allow individuals to smooth consumption over time in the face of both expected income dynamics and unexpected shocks, such as consumer credit facilities and stock market access. While these differ markedly across countries and over time (see Bertola, Disney and Grant 2006; Guiso, Haliassos and Jappelli 2003), comparable data on the most relevant aspects are too scarce for the purpose of even descriptive statistical analysis. Accordingly, the regressions below exploit broader, but more readily available

indicators of credit market development as relevant and observable proxies for the phenomena of interest.

### 3.1 Cross-country patterns

To inspect the influence of openness and financial development on government interference with market-determined income distribution, consider first the cross-sectional regressions in Tables 1–3. The first two columns of Table 1 reproduce Rodrik's (1998) basic result for the large Penn World Table sample of countries, on a 1985–2003 average basis; in countries where imports and exports are a larger share of GDP, the government's share of GDP is also larger.<sup>3</sup> This remains true when controlling for population (insignificantly positive) and for real GDP per capita (GDPpc), which after accounting for openness shows a negative partial correlation with the government's share of GDP.

Consider next the patterns of co-variation between these variables and indicators of financial development. A variable measuring credit extended by deposit-taking banks is more widely available than broader and perhaps more appropriate measures of total private credit; available data do not include narrower household-oriented credit measures. For 135 of the 184 Penn World Table countries, at least partial data are available during the period from 1985 to 2003 for a measure of credit (the log of the ratio of credit to GDP – see the Appendix for data definitions and sources). In column (3) of Table 1, column (2)'s regression results for this restricted sample suggest an even stronger relationship between openness and government consumption. Column (4) shows that credit is positively related to openness (after controlling for population and real GDP per capita, both of which also have positive and significant coefficients).

Columns (5) and (6) include the credit variable in the regression relating government consumption and openness. In the linear specification (5), credit has no impact on government expenditure, and leaves the other coefficients unchanged. But when credit is entered both linearly and as a term interacted with openness, the coefficients are more significant and the interaction is negative. This is qualitatively consistent with the idea, discussed in Section 2, that financial markets can substitute for government schemes in addressing workers' need for insurance in the face of labour income risk. In these data, government expenditure is more positively affected by openness in countries that (after controlling for size and income) display relatively small volumes of credit.

All else equal, the volume of credit should be lower when structural factors make it difficult to access financial markets. But the volume transacted on the credit market, as on any other market, depends on demand factors as well as on such supply factors. To the extent that credit reflects the degree of heterogeneity across individuals' income histories (Iacoviello 2006), and income shocks depend on

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3. The regressions, as in Rodrik, are specified in logarithmic terms. Other functional forms do not alter the signs and significance of coefficients in this and all other tables, but tend to yield worse overall fit.

**Table 1: Cross-country Relationship between Openness, Credit, and Government Consumption Share of GDP – Worldwide Sample**

|                   | (1)                   | (2)                     | (3)                     | (4)                    | (5)                     | (6)                     | (7)                     | (8)                     | (9)                       |
|-------------------|-----------------------|-------------------------|-------------------------|------------------------|-------------------------|-------------------------|-------------------------|-------------------------|---------------------------|
|                   | Government            | Government              | Government              | Credit                 | Government              | Government              | Government              | Government              | Government <sup>(a)</sup> |
| Openness          | 0.1882<br><b>3.19</b> | 0.2384<br><b>3.91</b>   | 0.2761<br><b>4.35</b>   | 0.3703<br><b>2.91</b>  | 0.2779<br><b>4.46</b>   | 0.2097<br><b>2.58</b>   | 0.2741<br><b>4.28</b>   | 0.3877<br><b>3.08</b>   | 0.3963<br><b>3.38</b>     |
| Population        |                       | 0.0002<br><b>1.28</b>   | 0.0004<br><b>1.11</b>   | 0.0016<br><b>2.78</b>  | 0.0004<br><b>1.12</b>   | 0.0004<br><b>0.94</b>   | 0.0004<br><b>2.10</b>   | 0.0003<br><b>1.88</b>   | 0.0009<br><b>2.04</b>     |
| GDPpc             |                       | -0.0160<br><b>-4.96</b> | -0.0106<br><b>-2.99</b> | 0.0922<br><b>14.41</b> | -0.0101<br><b>-1.90</b> | -0.0107<br><b>-2.01</b> | -0.0098<br><b>-2.35</b> | -0.0113<br><b>-2.63</b> | 0.0187<br><b>0.91</b>     |
| Credit            |                       |                         |                         |                        | -0.0048<br><b>-0.10</b> | 0.2180<br><b>0.92</b>   |                         |                         | -0.3173<br><b>-1.41</b>   |
| Openness*Credit   |                       |                         |                         |                        |                         | -0.0531<br><b>-0.95</b> |                         |                         |                           |
| CredInfo          |                       |                         |                         |                        |                         |                         | -0.0268<br><b>-1.67</b> | 0.1397<br><b>1.17</b>   |                           |
| Openness*CredInfo |                       |                         |                         |                        |                         |                         |                         | -0.0385<br><b>-1.42</b> |                           |
| No                | 184                   | 184                     | 135                     | 135                    | 135                     | 135                     | 152                     | 152                     | 127                       |
| R <sup>2</sup>    | 0.0616                | 0.1462                  | 0.1481                  | 0.5652                 | 0.1482                  | 0.1531                  | 0.1690                  | 0.1793                  |                           |

Notes: Observations are averages over periods between 1985 and 2003 where data are available for each country; before computing the average, occasionally missing data are interpolated (the results are virtually identical when only available data are averaged). All regressions include a constant term. Robust *t*-statistics are reported below the coefficients. Sample: all countries, except those where openness exceeds 200 per cent (Hong Kong and Singapore) and countries where data are missing.

(a) Credit is instrumented with CredInfo.

openness because trade and specialisation imply greater risks for producers within each country, credit will be determined jointly with openness. To try to disentangle supply factors from these and other demand factors (such as those related to features of the welfare state and the labour market), the last three regressions in Table 1 exploit a credit information index (CredInfo – see the Appendix for details). Along with the enforcement of property rights, information is a key element of financial market infrastructure (Jappelli and Pagano 2006) and allows markets to manage income risk with private contracts rather than government instruments. It is interesting to find that in column (7) the coefficient on CredInfo is indeed negative and more significant than that of credit. In column (8), the coefficient estimates for CredInfo and its interaction term are again consistent with substitutability of financial market improvements and larger governments in the face of deeper internationalisation. In column (9) when credit information is used as an instrument for the volume of credit the coefficient on credit is more negative and more significant than in column (5), where credit was completely irrelevant.<sup>4</sup>

The government expenditure share is available for a very wide sample of countries, but is of course a poor measure of efforts to stabilise income and smooth consumption, which may become more important in more open economies and be addressed instead by financial market development. For OECD countries, arguably better indicators are available for both public management of risk (detailed spending categories from the OECD Social Expenditure Database) and the efficiency of financial markets (proxied by lending-borrowing interest margins and indicators of borrowing limits on housing purchases – that is, maximum loan-to-valuation (LTV) ratios).<sup>5</sup>

Before running regressions similar to those of Table 1 with these alternative indicators, it is useful to check whether and how the results of Table 1's specifications change for the restricted OECD sample. Table 2 shows that across OECD countries, as in the Rodrik (1998) sample, there is very little evidence of a relationship between openness and government size. The bi-variate correlation is sizable and significant in column (1), but is already insignificant when population and GDP per capita are controlled for in column (2). It all but vanishes when credit – which is highly correlated with GDP per capita in column (3) – and credit interacted with openness are included in column (5). As in Table 1, the negative sign of the coefficient on the interaction variable and of the large and imprecisely estimated IV coefficient in column (6) are qualitatively consistent with the notion that better-developed financial markets reduce the effect of increased openness on the size of government.

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4. An instrument is used in this way as an attempt to isolate supply-side determinants of credit from demand-side ones that also influence government expenditure.
  5. Public social expenditure and interest rate margins are available for 27 countries (Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, South Korea, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States). Information on LTV ratios is not available for six of these countries (Czech Republic, Iceland, Mexico, Poland, South Korea and Switzerland); only one observation of the LTV ratio is available for Turkey.

**Table 2: Cross-country Relationship between Openness, Credit, and Government Consumption Share of GDP – OECD Sample**

|                 | (1)                   | (2)                     | (3)                     | (4)                     | (5)                     | (6)                       |
|-----------------|-----------------------|-------------------------|-------------------------|-------------------------|-------------------------|---------------------------|
|                 | Government            | Government              | Credit                  | Government              | Government              | Government <sup>(a)</sup> |
| Openness        | 0.2514<br><b>2.40</b> | 0.1633<br><b>1.15</b>   | -0.0411<br><b>-0.20</b> | 0.1665<br><b>1.15</b>   | 0.0586<br><b>0.37</b>   | 0.1132<br><b>0.37</b>     |
| Population      |                       | -0.0009<br><b>-0.99</b> | -0.0001<br><b>-0.06</b> | -0.0009<br><b>-0.95</b> | -0.0021<br><b>-2.38</b> | -0.0010<br><b>-0.59</b>   |
| GDPpc           |                       | -0.0086<br><b>-0.94</b> | 0.0856<br><b>9.93</b>   | -0.0153<br><b>-1.11</b> | -0.0147<br><b>-1.08</b> | 0.0956<br><b>0.85</b>     |
| Credit          |                       |                         |                         | 0.0778<br><b>0.58</b>   | 2.0196<br><b>2.99</b>   | -1.2190<br><b>-0.93</b>   |
| Openness*Credit |                       |                         |                         |                         | -0.4846<br><b>-2.71</b> |                           |
| No              | 27                    | 27                      | 27                      | 27                      | 27                      | 27                        |
| R <sup>2</sup>  | 0.1734                | 0.2366                  | 0.7854                  | 0.2430                  | 0.3995                  |                           |

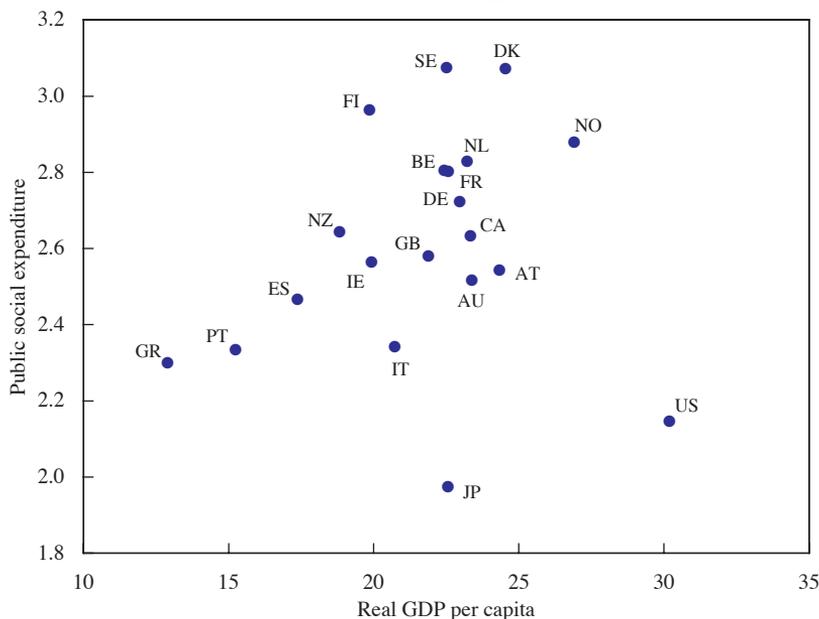
Notes: Observations are averages over periods between 1985 and 2003 where data are available for each country; before computing the average, occasionally missing data are interpolated (the results are virtually identical when only available data are averaged). All regressions include a constant term. Robust *t*-statistics are reported below the coefficients. Sample: OECD countries included in the OECD Social Expenditure Database.

(a) Credit is instrumented with CredInfo.

The smaller and familiar sample of OECD countries also makes it possible to assess informally the patterns of variation in the relevant data. Figures 1–3 display scatter plots for core OECD countries where more than one observation of LTV ratios are available.<sup>6</sup> In Table 3, where the dependent variable is a measure of public social expenditure (see the Appendix for details), the first four columns deliver a message similar to that of the corresponding columns of Table 2. Openness is not strongly related to public social expenditure after controlling for country size and income. As shown in Figure 1, there is a clear positive relationship between GDP per capita and public social expenditure (as a share of GDP). Since relatively large countries (such as Japan and the United States) are outliers for this relationship, while small Scandinavian countries spend even more than their income would predict, population enters with a negative sign in column (2) of Table 3. The strength of the bi-variate relationship between openness and public social expenditure, shown in Figure 2 and column (1) of Table 3, is halved when income levels and population are included.

The positive correlation between income levels and social spending ratios should not necessarily be read as a causal relationship running from the latter to the former. It is possible for taxes and transfers to perform efficiency-enhancing roles beyond the

**Figure 1: Income Levels and Social Spending in OECD Countries**  
1990–2003 averages



Notes: Public social expenditure is expressed as a logarithm of its share of GDP. Real GDP per capita is expressed in US\$'000. See the Appendix for more details. See Glossary for a listing of country codes.

Sources: OECD; Penn World Table Version 6.2; author's calculations

6. The regressions in Table 1 and columns (1–4) of Table 2 include other OECD countries as well. Statistical significance is affected by inclusion of those observations but the sign and size is similar for the smaller and more easily plotted sample shown in the figures.

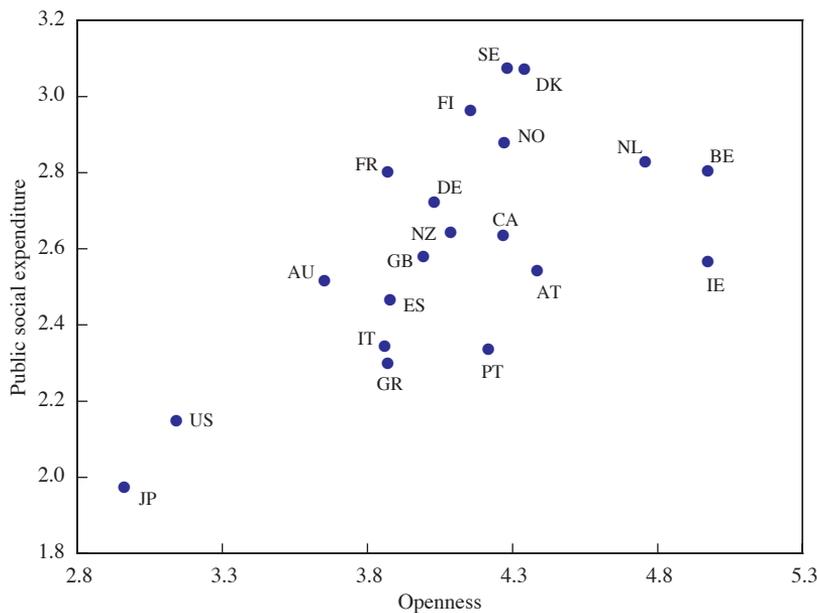
**Table 3: Cross-country Relationship between Openness, Intermediation Margins, and Public Social Expenditure – OECD Sample**

|                     | (1)                   | (2)                     | (3)                     | (4)                      | (5)                         | (6)                     | (7)                     |
|---------------------|-----------------------|-------------------------|-------------------------|--------------------------|-----------------------------|-------------------------|-------------------------|
|                     | Pub.Soc.Exp.          | Pub.Soc.Exp.            | Pub.Soc.Exp.            | Pub.Soc.Exp.             | Pub.Soc.Exp. <sup>(a)</sup> | Pub.Soc.Exp.            | Pub.Soc.Exp.            |
| Openness            | 0.3794<br><b>4.41</b> | 0.1523<br><b>1.54</b>   | 0.1504<br><b>1.42</b>   | -0.0509<br><b>-0.32</b>  | 0.2105<br><b>0.74</b>       | 0.1282<br><b>1.02</b>   | 1.0754<br><b>0.64</b>   |
| Population          |                       | -0.0031<br><b>-2.88</b> | -0.0029<br><b>-2.31</b> | -0.0024<br><b>-1.84</b>  | -0.0080<br><b>-1.63</b>     | -0.0033<br><b>-4.27</b> | -0.0034<br><b>-4.28</b> |
| GDPpc               |                       | 0.0370<br><b>3.11</b>   | 0.0338<br><b>2.10</b>   | 0.0370<br><b>2.28</b>    | 0.1367<br><b>1.59</b>       | 0.0441<br><b>5.49</b>   | 0.0410<br><b>5.06</b>   |
| Int.Margin          |                       | -1.2738<br><b>-0.47</b> | -1.2738<br><b>-0.47</b> | -39.9544<br><b>-2.10</b> | 39.4884<br><b>1.16</b>      |                         |                         |
| Openness*Int.Margin |                       |                         |                         | 9.9738<br><b>2.03</b>    |                             |                         |                         |
| LTV                 |                       |                         |                         |                          |                             | 0.0034<br><b>1.19</b>   | 0.0470<br><b>0.64</b>   |
| Openness*LTV        |                       |                         |                         |                          |                             |                         | -0.0109<br><b>-0.58</b> |
| No                  | 27                    | 27                      | 27                      | 27                       | 27                          | 21                      | 21                      |
| R <sup>2</sup>      | 0.1992                | 0.6049                  | 0.6074                  | 0.6251                   |                             | 0.7606                  | 0.7645                  |

Notes: Observations are averages over periods between 1985 and 2003 where data are available for each country; before computing the average, occasionally missing data are interpolated (the results are virtually identical when only available data are averaged). All regressions include a constant term. Robust *t*-statistics are reported below the coefficients. Sample: OECD countries included in the OECD Social Expenditure Database.

(a) Int.Margin is instrumented with CredInfo.

**Figure 2: Openness and Social Spending in OECD Countries**  
1990–2003 averages



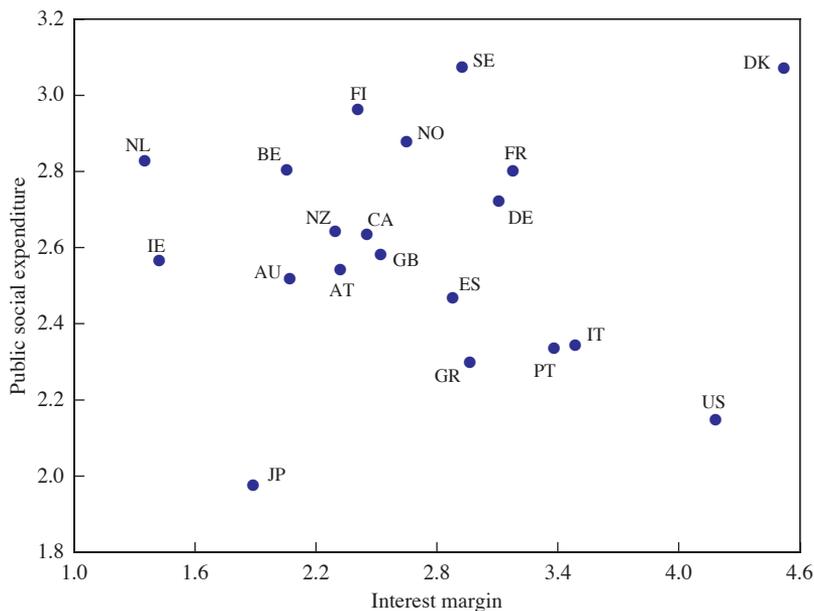
Notes: Public social expenditure is expressed as a logarithm of its share of GDP. Openness is the logarithm of the ratio of imports plus exports to GDP. See the Appendix for more details. See Glossary for a listing of country codes.

Sources: OECD; Penn World Table Version 6.2; author's calculations

reach of imperfect and incomplete financial markets, but the evidence is consistent with the more pessimistic view outlined in Section 2.1. That is, if countries are exogenously different in their ability to produce income at the aggregate level and the negative side-effects of social policy are less serious for countries that are richer to begin with (for geographical and historical reasons), then such countries may well implement more extensive redistribution than poorer ones where strenuous effort is absolutely necessary. The negative coefficient on size (as measured by population) might reflect administrative difficulties and additional distortions entailed by social policies in larger and perhaps more heterogeneous countries; Alesina *et al* (2003) examine in more detail the role as a determinant of redistribution policies of ethnic fractionalisation, which is of course not necessarily high in countries such as Japan that are large but homogeneous.

To the extent that population and real GDP per capita control for the determinants of social policy supply and demand, it is possible to assess the additional role of risk factors and financial development in shaping each country's willingness and ability to open up internationally and/or to engage its government in redistributive activities. There is no bi-variate relationship between interest margins and public social expenditure (see Figure 3), nor is there any partial correlation between those variables after controlling for other standard determinants in column (3) of

**Figure 3: Interest Margins and Social Spending in OECD Countries**  
1990–2003 averages



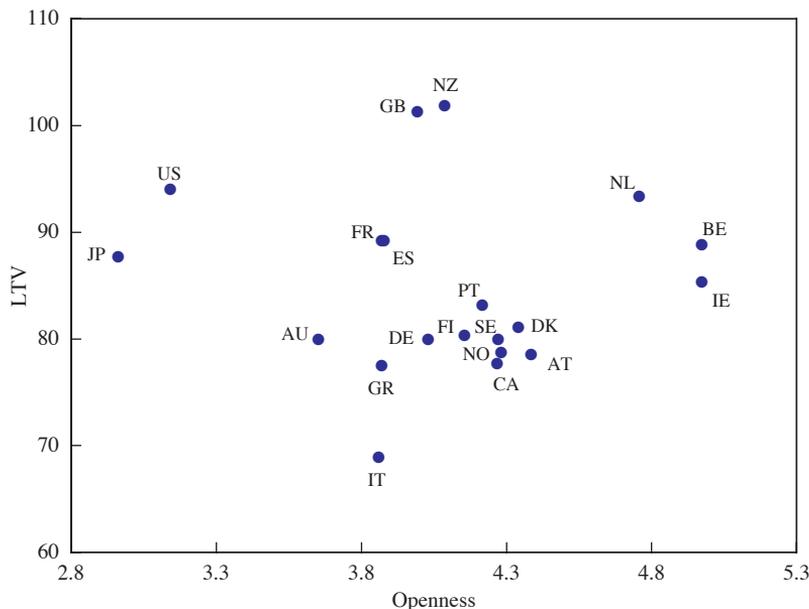
Notes: Public social expenditure is expressed as a logarithm of its share of GDP. The interest margin is the difference between lending and borrowing rates at commercial banks. See the Appendix for more details. See Glossary for a listing of country codes.

Sources: Beck, Demirgüç-Kunt and Levine (2000); OECD; author's calculations

Table 3. When the interaction between openness and interest margins is included among the regressors in column (4), however, openness *per se* appears to be irrelevant to the extent of social policies. What is associated with larger social spending is instead the combination of openness and poor financial market access, as large spreads between interest rates on households' assets and liabilities make saving and borrowing unattractive and expose consumption to large fluctuations if income shocks are larger or more frequent.

The same interpretation of cross-country facts is supported, in columns (6) and (7), by the opposite pattern of signs for the LTV ratios (which is larger in more accessible financial markets) and its interaction with openness. While the coefficient on the LTV ratio and its interactive term (measured in percentage terms) are not statistically significant in column (7), they tell a quantitatively interesting story. The average 1990s LTV ratios range between 69 per cent and 102 per cent (for Italy and New Zealand, respectively; see Figure 4 to get a sense of other values). As the LTV ratio varies between these values, the estimated total effect of openness on public social expenditure ranges from 0.32, which is almost as large as the bi-variate regressions coefficient of column (1), to essentially zero for NZ and the UK.

**Figure 4: Openness and Mortgage Loan-to-valuation Ratios in OECD Countries**  
1990–2003 averages



Notes: LTV is the maximum loan-to-valuation ratio (in percentage points) for mortgages. Openness is the logarithm of the ratio of imports plus exports to GDP. See the Appendix for more details. See Glossary for a listing of country codes.

Sources: Chiuri and Jappelli (2003); Jappelli and Pagano (1994); Maclennan, Muellbauer and Stephens (1998); Penn World Table Version 6.2; author's calculations

### 3.2 Changes over time

Tables 4–6 report regressions similar to those of the previous tables, aimed at characterising relationships between openness, financial market development and government activity. To focus on within-country dynamic developments rather than on cross-country patterns, all regressions include dummies, so that the results are not influenced by any (observable or unobservable) source of cross-country variation that is constant over time. Since the credit information index is only available for very recent years, its information is essentially cross-sectional and cannot be exploited in these specifications. Also, the sample is restricted throughout to countries with at least two observations of LTV ratios.

The message of the data is similar in some respects, but different in others. Table 4 estimates a shallow (but significant) positive relationship between openness and government expenditure over time across the broadest available sample of countries, also after controlling for population and income per capita. However, the relationship is sufficiently weak to become statistically insignificant in the regression of column (3), which restricts the sample to observations with non-missing credit information. Column (4) shows that credit is strongly positively

**Table 4: Within-country Relationship between Openness, Credit, and Government Consumption Share of GDP – Worldwide Sample**

|                 | (1)                   | (2)                     | (3)                     | (4)                    | (5)                     | (6)                     |
|-----------------|-----------------------|-------------------------|-------------------------|------------------------|-------------------------|-------------------------|
|                 | Government            | Government              | Government              | Credit                 | Government              | Government              |
| Openness        | 0.0324<br><b>2.07</b> | 0.0456<br><b>2.78</b>   | 0.0332<br><b>0.87</b>   | 0.0483<br><b>0.66</b>  | 0.0307<br><b>0.82</b>   | -0.1075<br><b>-2.16</b> |
| Population      |                       | -0.0003<br><b>-1.34</b> | -0.0006<br><b>-1.43</b> | 0.0002<br><b>0.26</b>  | -0.0006<br><b>-1.44</b> | -0.0005<br><b>-1.28</b> |
| GDPpc           |                       | -0.0109<br><b>-7.52</b> | -0.0094<br><b>-5.70</b> | 0.0412<br><b>10.74</b> | -0.0115<br><b>-6.19</b> | -0.0084<br><b>-4.37</b> |
| Credit          |                       |                         |                         |                        | 0.0516<br><b>3.82</b>   | 0.3576<br><b>2.91</b>   |
| Openness*Credit |                       |                         |                         |                        |                         | -0.0758<br><b>-2.59</b> |
| No              | 2 750                 | 2 750                   | 1 840                   | 1 840                  | 1 840                   | 1 840                   |
| R <sup>2</sup>  | 0.8802                | 0.8825                  | 0.8651                  | 0.8933                 | 0.8668                  | 0.8683                  |

Notes: All regressions include country dummies. Robust *t*-statistics are reported below the coefficients. The sample includes all available observations for the 1986–2001 period.

related to GDP per capita over time, as was the case in the cross-section estimates, and has an insignificant partial correlation with openness. In column (5) credit is positively (and GDP per capita negatively) related to government's share of GDP, and its inclusion in the regression makes openness insignificant. Finally, and most interestingly, we see in column (6) that the interaction between credit and openness has a significant negative coefficient. Once again, the development of financial markets appears to reduce the need for government economic involvement in the face of increased openness.

Retracing the cross-sectional specifications, Table 5 shows a similar pattern for regression coefficients estimated on the smaller sample of OECD countries with at least two observations (the results are broadly similar for the whole OECD sample of the cross-sectional regressions in Table 2, which also includes the Czech Republic, Hungary, Iceland, Mexico, Poland, Switzerland and Turkey). While greater openness had a positive uncontrolled relationship with government expenditure in the wider sample, its partial correlation is consistently negative in the OECD sub-sample. Differences in credit dynamics, however, are not pronounced and informative enough within developed countries to yield significant coefficients on credit and its interaction term in column (5). Fortunately, more detailed and relevant indicators of financial market development are available for these countries.

Table 6 reports regressions on the same sample that exploit the dynamic information in public social expenditure, interest differentials and loan-to-valuation ratios within each country. To convey a sense of the data's shape and of the phenomena driving the results, Figures 5 and 6 display the data graphically, at five-year intervals, focusing on a familiar subset of advanced countries. The bi-variate relationship between openness and public social expenditure is negative on a within-country basis, as shown in Figure 5. The results in columns (1–4) of Table 6 indicate that openness and public social expenditure are negatively related in the OECD sample when country dummies are included. In contrast to Agell's (2002) reading of evidence of a positive relationship between changes in openness and in employment protection legislation, this finding may indicate that redistribution policies become much more difficult in more open economies. This effect may more than compensate for the extra demand for social protection. Alternatively, a weaker interpretation is that the same structural and policy changes that affect openness differently across countries also affect social policies in the opposite direction.

Columns (5–7) of Table 6 display similarly intriguing patterns of co-variation of openness and public social expenditure shares with indicators of financial development. In column (5), where the regression controls for interest margins and its interaction with openness, the latter's main effect is a sharply negative determinant of public social expenditure, while the coefficient on the interaction term is significantly positive. This may indicate that, in situations where efficient financial markets encourage borrowing and lending, openness implies a more pronounced decline in (less necessary, and more distorting) public redistribution programs.

Figure 6 displays observations for advanced countries, at five-year intervals. It shows that the bi-variate correlation between maximum LTV ratios and openness

**Table 5: Within-country Relationship between Openness, Credit, and Government Consumption Share of GDP – OECD Sample**

|                 | (1)<br>Government       | (2)<br>Government       | (3)<br>Credit           | (4)<br>Government       | (5)<br>Government       |
|-----------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| Openness        | -0.1938<br><b>-6.07</b> | -0.0860<br><b>-2.15</b> | -0.2110<br><b>-1.45</b> | -0.0849<br><b>-2.07</b> | -0.0821<br><b>-1.97</b> |
| Population      |                         | -0.0038<br><b>-4.60</b> | 0.0058<br><b>2.21</b>   | -0.0039<br><b>-4.60</b> | -0.0037<br><b>-3.01</b> |
| GDPpc           |                         | -0.0034<br><b>-2.50</b> | 0.0317<br><b>4.70</b>   | -0.0036<br><b>-2.16</b> | -0.0037<br><b>-2.35</b> |
| Credit          |                         |                         |                         | 0.0042<br><b>0.23</b>   | -0.0386<br><b>-0.19</b> |
| Openness*Credit |                         |                         |                         |                         | 0.0102<br><b>0.22</b>   |
| No              | 314                     | 314                     | 298                     | 298                     | 298                     |
| R <sup>2</sup>  | 0.9320                  | 0.9382                  | 0.8040                  | 0.9383                  | 0.9384                  |

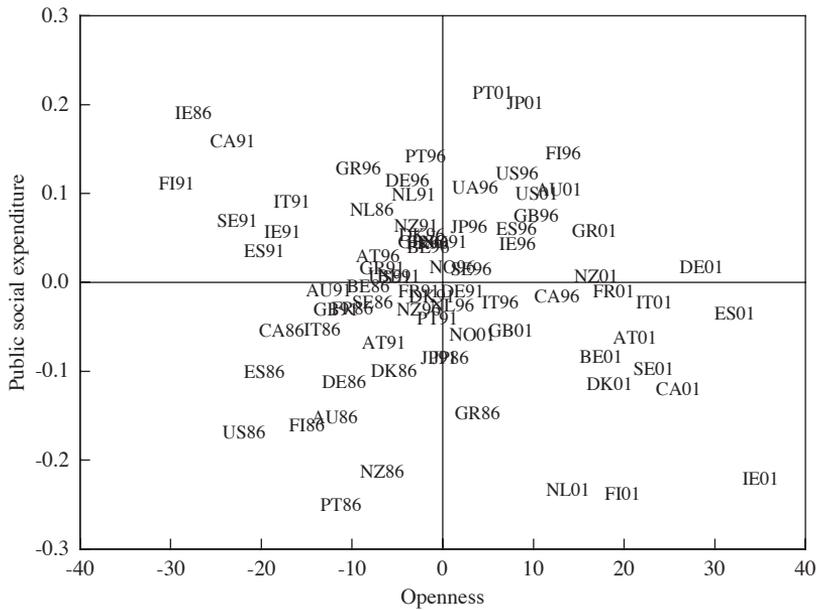
Notes: All regressions include country dummies. Robust *t*-statistics are reported below the coefficients. The sample includes all available observations for the 1986–2001 period.

**Table 6: Within-country Relationship between Openness, Interest Margin or Mortgage Loan-to-valuation Ratios, and Public Social Expenditure – OECD Sample**

|                      | (1)                     | (2)                     | (3)                     | (4)                     | (5)                      | (6)                     | (7)                     |
|----------------------|-------------------------|-------------------------|-------------------------|-------------------------|--------------------------|-------------------------|-------------------------|
|                      | Pub.Soc.Exp.            | Pub.Soc.Exp.            | Pub.Soc.Exp.            | Pub.Soc.Exp.            | Pub.Soc.Exp.             | Pub.Soc.Exp.            | Pub.Soc.Exp.            |
| Openness             | -0.1117<br><b>-2.17</b> | -0.3449<br><b>-4.87</b> | -0.3259<br><b>-4.57</b> | -0.2031<br><b>-4.11</b> | -0.4764<br><b>-4.99</b>  | -0.3261<br><b>-4.61</b> | 0.2417<br><b>2.39</b>   |
| Population           |                         | 0.0083<br><b>4.23</b>   | 0.0086<br><b>4.46</b>   | 0.0069<br><b>4.13</b>   | 0.0056<br><b>2.48</b>    | 0.0086<br><b>4.46</b>   | 0.0061<br><b>3.12</b>   |
| GDPpc                |                         | 0.0074<br><b>2.60</b>   | 0.0060<br><b>2.14</b>   | -0.0121<br><b>-4.60</b> | -0.0100<br><b>-3.98</b>  | 0.0061<br><b>2.22</b>   | 0.0065<br><b>2.39</b>   |
| Int.:Margin          |                         |                         |                         | -4.2092<br><b>-3.61</b> | -36.4688<br><b>-3.57</b> |                         |                         |
| Openness*Int.:Margin |                         |                         |                         | 7.8368<br><b>3.14</b>   |                          |                         |                         |
| LTV                  |                         |                         |                         |                         |                          | -0.0001<br><b>-0.05</b> | 0.0286<br><b>7.54</b>   |
| Openness*LTV         |                         |                         |                         |                         |                          |                         | -0.0069<br><b>-7.50</b> |
| No                   | 314                     | 314                     | 300                     | 199                     | 199                      | 300                     | 300                     |
| R <sup>2</sup>       | 0.8960                  | 0.9077                  | 0.9108                  | 0.9610                  | 0.9632                   | 0.9108                  | 0.9193                  |

Notes: All regressions include country dummies. Robust *t*-statistics are reported below the coefficients. The sample includes all available observations for the 1986–2001 period.

**Figure 5: Openness and Social Spending in OECD Countries**  
Deviations from country mean



Notes: Available observations of deviations of 1986, 1991, 1996 and 2001 data from 1986–2001 country-specific averages. See the Appendix for more details. See Glossary for a listing of country codes.

Sources: Chiuri and Jappelli (2003); Jappelli and Pagano (1994); Maclellan *et al* (1998); Penn World Table Version 6.2; author's calculations

changes is positive. This is consistent with the notions that openness makes financial market development more necessary and that financial market development makes openness more palatable.<sup>7</sup> While the LTV ratio and its interactive term were not significant (though with the right sign pattern) in cross-sectional estimates, they are very significant along the time-series dimension in column (7). Although in cross-section the relationship between openness and government was estimated to be either positive or absent, depending on financial market developments, in the time-series regressions it is consistently negative.<sup>8</sup>

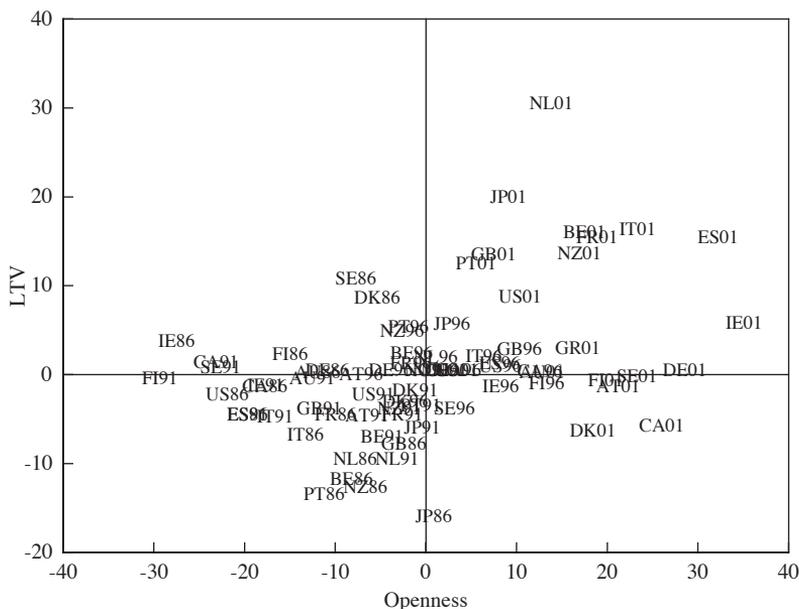
The insignificant cross-sectional estimates may be due to the limited range of the independent variable; within this set of countries, financial markets have developed faster in laggard countries, and the convergence pattern implies that averages are not as sharply different as early observations. It may also indicate that uncontrolled country characteristics influence choices of openness and social policies in such a

7. While the direction of causality is of course unclear, either or both channels of interaction are likely to be at work in the data, along with other factors that may explain why controlling for population and GDP per capita deprives the LTV ratio of all significance in the regression of column (6).

8. The variation in the implied relationship between openness and public social expenditure is again large, ranging from around  $-0.5$  for the 2001 values of LTV ratio deviations from the Netherlands, United Kingdom, and New Zealand country means, to only  $-0.15$  for the 1986 LTV ratio deviation observed in Italy.

**Figure 6: Openness and Mortgage Loan-to-valuation Ratios  
in OECD Countries**

Deviations from country mean



Notes: Available observations of deviations of 1986, 1991, 1996 and 2001 data from 1986–2001 country-specific averages. LTV is the maximum loan-to-valuation ratio (in percentage points) for mortgages. See the Appendix for more details. See Glossary for a listing of country codes.

Sources: OECD; Penn World Table Version 6.2; author's calculations

way as to preserve within-country income redistribution. The high significance of the LTV ratio and its interaction with openness in the time-series regressions may also be spurious in regressions using annual data. The inclusion of contemporaneous GDP may control for cyclical influences, but the relationship between openness and public spending may be driven by short-run fluctuations as well as by the trends represented by interpolated observations of LTV ratios. While dynamic specifications of the relevant relationship are beyond the scope of this paper (and of available data), it is interesting that within-country panel estimates offer statistically strong evidence that relationships between changes in maximum LTV ratios, openness and government spending are both quantitatively important and consistent with the arguments made in Section 2.

#### 4. Policy Implications and Further Research

This paper's broad perspective views observed redistribution policies as a result of the interplay between factors determining their desirability (labour income uncertainty and the ability of markets to help smooth consumption) and of factors determining their effectiveness (the government's ability to exploit superior information and enforcement, and markets' ability to circumvent regulation and

amplify the undesirable side-effects of policies). The insights discussed in Section 2 suggest that international integration may amplify market risks at the same time as it makes it increasingly difficult for governments to provide households with insurance against them and increasingly important for households to access private financial markets. The simple evidence discussed in Section 3 supports the empirical relevance of this policy prescription, especially for developing countries, but also for those among industrialised countries that have more extensively relied on taxes, transfers and regulation.

Across countries, the data display patterns of increasing openness, decreasing government redistribution activity and increasing depth and efficiency of credit markets. Along the time-series dimension, and especially in developed countries, the implications of openness (or concurrent exogenous developments) for both income risks and the desirability of redistribution policies appear to be more than offset by the increasing difficulties of operating such policies. A possible interpretation of the evidence views globalisation trends, driven by technological and multilateral trends beyond individual countries' control, as a factor weakening governments' power to control market-driven income distribution. Shrinking public budgets naturally increase demand for private financial services, and increase the need for appropriate regulation and suitable legal frameworks to ensure that demand is met by adequate supply in private financial markets. Accordingly, governments should face the challenges of globalisation by strengthening their economies' financial infrastructure, to allow private contractual relationships to smooth consumption in the face of increased specialisation and foreign shocks.

While improving financial market infrastructures is not costless, it should be given high priority in countries where economic integration entails new risks and, at the same time, makes it difficult to operate redistribution policies. From this perspective, the United Kingdom's financial market liberalisation and development is consistent with that country's experience of public policy and labour market reforms in the 1980s (Koeniger 2004), and it is not surprising to find that individuals whose age and income make them more likely to borrow are more keenly in favour of redistribution in countries where credit supply is relatively constrained (Bertola and Koeniger 2007).

Further empirical work should adopt more suitable dynamic specifications than those of this paper. It could bring a similar approach to analysing the relationship between openness and wage-setting and employment regulation, along the lines of Agell's (2002) perspective on labour market institutions as a risk-management device, and follow Lo Prete (2007) in relating devices to redistribute income within countries to country-level consumption and income dynamics.

It would also be very interesting to model how the choice between private and public insurance schemes is driven by underlying structural and historical factors affecting their relative efficiency. It is both very important and extremely difficult to assess the extent to which substitution is endogenously driven by trends such as the increasing internationalisation of market interactions. It is important, because globalisation would be self-sustaining if it led to efficient private financial markets

at the same time as they crowd out public schemes. However, it would sow the seeds of its own demise if it is perceived as forcing unpalatable risks on citizens of countries whose inefficient financial markets cannot shelter them as effectively as trade and government protection used to.

And it is difficult, because the data cannot shed much light on structural relationships between exogenous conditions and endogenous policy relationships. In order to detect patterns of statistical causality, the literature has focused on persistent influences of ancient conquests and colonisations on countries' legal frameworks and institutional developments. As discussed in Rodrik, Subramanian and Trebbi (2004), historical legacies are useful as instrumental variables for the empirical purpose of identifying and assessing the role of exogenous factors. However, countries are not condemned by history. To the extent that historically determined financial market development can substitute for public provision of insurance and savings vehicles, policy actions aimed at making financial markets more easily accessible and more efficient may be a key condition for economic integration to be welfare-enhancing and politically acceptable.

Relevant formal modelling should focus on the interplay of information problems with determinants of financial market efficiency (such as legal traditions in La Porta *et al* 1998) and of policy effectiveness (such as 'civicness' indicators constructed from survey information in Algan and Cahuc 2006). Bertola and Koeniger (forthcoming) propose a simple model of an economy where unobservable effort and moral hazard problems hamper the role of private markets and government policies in smoothing consumption. This perspective may be used to characterise how borrowing constraints, market transaction costs and policy administration costs may shape the trade-off between insurance, efficiency and the relative importance of private and collective instruments for smoothing income. Bringing this perspective to bear on such cross-country panel data, it might be possible empirically to detect relationships between underlying structural features of countries, trends affecting the desirability and feasibility of public policies and policy action and reaction patterns.

## Appendix: Data definitions and sources

**CredInfo** is the ‘depth of credit information index’ downloadable from the World Bank’s ‘Doing Business’ website, meant to measure rules affecting the scope, accessibility and quality of credit information available through either public or private credit registries. It is constructed as follows from data defined and documented in Djankov, McLiesh and Shleifer (2007). For each of the six features of the credit information system a score of 1 is assigned if: (1) ‘both positive credit information (for example, loan amounts and pattern of on-time repayments) and negative information (for example, late payments, number and amount of defaults and bankruptcies) are distributed’; (2) ‘data on both firms and individuals are distributed’; (3) ‘data from retailers, trade creditors or utility companies as well as financial institutions are distributed’; (4) ‘More than 2 years of historical data are distributed. Registries that erase data on defaults as soon as they are repaid obtain a score of 0 for this indicator’; (5) ‘data on loans below 1% of income per capita are distributed. A registry must have a minimum coverage of 1% of the adult population to score a 1 for this indicator’; and (6) ‘by law, borrowers have the right to access their data in the largest registry in the country. The index ranges from 0 to 6, with higher values indicating the availability of more credit information, from either a public registry or a private bureau, to facilitate lending decisions’.

**Credit** is the logarithm of variable *pcrdbgdp* ‘private credit by deposit money banks/GDP’ from the World Bank’s Financial Structure Dataset (Revised: 17 October 2007), as defined and documented in Beck *et al* (2000).

**GDPpc** is the variable *cgdp* ‘real gross domestic product per capita’ from the Penn World Table Version 6.2 (Heston, Summers and Aten 2006), divided by 1000 (hence measured in thousands of 2000 US\$).

**Government** expenditure is the variable *cg* ‘government share of CGDP’ from the Penn World Table Version 6.2 (Heston *et al* 2006).

**Int.Margin** – the difference between lending and borrowing rates at commercial banks – is the variable *netintmargin* ‘net interest margin’ from the World Bank’s Financial Structure Dataset (revised in October 2007), as documented in Beck *et al* (2000).

**LTV** is the maximum loan-to-valuation ratio (in percentage points) for mortgages, interpolated from data available on or around 1976, 1984, 1994 and 2001 from Jappelli and Pagano (1994); Maclennan *et al* (1998); and Chiuri and Jappelli (2003).

**Openness** – the logarithm of the ratio of imports plus exports to GDP – is the variable *openc* ‘openness in current prices’ from the Penn World Table Version 6.2 (Heston *et al* 2006). As in the original Rodrik (1998) regressions, the sample excludes observations (for Hong Kong and Singapore) where this variable exceeds 200 per cent. The results are very similar when those observations are included, or when the variable *openk* ‘openness in constant prices’ is used instead of *openc*.

**Population** is the variable *pop* ‘population’ from the Penn World Table Version 6.2 (Heston *et al* 2006), divided by 1000 (hence measured in millions).

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**Pub.Soc.Exp.** is the logarithm of the sum in per cent of GDP of the following data from the OECD 1980–2001 Social Expenditure Database: 3. Incapacity-related benefits; 4. Health; 5. Family; 6. Active labor market programmes; 7. Unemployment; 8. Housing; and 9. Other social policy areas. (Only 1. Old age and 2. Survivors are excluded from total social expenditure.)

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## *Discussion*

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### **1. Guy Debelle**

The interesting question raised by this thought-provoking paper by Giuseppe Bertola is the extent to which financial institutions can provide an adequate degree of insurance to individuals against income risk or whether it is necessary, or even possible, for the insurance to be provided by governments. In terms of government insurance, this can take the form of pensions, unemployment benefits, provision of education and retraining, among others. The second question the paper asks is to what extent this is affected by globalisation.

It is interesting to consider this in the Australian context. Over the past few decades there has been a general reform to such insurance arrangements. They are generally all in the direction predicted by Giuseppe as the Australian economy has become more integrated with the global economy. It is most obvious in the case of pensions, where there has been the very large growth of superannuation, where individuals rather than the government are investing in financial vehicles to provide for their retirement.

The general answer to the first question according to the paper appears to be yes. The paper argues that with the greater economic integration of the global economy, idiosyncratic income risk has increased. More developed and more integrated financial markets allow for the possibility of this risk being hedged. It also argues that governments are less well placed to do this because their ability to raise the funds necessary to fund the insurance schemes may be compromised by the erosion of their tax base due to global tax competition. So I will focus on two fundamental issues in my comments: do financial markets have the capacity to provide the insurance; and do governments have the capacity?

I found this very reminiscent of a paper given by Bob Shiller at a conference at the San Francisco Fed back in 1994. Shiller's argument at that time, if my memory serves me well, was that there needed to be much greater risk-sharing but that financial markets had not yet developed the appropriate instruments, such as bonds indexed to GDP and the like. To some extent, Shiller himself has been on a quest to help those markets develop through such things as the Case-Shiller house-price futures contracts. The question to ask therefore is: do financial markets have sufficient breadth to cover the idiosyncratic risks and do the necessary financial instruments exist?

Regarding the issue of the erosion of government tax bases, this obviously extends well beyond that of providing income insurance to the provision of all government services. For a long time we have been warned about the dangers of tax competition. However, I think a valid argument could be made that people will not desert higher-taxing regimes for lower-taxing ones in droves. Quality of life ranks high in people's decision-making and people are aware that quality of life does not come free. One has to pay for the sort of society that one wants to live in.

The experience of the Nordic countries would support this argument. Indeed, the Nordics' willingness and ability to do this is evident in Giuseppe's results.

One aspect where governments may have an advantage over financial markets, at least at this point, is dealing with intergenerational issues. Financial markets are open to those that are alive (and financially active) at the moment. They are not open to future generations. Governments can (if they want) take better account of the needs of future generations. Governments are also better at coping with events that are outside the range of financial market comprehension. Hurricane Katrina is a good example of this. Catastrophy insurance was available but the losses associated with the hurricane were well outside the bounds of that assumed by the insurance and so the government was required to provide the funding to get the New Orleans area back to normal.

The paper discusses financial development in the United Kingdom as a good example of the arguments presented here. I am not sure that I would agree with Giuseppe's characterisation of it. Financial reforms in the UK were broadly coincident with labour market and other public sector reforms. It and the other reforms were, to a large extent, a function of the UK crisis of the late 1970s which necessitated the involvement of the International Monetary Fund.

It is worth noting that the UK financial reforms led to their own crisis in the early 1990s. They contributed in a sizeable way to an asset-price boom and bust, which I would not regard as a good advertisement of the ability of the financial markets to provide insurance. Another interpretation of what happened is that the financial markets allowed UK residents' optimism about the future to be reflected in their borrowing and house prices. This was a form of income smoothing but one based on what turned out to be excessive optimism about future income paths. As this unwound it turned out to be quite traumatic and required the government to step in and provide the insurance by running a budget deficit. So the ability of financial markets to insure against idiosyncratic risk was found to be wanting in this instance. Current developments in financial markets also cast doubt on the financial markets' ability to provide the appropriate insurance. One can claim that if adequate supervisory frameworks had been in place this could have been avoided, but I think that is too glib an answer.

Let me now turn to Giuseppe's arguments about the effect of globalisation on all of this. As we all know from our trade economics, opening up a country leads to gains from trade which are of net benefit to the country. There are those who lose from the opening up to trade, but the winners should be able to compensate the losers. This is a within-country proposition, not an across-country one. However, it is also worth noting that this is a comparative static proposition, and not one about the exposure to shocks once the economy has been opened up.

Does integration increase labour income risk? The paper states that survey evidence suggests that the answer is yes, but I would not rely on this to be an accurate reflection of the reality. This is fundamentally an empirical question testable by data not surveys.

The inter-country insurance that Giuseppe is talking about could perhaps better be construed as being about changes in the terms of trade. Or perhaps idiosyncratic GDP risk. In this instance it is not clear to me why this could be better provided at the micro level by financial markets, rather than at the macro level by governments. The government could still access the financial markets to provide the insurance on behalf of all its citizens, perhaps through a GDP bond. The government conceivably has stronger bargaining power with financial markets and probably can be more easily monitored by markets. The funds raised by the government in this form could potentially be used to fund their own internal insurance programs. Sovereign wealth funds and the Norwegian Petroleum Fund are good examples of where the government has acted through financial markets on behalf of their citizens to provide income insurance.

Another potential missing element of the markets, which Giuseppe envisages, might be the absence of particular countries. Will it be possible, even within developed countries, to rely on cross-country insurance if not everyone is participating? Insurance does not work properly if the person against whose income my income negatively co-varies is not at the table. So if all the Anglo-Saxon countries go down this route and their business cycles have a high positive correlation but all the Continental Europeans go down the public insurance path, I do not see this market working very effectively.

Let me make a few brief comments on the empirical evidence. I do not find the time-series results all that convincing. The correlation between credit and public spending may be picking up more of the normal procyclical aspect of credit growth. Indeed, the correlation between openness and government consumption may also be just picking up the global business cycle. The business cycle is probably driving too much of the variation in all of the variables that Giuseppe is looking at. Hence I think the cross-sectional regressions are likely to be the better place to be looking for the answers.

So to finish, Giuseppe's paper raises some very interesting questions; particularly the degree to which financial markets can provide the necessary insurance for individuals in a globalised economy. I remain unconvinced that financial markets can do the job completely, in part because of the incompleteness of financial markets. It is also not clear to me how much more integration of global economies necessitates an increased reliance on financial markets.

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## 2. General Discussion

Discussion centred on the reasons for the increase in household indebtedness across many countries in the OECD over recent decades, and what this means for the vulnerability of the household sector. One participant pointed out that there was a tension between the research of labour economists, which suggested that individuals' uncertainty about their labour income had increased in recent years, and macroeconomic research suggesting that indebtedness had increased most in

countries that had experienced larger falls in unemployment. This sentiment was echoed by others, with calls for greater collaboration between labour economists and macroeconomists and more analysis of idiosyncratic risk within countries.

There followed a robust debate about whether or not households had taken on more debt and risk in general than was optimal. Those worried about the vulnerability of the household sector pointed to potential over-valuation of house prices in many countries, the increased proportion of household balance sheets exposed to sudden changes in financial markets, and the procyclicality of credit. In response, one participant argued that: household debt had been trending up relative to incomes for over 30 years; much of this reflected an adjustment to the earlier period of financial repression where households had extremely limited access to credit; households may simply have chosen to spend an increasing proportion of their incomes on housing as their incomes have increased; and it is not clear that households have exhausted their capacity to borrow. Another thought that it was very difficult to tell when risk-taking had gone too far and pointed to Greenspan's 'irrational exuberance' speech as a classic example of calling a bubble too early. A number of participants thought that with regard to sustainability there were two issues worth distinguishing: likely trends in indebtedness over the longer term and episodes of instability where debt and asset prices may have risen more rapidly than justified by an orderly long-run adjustment.

Reasons for the run-up in house prices in many countries received an airing. One participant argued that house prices may have increased more in Australia than the United States because there were more restrictions on the supply of land, while another argued that the direction of causality between house prices and debt ran both ways. There was also some discussion of whether the structural decline in real interest rates seen in many countries had contributed to debt and house price growth, particularly in countries where the decline was accompanied by financial deregulation. Donald Kohn replied that it was still unclear what the structural reasons for the increase in house prices were, given that it occurred many years after financial deregulation in the US and the large falls in real interest rates. Even so, he thought that financial innovation had played a role of late and that supply constraints were important, citing differences in the experience of regions in the US bordered by the coasts and those where land is more readily available for development. He also argued that the relationship between changes in interest rates and consumption could go either way because for every household making larger interest payments there was another receiving more interest income.

Participants also raised some interesting questions about the recent turmoil in the sub-prime mortgage market. For example, one asked whether the crisis would have evolved differently had the US been a less open economy, while another wondered what the implications for regulators were. In response, Donald Kohn argued that openness had probably contributed to the ability of the US economy to combine low savings rates with low interest rates. He then opined that central bankers had a good understanding of the problems once they had emerged, but were not well placed to prevent the problems from emerging in the first place, and went on to emphasise that most of the bad loans were made by unregulated entities and entities regulated

at the state level, and that states typically devote few resources to such issues. He also thought that the model of originating and selling mortgages had reduced the incentives to monitor the quality of these assets and that there may be too much reliance on credit ratings in pricing the risk of such assets. Nevertheless, he thought that the basic ‘model’ was not broken, though it was in need of reform. He cautioned against the temptation to respond to these problems through excessive regulation, arguing instead that there is a need to increase transparency and to broaden oversight of unregulated entities.

Christopher Kent noted that much of their paper had dealt with issues related to the trend rise in indebtedness over the longer term, and their stylised facts needed to be interpreted in that light. For example, he argued that most would accept that the decline in inflation across the OECD over the past two decades or so was driven largely by better monetary policy, and so could be thought of as largely exogenous with respect to household indebtedness. On the question of cyclical developments, he noted that their paper acknowledged that the speed of adjustment of debt – and asset prices – was important and that especially rapid adjustment had led to periods of instability in a number of countries, particularly following financial deregulation. He agreed that a better understanding of developments affecting the volatility of income was needed, particularly with regard to the ability of households to obtain and service debts.

Discussion of Giuseppe Bertola’s paper focused on whether the results from his time-series regressions simply reflected the procyclicality of credit. In response he argued that this was unlikely because his regressions control for the business cycle. He also pointed out that country-specific factors are likely to be important but are not included in his regressions.

# Banks, Markets and Liquidity

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## Abstract

The banking sector is one of the most highly regulated sectors in the economy. However, in contrast to other regulated sectors there is no wide agreement on the market failures that justify regulation. We suggest that there are two important failures. The first is a coordination problem that arises because of multiple equilibria. If people believe there is going to be a panic then that can be self-fulfilling. If they believe there will be no panic then that can also be self-fulfilling. Policy analysis is difficult in this case because our knowledge of equilibrium selection mechanisms is limited. Global games represent one promising modelling technique but as yet there is limited empirical evidence in support of this approach. The second market failure is that if there are incomplete markets, the provision of liquidity is inefficient. In particular there must be significant price volatility in order for the providers of liquidity to earn the opportunity cost of holding liquidity. We argue that financial fragility, contagion, and asset-price bubbles are manifestations of inefficient liquidity provision.

## 1. Introduction

In recent decades there has been significant deregulation in many industries. A sector that remains heavily regulated is banking. Why is banking so heavily regulated? One reason is consumer protection but this is a relatively minor issue. The main reason for banking regulation is to prevent financial crises. However, banking regulation is unusual compared to other types of regulation in that there is not wide agreement on what the market failure is that justifies regulation.

With other types of regulation there typically is agreement. For example, antitrust regulation is necessary to prevent the pernicious effects of monopoly. The market failure is the lack of competition. With environmental regulation, there is a missing market. Polluters do not have to pay a price to compensate the people they harm. If there was a market where they did have to do this, there would be an efficient allocation of resources and no need for intervention. But there is not such a market and it is necessary to regulate instead. In contrast, with banking, what is the market failure that justifies so much regulation? The purpose of this paper is to address this question.

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During the latter part of the 19<sup>th</sup> century European central banks, particularly the Bank of England, developed techniques of liquidity provision both to financial markets and distressed financial institutions that prevented crises. The last true crisis in the United Kingdom was the Overend, Gurney and Company Crisis of 1866. It was during this period that Bagehot published his famous book *Lombard Street* outlining how central banks should intervene during times of crisis (Bagehot 1962).

At this time the United States did not have a central bank. After the Revolution it had established the First Bank of the United States (1791–1811) and the Second Bank of the United States (1816–1836). In a report on the Second Bank, John Quincy Adams wrote ‘Power for good, is power for evil, even in the hands of Omnipotence’ (Timberlake 1978, p 39). This mistrust of centralised financial power led to a failure to renew the charter of the Second Bank. During the period without a central bank, the US experienced several major financial crises and subsequent depressions. A particularly severe crisis in 1907 originating in the US led a French banker to sum up European frustration with the inefficiencies of the US banking system by declaring that the US was ‘a great financial nuisance’ (Studenski and Krooss 1963, p 254). Finally, in 1913 the Federal Reserve System was created. However, the traditional distrust of centralised power led to a regional structure with decentralised decision-making.

The Federal Reserve was unable to prevent the banking crises that occurred in the early 1930s. There was a widespread perception that these crises were an important contributing factor to the severity of the Great Depression. The experience was so awful that it was widely agreed that it must never be allowed to happen again. The Federal Reserve System was reformed and the Board of Governors was given more power than had initially been the case. In addition, extensive banking regulation was introduced to prevent systemic crises. This regulation was not guided by theory but instead was a series of piecemeal reforms. In many European countries, such as France and Sweden, the response was much stronger and involved government ownership of the banking sector. Either through regulation or public ownership, the banking sector was highly controlled.

These reforms were very successful in terms of preventing banking crises. From 1945 to 1971 there was only one banking crisis in the world. This was in Brazil in 1962 and it occurred together with a currency crisis (see Bordo *et al* 2001). The reason that crises were prevented is that risk-taking and competition were controlled so much that the financial system ceased to perform its function of allocating resources efficiently. The financial repression that resulted from excessive regulation and public ownership eventually led to pressures for financial liberalisation. Starting in the 1970s, regulations were lifted and in many countries government-owned banks were privatised.

Financial liberalisation not only allowed the financial system to fulfill its role in allocating resources, it also led to the return of banking crises and there have been numerous ones in the past three decades. Many have been in emerging countries but many have also been in developed countries such as those in Norway, Sweden and Finland in the early 1990s. Bordo *et al* (2001) find that the frequency of crises in the period since 1971 is not that different from what it was before 1914.

There is a large literature on the costs of crises and their resolution (see, for example, Bordo *et al* 2001; Hoggarth, Reis and Saporta 2002; Boyd, Kwak and Smith 2005; Honohan and Laeven 2005). Much of the debate has been concerned with how exactly to measure costs. A large part of the early literature focused on the fiscal costs. This is the amount that it costs the government to recapitalise banks and to reimburse insured depositors and possibly other creditors. However, these are mostly transfers rather than true costs. The subsequent literature has focused more on the lost output relative to a benchmark such as an economy's trend growth rate.

There are two important aspects of the costs of crises when measured this way. The first is the high average cost and the second is the large variation in the amount of costs. Boyd *et al* (2005) estimate the average discounted present value (PV) of losses in a number of different ways. Depending on the method used, the mean loss is between 63 per cent and 302 per cent of real GDP per capita in the year before the crisis starts. The range of losses is very large. In Canada, France, Germany and the US, which experienced mild non-systemic crises, there was no significant slowdown in growth and costs were insignificant. However, in other countries the slowdowns and discounted losses in output were extremely high. In Hong Kong, for example, the discounted PV of losses was 1 041 per cent of real output the year before the crisis.

It is the large average costs and the very high tail costs that make policy-makers so averse to crises, and why in most cases they go to such great lengths to avoid them. However, it is not clear that this is optimal. There are significant costs associated with regulations to avoid crises and in many cases the expected costs of crises are not very high. But what are these costs of regulation? Are crises always bad or can they sometimes be advantageous? Once again the key question is what exactly is the market failure?

The Basel Accords illustrate the lack of agreement on the basic underlying market failure. An enormous amount of effort has been put into designing these rules. Large sums of money have been expended by the banks in setting up systems to implement them. They provide an example of regulation that is empirically rather than theoretically motivated. Practitioners have become experts in the details of a highly complex system for which there is no widely agreed rationale based on economic theory. What is the optimal capital structure? What market failure necessitates the imposition of capital adequacy requirements? Why can the market not be left to determine the appropriate level of capital? There are no good answers to these questions in the theoretical literature.

The key point is that just because there is asymmetric information of some kind does not necessarily mean that there is a market failure and intervention is justified. It must be shown that the government can do better than the market. In the literature on capital adequacy, it is often argued that capital regulation is necessary to control the moral hazard problems generated by the existence of deposit insurance. Partial deposit insurance was introduced in the US in the 1930s to prevent bank runs or, more generally, financial instability. Because banks issue insured debt-like obligations (for example, bank deposits) they have an incentive to engage in risk-shifting

behaviour. In other words, the bank has an incentive to make excessively risky investments because it knows that in the event of failure the loss is borne by the deposit insurance fund and in the event of success the bank's shareholders reap the rewards. The existence of bank capital reduces the incentive to take risks because, in the event of failure, the shareholders lose their capital. Thus, capital adequacy requirements are indirectly justified by the desire to prevent financial crises.

However, any analysis of optimal policy must weigh the costs and benefits of regulation. This can only be done in a model that explicitly models the possibility of crises. In the absence of explicit modelling of the costs of financial crises, it is difficult to make a case for the optimality of intervention. As a corollary, it is difficult to make a case for capital adequacy requirements as a means of offsetting the risk-taking generated by deposit insurance.

There are numerous theories of crises (see, for example, Holmstrom and Tirole 1998; Caballero and Krishnamurthy 2001; Diamond and Rajan 2005). This literature contains many interesting insights that focus on particular aspects or types of crises. In this paper we consider a framework developed in Allen and Gale (2004a, 2004b, 2007) and Allen and Carletti (2006a, 2006b) that allows a wide range of phenomena associated with crises to be analysed. These phenomena include excessive asset-price volatility, bank runs, financial fragility, contagion and asset-price bubbles.

## **2. Panics versus Fundamentals**

Two approaches to crises can be developed. Both views of crises have a long history. One view, well expounded in Kindleberger (1978), is that they occur spontaneously as a panic. The modern version was developed by Bryant (1980) and Diamond and Dybvig (1983). The analysis is based on the existence of multiple equilibria. There is a panic in at least one equilibrium, while in another there is not.

The second view asserts that crises arise from fundamental causes that are part of the business cycle (see, for example, Mitchell 1941). The basic idea is that when the economy goes into a recession or depression the returns on bank assets will be low. Given their fixed liabilities in the form of deposits or bonds, banks may be unable to remain solvent. This may precipitate a run on banks.

### **2.1 Panics**

The panics view suggests that crises are random events, unrelated to changes in the real economy. The classical form of this view suggests that panics are the result of 'mob psychology' or 'mass hysteria' (see, for example, Kindleberger 1978). The modern version, developed by Bryant (1980) and Diamond and Dybvig (1983), is that bank runs are self-fulfilling prophecies. Given the assumption of first-come-first-served and costly liquidation of some assets, there are multiple equilibria. If everybody believes that a panic will not occur, only those with genuine liquidity needs will withdraw their funds and these demands can be met without costly liquidation of assets. However, if everybody believes a crisis will occur then it becomes a

self-fulfilling prophecy as people rush to avoid being last in line. Which of these two equilibria occurs depends on extraneous variables or ‘sunspots’. Although sunspots have no effect on the real data of the economy, they affect depositors’ beliefs in a way that turns out to be self-fulfilling.

The key issue in theories of panics is which equilibrium is selected and in particular what is the equilibrium selection mechanism. Sunspots are convenient pedagogically but this explanation does not have much content. It does not explain why the sunspot should be used as a coordination device. There is no real account of what triggers a crisis. This is particularly a problem if there is a desire to use the theory for policy analysis.

Carlsson and van Damme (1993) showed how the introduction of a small amount of asymmetric information could eliminate the multiplicity of equilibria in coordination games. Games with asymmetric information about fundamentals they described as global games. Their work showed that the existence of multiple equilibria depends on the players having common knowledge about the fundamentals of the game. Introducing noise ensures that the fundamentals are no longer common knowledge and thus prevents the coordination that is essential to multiplicity. Morris and Shin (1998) applied this approach to models of currency crises. Rochet and Vives (2004) and Goldstein and Pauzner (2005) have applied the same technique to banking crises.

Using a global games approach to ensure the uniqueness of equilibrium is theoretically appealing. It specifies precisely the parameter values for which a crisis occurs and allows a comparative static analysis of the factors that influence this set of parameters. This is the essential tool for policy analysis. However, what is really needed in addition to logical consistency is empirical evidence that such an approach is valid. Currently there is a very limited empirical literature. Much of this is in the context of currency crises and is broadly consistent with the global games approach (see Prati and Sbracia 2002; Tillman 2004; Bannier 2006; Chen, Goldstein and Jiang 2007). In an important recent contribution, Chen *et al* develop a global games model of mutual fund withdrawals. Using a detailed data set they find evidence consistent with their model.

In terms of answering the question of what is the market failure, the coordination problem that leads to panics is one possible answer. The problem is that any serious policy analysis requires a theory of equilibrium selection. However, this is not something on which much progress has been made. Global games provide one possible approach, but the evidence on the relevance of this approach remains limited.

## 2.2 Fundamentals

An alternative to the sunspot view is that banking crises are a natural outgrowth of the business cycle. An economic downturn will reduce the value of bank assets, raising the possibility that banks are unable to meet their commitments. If depositors receive information about an impending downturn in the cycle, they will anticipate financial difficulties in the banking sector and try to withdraw their funds. This

attempt will precipitate the crisis. According to this interpretation, crises are not random events but a response to unfolding economic circumstances.

A number of authors have developed models of banking crises caused by aggregate risk. For example, Chari and Jagannathan (1988) focus on a signal extraction problem where part of the population observes a signal about future returns. Others must then try to deduce from observed withdrawals whether an unfavourable signal was received by this group or whether liquidity needs happen to be high. Chari and Jagannathan are able to show that crises occur not only when the outlook is poor but also when liquidity needs turn out to be high.

Building on the empirical work of Gorton (1988) that 19<sup>th</sup> century banking crises were predicted by leading economic indicators, Allen and Gale (1998) develop a model that is consistent with the business-cycle view of the origins of banking crises. They assume that depositors can observe a leading economic indicator that provides public information about future returns on bank assets. If returns are high then depositors are quite willing to keep their funds in the bank. However, if the returns are sufficiently low, they will withdraw their money in anticipation of low returns and thus there is a crisis.

### 2.3 Empirical evidence

What is the empirical evidence concerning whether runs are panic-based or fundamental-based? Friedman and Schwartz (1963) have written a comprehensive monetary history of the US from 1867 to 1960. Among other things, they argue that banking panics can have severe effects on the real economy. In the banking panics of the early 1930s, banking distress developed quickly and had a large effect on output. Friedman and Schwartz argued that the crises were panic-based and offered as evidence the absence of downturns in the relevant macroeconomic time series prior to the crises. Gorton (1988) showed that banking crises in the National Banking Era of the late 19<sup>th</sup> and early 20<sup>th</sup> centuries were predicted by a leading indicator based on liabilities of failed businesses. This evidence suggests that banking crises are fundamental or related to business cycles rather than panic-based. Calomiris and Gorton (1991) provide a wider range of evidence that crises are fundamental-based rather than panic-based. Wicker (1980, 1996) shows that, despite the absence of collapses in measures of US national economic activity, in the first two of the four crises identified by Friedman and Schwartz in the early 1930s, there were large regional shocks and attributes the crises to these shocks. Calomiris and Mason (2003) undertake a detailed econometric study of the four crises using a broad range of data and conclude that the first three crises were fundamental-based while the fourth was panic-based.

Overall, the evidence suggests that both types of banking crisis can occur in practice. However, the evidence for the US in the 19<sup>th</sup> century and for the early 1930s suggests that fundamental-based crises are more important.

### 3. The Market Failure in Fundamental-based Models

Allen and Gale (2004b, 2007) develop a general equilibrium framework for understanding the normative aspects of crises. The model is a benchmark for investigating the welfare properties of financial systems. The interaction of banks and markets is considered. The markets are institutional markets in the sense that they allow banks and intermediaries to share risks and liquidity. Individuals cannot directly access these markets but instead invest their funds in banks that have access to the markets. Given the lack of a widely accepted theory of equilibrium selection they focus on fundamental shocks as the driver of financial crises – only *essential* crises are considered. In other words they do not consider panics that are unnecessary, in the sense that an equilibrium without a panic also exists.

Both financial intermediaries and markets play an important role in the model. Financial intermediaries provide liquidity insurance to consumers against idiosyncratic liquidity shocks. Markets allow financial intermediaries and their depositors to share shocks to aggregate liquidity and returns.

To understand the market failures that can justify regulation, a key role is played by complete versus incomplete markets and contracts. If financial markets are complete, it is possible for intermediaries to hedge all aggregate risks in financial markets. Complete markets involve state-contingent Arrow securities or their equivalent in terms of derivative securities or dynamic trading opportunities. In contrast, incomplete markets mean that the amount of consumption in each possible aggregate state cannot be independently varied. If the contracts between intermediaries and consumers are complete then they can also be conditioned on aggregate risks. An incomplete contract would be something like debt where the pay-off on the contract does not depend on the aggregate state. Given these definitions Allen and Gale (2004b) show the following result.

*Result 1: When markets are complete and contracts are complete the allocation of resources is incentive efficient.*

The result provides the important benchmark of circumstances where Adam Smith's invisible hand works despite the presence of asymmetric information. As usual it involves comparing the allocation of a decentralised market system with an allocation implemented by a central planner. The reason that the allocation is incentive efficient is that the idiosyncratic liquidity shocks to depositors cannot be directly observed by the intermediaries in the case of the market or the planner in the case of direct allocation. The depositors must have the correct incentives to reveal the information if this is necessary in the efficient allocation. Hence the notion of incentive efficiency rather than full efficiency is used.

In this ideal world of complete markets and complete contracts there is no market failure. Moreover financial crises do not occur because banks and other intermediaries can balance assets and liabilities state by state. In this case there is no need for regulation or government intervention of any kind. It is the analog to the first fundamental theorem of welfare economics in the context of financial intermediation.

So far we have assumed complete contracts between banks and other intermediaries and their customers. Many contracts observed in practice between intermediaries and consumers, such as debt and deposit contracts, are incomplete. However, even if this is the case, it is possible to show a result concerning efficiency.

*Result 2: When contracts are incomplete and markets are complete the allocation is constrained efficient.*

Again the invisible hand of the market works in the sense that a planner constrained to use incomplete contracts with consumers could not do any better than the market, provided financial markets are complete. What is more, it can be shown that in the equilibrium with incomplete contracts there can be financial crises. For example, if a bank uses a deposit contract then there can be a banking crisis. In some cases they can increase effective state contingencies and improve the possibilities for risk-sharing and hence the allocation of resources. Of course, it is not the case that crises are always good, only that in some cases they can be, in particular when financial markets are complete and contracts between intermediaries and consumers are incomplete.

Once again there is no market failure and no justification for regulation or any other kind of intervention. This is another important benchmark. It shows that some crises can be good. Moreover the possibility of crisis does not always justify intervention. However, there is of course another case to be considered and that is when financial markets are incomplete. We turn to this next. As we shall see, there is indeed a market failure here. Now crises can be bad and regulations and other forms of intervention have the possibility of improving the allocation of resources.

## 4. Incomplete Markets

The two results in the previous section show that if there are complete markets then there is no market failure. This is true whether contracts between banks and other intermediaries are complete or incomplete. Of course, welfare is usually higher with complete contracts than incomplete contracts but there is no market failure. With incomplete markets, it turns out there is indeed a market failure. This can take a number of different forms as we shall see. There can be financial fragility, contagion and asset-price bubbles.

The essential problem with incomplete markets is that liquidity provision is inefficient. The nature of risk management to ensure that the bank or intermediary has the correct amount of liquidity changes significantly from the case of complete markets. When markets are complete it is possible to use Arrow securities or equivalently a full set of derivatives or dynamic trading strategies to ensure liquidity is received when it is needed. The price system ensures adequate liquidity is provided in every state and is priced properly state by state. To understand how this works it is helpful to conceptualise complete markets in terms of Arrow securities that are traded at the initial date and pay-off in a particular state. In this case banks and other intermediaries buy liquidity in states where it is scarce by selling liquidity

in states where it is plentiful for them. The complete markets allow risk-sharing and insurance.

In contrast, when markets are incomplete, liquidity provision is achieved by selling assets in the market when required. Asset prices are determined by the available liquidity or in other words by the 'cash in the market'. It is necessary that people hold liquidity and stand ready to buy assets when they are sold. These suppliers of liquidity are no longer compensated for the cost of providing liquidity state by state. Instead the cost must be made up on average across all states and this is where the problem lies.

The providers of liquidity have the alternative of investing in a productive long asset. There is an opportunity cost to holding liquidity since this has a lower return than the productive long asset. In order for people to be willing to supply liquidity they must be able to make a profit in some states. If nobody held liquidity, then when banks and intermediaries sold assets to acquire liquidity their price would collapse to zero. This provides an incentive for people to hold liquidity since they can acquire assets cheaply. In equilibrium, prices of assets will be such that the profit in the states where banks and intermediaries sell assets is sufficient to compensate the providers of liquidity for all the other states where they are not called upon to provide liquidity and simply bear the opportunity cost of holding it. In other words, asset prices are low in the states where banks and intermediaries need liquidity. But from an efficiency point of view this is exactly the wrong time for there to be a transfer from the banks and intermediaries who need liquidity to the providers of liquidity. There is in effect negative insurance and sub-optimal risk-sharing. Allen and Carletti (2006a, 2006b) explain in detail how this pricing mechanism works.

To summarise, when markets are incomplete, asset prices must be volatile to provide incentives for liquidity provision. This asset-price volatility can lead to costly and inefficient crises. There is a market failure that potentially provides the justification for regulation and other kinds of intervention to improve the allocation of resources.

## **5. The Symptoms of Market Failure**

The problems in liquidity provision that result from incomplete markets can result in a number of phenomena that are associated with financial crises. These are financial fragility, contagion and asset-price bubbles. Financial fragility is where a small shock can have a large effect and lead to a crisis. With contagion, a shock in one region can spread to other regions and have a damaging effect. With asset-price bubbles, the inefficient provision of liquidity by the market can be exacerbated by the inefficient provision of liquidity by the central bank and this can result in deviations of asset prices from fundamentals. We consider each of these symptoms of market failure in turn.

## 5.1 Financial fragility

There are many historical illustrations of situations where small shocks had a significant impact on the financial system. For example, Kindleberger (1978, pp 107–108) argues that the immediate cause of a financial crisis:

... may be trivial, a bankruptcy, a suicide, a flight, a revelation, a refusal of credit to some borrower, some change of view which leads a significant actor to unload. Prices fall. Expectations are reversed. The movement picks up speed. To the extent that speculators are leveraged with borrowed money, the decline in prices leads to further calls on them for margin or cash, and to further liquidation. As prices fall further, bank loans turn sour, and one or more mercantile houses, banks, discount houses, or brokerages fail. The credit system itself appears shaky, and the race for liquidity is on.

Recent examples provide a stark illustration of how small events can cause large problems. In August 1998, the Russian government announced a moratorium on about 281 billion roubles (US\$13.5 billion) of government debt. Despite the small scale of the default, it triggered a global crisis and caused extreme volatility in many financial markets. The hedge fund Long Term Capital Management (LTCM) came under extreme pressure. Despite LTCM's small size in relation to the global financial system, the Federal Reserve Bank of New York was sufficiently worried about the potential for a crisis if LTCM went bankrupt that it helped arrange for a group of private banks to purchase the hedge fund and liquidate its positions in an orderly way. The Fed's concern was that if LTCM went bankrupt, it would be forced to liquidate all its assets quickly. LTCM held many large positions in fairly illiquid markets. In such circumstances, prices might fall a long way if large amounts were sold quickly. This could put strain on other institutions, which would be forced to sell in turn, and this would further exacerbate the problem, as Kindleberger describes in the passage above.

Allen and Gale (2004a) show how the interaction of financial intermediaries and markets can lead to financial fragility. Small events, such as minor liquidity shocks, can have a large impact on the financial system because of the interaction of banks and markets. The role of liquidity is crucial. In order for financial intermediaries to have an incentive to provide liquidity to a market, asset prices must be volatile. Intermediaries that are initially similar may pursue radically different strategies, both with respect to the types of asset they invest in and their risk of default. The interaction of banks and markets provides an explanation for systemic or economy-wide crises, as distinct from models, such as Bryant (1980) and Diamond and Dybvig (1983) that explain individual bank runs.

As described in the previous section, the central idea is that when markets are incomplete financial institutions are forced to sell assets in order to obtain liquidity. Because the supply of, and demand for, liquidity are likely to be inelastic in the short run, a small degree of aggregate uncertainty can cause large fluctuations in asset prices. Holding liquidity involves an opportunity cost and the suppliers of liquidity can only recoup this cost by buying assets at fire-sale prices in some states of the world; so, the private provision of liquidity by arbitrageurs will always be inadequate to ensure complete asset-price stability. As a result, small shocks can

cause significant asset-price volatility. If the asset-price volatility is severe enough, banks may find it impossible to meet their fixed commitments and a full-blown crisis will occur.

## 5.2 Contagion

Financial contagion refers to the process by which a crisis that begins in one region, country or industry spreads to an economically linked region, country or industry. There are a number of different reasons why contagion can occur. For example, one basis for contagion is information (see, for example, Calvo and Mendoza 2000a, 2000b; Kodres and Pritsker 2002; Calvo 2005). Here we will focus on a second type of contagion that is due to incompleteness as laid out in Allen and Gale (2000b). Again the problem is concerned with liquidity provision but in a somewhat different way than that discussed in the context of financial fragility. The possibility of this kind of contagion arises from the overlapping claims that different regions or sectors of the banking system have on one another. When one region suffers a banking crisis, the other regions suffer a loss because their claims on the troubled region fall in value. If this spillover effect is strong enough, it can cause a crisis in adjacent regions. In extreme cases, the crisis passes from region to region, eventually having an impact on a much larger area than the region in which the initial crisis occurred.

Suppose the economy consists of a number of regions. The number of early and late consumers in each region fluctuates randomly, but the aggregate demand for liquidity is constant. This allows for inter-regional insurance as regions with liquidity surpluses provide liquidity for regions with liquidity shortages. One way to organise the provision of insurance is through the exchange of interbank deposits. Suppose that region A has a large number of early consumers when region B has a small number of early consumers, and vice versa. Since regions A and B are otherwise identical, their deposits are perfect substitutes. The banks exchange deposits at the first date, before they observe the liquidity shocks. If region A has a higher-than-average number of early consumers at date 1, then banks in region A can meet their obligations by liquidating some of their deposits in the banks of region B. Region B is happy to oblige, because it has an excess supply of liquidity, in the form of the short asset. At the final date, the process is reversed, as banks in region B liquidate the deposits they hold in region A to meet the above-average demand from late consumers in region B.

Inter-regional cross-holdings of deposits work well as long as there is enough liquidity in the banking system as a whole. If there is an excess demand for liquidity, however, the financial linkages caused by these cross-holdings can turn out to be a disaster. While cross-holdings of deposits are useful for reallocating liquidity within the banking system, they cannot increase the total amount of liquidity. If the economy-wide demand from consumers is greater than the stock of the short asset, the only way to allow more consumption is to liquidate the long asset. In this case liquidation refers to technological or physical liquidation rather than selling the asset in a market. There is a limit to how much can be liquidated without provoking a run

on the bank, however, so if the initial shock requires more than this buffer, there will be a run on the bank and the bank is forced into bankruptcy. Banks holding deposits in the defaulting bank will suffer a capital loss, which may make it impossible for them to meet their commitments to provide liquidity in their region. Thus, what began as a financial crisis in one region will spread by contagion to other regions because of the cross-holdings of deposits.

Whether the financial crisis does spread depends crucially on the pattern of inter-connectedness generated by the cross-holdings of deposits. The interbank network is said to be complete if each region is connected to all the other regions and incomplete if each region is connected with a small number of other regions. In a complete network, the amount of interbank deposits that any bank holds is spread evenly over a large number of banks. As a result, the initial impact of a financial crisis in one region may be attenuated. In an incomplete network, on the other hand, the initial impact of the financial crisis is concentrated in the small number of neighbouring regions, with the result that they easily succumb to the crisis too. As each region is affected by the crisis, it prompts premature liquidation of long assets, with a consequent loss of value, so that previously unaffected regions find that they too are affected.

It is important to note the role of a free-rider problem in explaining the process of contagion. Cross-holdings of deposits are useful for redistributing liquidity, but they do not create liquidity. So when there is excess demand for liquidity in the economy as a whole, each bank tries to meet external demands for liquidity by drawing down its deposits in another bank. In other words, each bank is trying to ‘pass the buck’ to another bank. The result is that all the interbank deposits disappear and no one gets any additional liquidity.

The only solution to a global shortage of liquidity (in which withdrawals exceed short assets), is to physically liquidate long assets. Each bank has a limited buffer that it can access by physically liquidating the long asset. If this buffer is exceeded, the bank must fail. This is the key to understanding the difference between contagion in complete and incomplete networks. When the network is complete, banks in the troubled region have direct claims on banks in every other region. Every region takes a small hit (physically liquidates a small amount of the long asset) and there is no need for a global crisis. When the network is incomplete, banks in the troubled region have a direct claim only on the banks in adjacent regions. The banks in other regions are not required to liquidate the long asset until they find themselves on the front line of the contagion. At that point, it is too late to save themselves.

There are a number other ways that contagion can occur. For example, Allen and Carletti (2006a) analyse how financial innovation can create contagion across sectors and lower welfare relative to the autarky solution. They focus on the structure of liquidity shocks hitting the banking sector as the main mechanism generating contagion. Differently, Allen and Carletti (2006b) focus on the impact of different accounting methods and show that mark-to-market accounting can lead to contagion in situations where historic cost-based accounting values do not.

### 5.3 Bubbles

The idea that the amount of liquidity available is an important factor in the determination of asset prices has a long history. In addition to the liquidity provided by the market, the liquidity in the form of money and credit provided by the central bank also plays an important role. It is this aspect of liquidity provision that is the focus here. In his description of historic bubbles Kindleberger (1978, p 52) emphasises the role of this factor: 'Speculative manias gather speed through expansion of money and credit or perhaps, in some cases, get started because of an initial expansion of money and credit'.

In many recent cases where asset prices have risen and then collapsed dramatically, an expansion in credit following financial liberalisation appears to have been an important factor. Perhaps the best-known example of this type of phenomenon is the dramatic rise in real estate and stock prices that occurred in Japan in the late 1980s and their subsequent collapse in 1990. The next few years were marked by defaults and retrenchment in the financial system. The real economy was adversely affected by the aftermath of the bubble and growth rates during the 1990s were typically very low compared to previous decades.

This and other examples suggest a relationship between the occurrence of significant rises in asset prices or positive bubbles and the provision of liquidity. They also illustrate that the collapse in the bubble can lead to severe problems because the fall in asset prices leads to strains on the banking sector. Banks holding real estate and stocks with falling prices (or with loans to the owners of these assets) often come under severe pressure from withdrawals because their liabilities are fixed. This forces them to call in loans and liquidate their assets, which in turn appears to exacerbate the problem of falling asset prices. In other words there may be negative asset-price bubbles as well as positive ones. These negative bubbles, where asset prices fall too far, can be very damaging to the banking system. This can make the problems in the real economy more severe than they need to have been.

Despite the apparent empirical importance of the relationship between liquidity and asset-price bubbles there is no widely agreed theory of what underlies these relationships. Allen and Gale (2000a) provide a theory of this based on the existence of an agency problem. Many investors in real estate and stock markets obtain their investment funds from external sources. If the ultimate providers of funds are unable to observe the characteristics of the investment, there is a classic risk-shifting problem. Risk-shifting increases the return to investment in risky assets and causes investors to bid up prices above their fundamental values. A crucial determinant of asset prices is thus the amount of credit that is provided. Financial liberalisation, by expanding the volume of credit and creating uncertainty about the future path of credit expansion, can interact with the agency problem and lead to a bubble in asset prices.

When the bubble bursts, either because returns are low or because the central bank tightens credit, banks are put under severe strain. Many of their liabilities are fixed while their assets fall in value. Depositors and other claimants may decide to withdraw their funds in anticipation of problems to come. This will force banks

to liquidate some of their assets and this may result in a further fall in asset prices because of a lack of liquidity in the market. It can be shown that when there is a market for risky assets then their price is determined by ‘cash-in-the-market’ or liquidity in some states and can fall below their fundamental value. This leads to an inefficient allocation of resources. The central bank can eliminate this inefficiency by an appropriate injection of liquidity into the market.

## 6. Discussion

We have identified two market failures. The first concerns a coordination problem associated with panics. The problem in analysing this from a policy perspective is that there is no widely accepted method for selecting equilibria. Global games are one promising approach but as yet there is limited empirical evidence to support this methodology. The second market failure concerns the incompleteness of financial markets. The essential problem here is that the incentives to provide liquidity lead to an inefficient allocation of resources. We have discussed three manifestations of market failure associated with problems of liquidity provision. These are financial fragility, contagion and asset-price bubbles.

Having identified when there is a market failure, the natural question that follows is whether there exist policies that can correct the undesirable effects of such failures. With market failure associated with panics, one of the main points that Diamond and Dybvig (1983) made was that deposit insurance was a way of eliminating the multiplicity of equilibria. In practice, deposit insurance is not complete since typically only small depositors are covered. As a result, actual deposit insurance schemes do not prevent the possibility of panics. The analysis of deposit insurance as a way of eliminating crises is something that deserves more attention. This potentially provides an underpinning for why deposit insurance is needed, which in turn justifies the need for capital regulation. In standard analyses of capital regulation, the need for this is usually justified by the existence of deposit insurance but this is simply assumed. A full analysis requires the need for deposit insurance to be properly modelled.

In the context of the market failure due to incomplete markets in fundamental-based models, Allen and Gale (2004b, 2007) and Gale and Özgür (2005) consider two types of regulation. The first is the regulation of bank liquidity and the second is the regulation of bank capital. Allen and Gale (2004b) investigate bank liquidity regulation and show that requiring banks to hold more liquidity than they would choose is welfare-improving if relative risk aversion is above one. Gale and Özgür (2005) investigate simple examples with consumers who have constant relative risk aversion in a context of incomplete markets. It is shown that the effect of bank capital regulation depends critically on the degree of relative risk aversion. When relative risk aversion is sufficiently low (below two), increasing levels of bank capital above that which banks would voluntarily hold can make everybody better off. The informational requirements for these kinds of intervention are high. Thus it may be difficult to improve welfare through these kinds of regulation as a practical matter.

The rationale for much of the existing regulation is not widely agreed upon. There has been considerable deregulation in the past three decades. There is some evidence that this has allowed the financial system to allocate resources in a better way and has improved growth (see, for example, Jayaratne and Strahan 1996). An important issue is the extent to which there should be further deregulation. A crucial component of this is to analyse the purpose of existing regulations and to see whether the benefits of the regulation outweigh the costs.

Financial fragility, contagion and asset-price bubbles are also manifestations of market failures. The policies required for dealing with these are rather different. These issues have not been analysed very much; however, it seems likely that to overcome them requires provision of liquidity by the central bank. The relationship between monetary policy and the control of crises is not well understood. For the case of financial fragility, the problem is the price volatility that arises from the private incentives for liquidity provision. By injecting monetary liquidity into the market the central bank may be able to change the price volatility and hence the financial fragility. With contagion, the problem is again a lack of liquidity. By injecting liquidity into the interbank market, the central bank may be able to prevent the spread of crises. Also, asset-price bubbles represent an important area where the central bank may be able to use monetary policy to solve the market failure. Allen and Gale (2007, Ch 9) contains an analysis of how easy money and credit policies can lead to positive price bubbles in real estate and stock markets. It also considers how negative price bubbles can arise as a result of a lack of liquidity and policies that can be used to prevent this. The development of microeconomic banking models with monetary channels is at an early stage. Allen and Gale (1998, 2007) and Diamond and Rajan (2006), among others, have made steps in this direction. However, the role of monetary policy in solving these market failures represents an important topic for future research. This potentially provides an attractive alternative to bank regulation.

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# *Discussion*

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## **Mathias Drehmann<sup>1</sup>**

Although Franklin Allen and Elena Carletti's paper on banks, markets and liquidity is in itself very stimulating and interesting, the emergence of the recent financial market turmoil has made this paper even more topical and important. The crisis illustrates a key message of the paper; given incomplete markets, even relatively small losses can lead to large swings in asset prices, bank defaults and financial instability. As politicians have already called for tighter regulation of banks, the paper provides a timely reminder that regulation should address market failures and not be led by political point scoring.

The authors ask a fundamental question: what is the welfare argument for regulating banks? It is surprising how little agreement and understanding there is on this question, even though banks are heavily regulated at considerable cost. Franklin and Elena survey the literature and propose two market failures justifying regulation: a coordination problem among depositors that can lead to inefficient bank runs; and incomplete markets with inefficient liquidity provision resulting in financial fragility, asset-price bubbles and contagion. In line with the state of the literature, they are not able to provide easy answers on how to design optimal policy rules to enhance overall welfare.

My comments focus on both of these market failures in turn. In contrast to Franklin and Elena, I argue that coordination problems are not a deep-rooted market failure because they are themselves caused by incomplete markets and informational asymmetries. Before doing so, I briefly comment on the debate about whether bank runs are driven by panics or fundamentals. Later in my comments I suggest several *ex post* and *ex ante* policy instruments to address inefficient liquidity provision due to incomplete markets.

## **Panic versus fundamental-based bank runs**

Our understanding of bank runs as panics is based on the classic papers by Diamond and Dybvig (1983) and Bryant (1980). They show that there are multiple equilibria since it is optimal to run if everyone else runs, but not to run if no-one runs. This is the coordination problem identified by Franklin and Elena as the first market failure. Gorton (1988) on the other hand advocates the view that bank runs are driven by adverse fundamentals and banks only fail when they are fundamentally insolvent. Based on the empirical literature the authors conclude that the evidence largely supports the fundamental view, but that panics have also occurred.

Given the location of the conference, it may be worth noting the Australian banking crisis of the early 1890s (see Dowd 1992). Similar to many other crises it was preceded by a property market boom. Once the first big bank failed, runs took

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1. The views expressed in this paper are not necessarily those of the European Central Bank.

place on several other institutions. However, one could also observe a flight to quality. In particular, three big banks received substantial deposit inflows. It is interesting to note that these banks had pulled out of the property market before it turned down at the end of the 1880s, suggesting that runs were driven by fundamentals, not random panics.

Discussing a banking crisis that occurred more than 100 years ago is not uncommon in the banking literature even though the structure of the current financial industry has changed substantially. This reveals a fundamental problem; crises are rare and hence limited data exist to undertake empirical analysis. I am therefore sceptical that the question of whether bank runs are driven by panics or fundamentals can be solved by looking at the empirical evidence only. However, economists have more tools than just theory or econometrics – they can also undertake economic experiments. A good example of how experiments can help to improve our understanding in this area is a study by Heinemann, Nagel and Ockenfels (2004), which assesses whether global games can solve the problem of coordination failures. As discussed by Franklin and Elena, a small amount of asymmetric information can theoretically eliminate the multiplicity of equilibria which imply the coordination problem underpinning bank runs.<sup>2</sup> The experimental results indicate that observed behaviour does not change much, regardless of whether the experiment is based on a global games framework or more classical set-ups.

Given the importance and costs of bank regulation, it is surprising how few experiments have been undertaken. I see experimental economics as a fruitful avenue for providing more behavioural data, which could be a valuable input to the design of optimal regulation. However, it is hard to use experiments to identify the underlying market failures that justify welfare-enhancing regulation in the first place.

## **Funding liquidity risk**

Franklin and Elena base the need for regulation on coordination problems and incomplete markets. Coordination problems can be thought of as ‘funding liquidity risk’ and incomplete markets as ‘market liquidity risk’; concepts which are more commonly used by regulators, bankers and the press. For the purpose of this discussion, funding liquidity risk is the risk that a bank is unable to meet its obligations when due, for example, when withdrawals are unexpectedly large because of panics driven by coordination problems. Market liquidity risk is the risk that assets cannot be sold at their fair value with immediacy, for example, when markets are incomplete or characterised by inefficient liquidity provision.

The definition of funding liquidity risk already hints at an important distinction. While solvency is determined by stocks, funding liquidity is determined by flows. A bank is liquid if its cash outflows are less than its cash inflows, including income from asset sales and new borrowing. This can be written as:

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2. Theoretical research into global games was initiated by Carlsson and van Damme (1993) and applied to banking crisis by Rochet and Vives (2004) and Goldstein and Pauzner (2005).

$$\text{Cash Outflows} \leq \text{Cash Inflows} \quad (1)$$

Or in more detail as:

$$\begin{aligned} \text{Expenses} + \text{Liabilities}_{(due)} + \text{Assets}_{(new/rolled\ over)} + \text{Off-balance Sheet}_{(net-liquidity\ demand)} \\ \leq \\ \text{Income} + \text{Liabilities}_{(new/rolled\ over)} + \text{Assets}_{(due)} + \text{Value of Assets Sold} \end{aligned} \quad (2)$$

While banks' liquidity risk managers look at funding liquidity risk as a flow constraint, the theoretical literature has not done so even though most papers can easily be rephrased in this way (see Drehmann, Elliot and Kapadia 2007). Take for example Diamond and Dybvig (1983). In the second period, deposits from both early and late depositors are contractually due –  $\text{Liabilities}_{(due)}$ . Cash or short-term assets held by banks –  $\text{Assets}_{(due)}$  – are used to pay out early depositors.<sup>3</sup> If there is no crisis, late depositors roll over their deposits –  $\text{Liabilities}_{(new/rolled\ over)}$  – so that total cash inflows equal cash outflows. But if late depositors do not roll over their deposits – that is if there is a bank run – the bank is forced to sell assets to satisfy all cash outflows. As the bank is only able to realise heavily discounted prices for their assets not enough cash can be raised, the flow constraint is not satisfied and the bank fails.

The flow constraint can also capture the downward spiral of funding and market liquidity risk (see for example Gromb and Vayanos 2002; Brunnermeier and Pedersen 2007). Suppose there is a severe drop in asset prices which induces higher margin calls. This would be captured in Equation (2) as an off-balance sheet item. If the funding liquidity of banks is a constraint, higher margin calls can only be satisfied by selling assets, which lowers asset prices further because of a lack of market liquidity. In turn this raises margin calls, leading to increased funding liquidity demands and so forth.<sup>4</sup>

It is also interesting to note that banks can adjust the flow constraint by restricting new lending or not rolling over short-term loans –  $\text{Assets}_{(new/rolled\ over)}$ . Banks are reluctant to do this to safeguard their customer relationships, but they may be forced to do so in severe crises. Depending on the structure of the financial system, this channel may contribute to contagion in the interbank market. It may also aggravate the impact on the real economy if lending to non-financial firms is curtailed.

An important consideration for this discussion is that funding liquidity, and hence the coordination problem, is only a result of imperfect information and imperfect capital markets. In a world with perfect information, examining the stock of assets and liabilities of a bank is sufficient to assess its health. And solvent institutions are always able to finance random liquidity demands by borrowing from other financial institutions or the central bank. Even if borrowing is impossible, the flow

3. *Expenses*, *Income* and *Off-balance Sheet* items are all zero in the model.

4. Liquidity demand from off-balance sheet items also includes committed credit lines to companies and liquidity lines to conduits. In the recent turmoil, the latter proved to be the key transmission channel from liquidity problems in the structured credit to the interbank market.

constraint can never bind if the bank is fundamentally solvent – as long as the bank can sell all assets at their fair value with immediacy. In other words, if assets are liquid a bank cannot fail because of funding liquidity problems. Hence, incomplete markets and imperfect information – not coordination problems – are the underlying market failures.

## Market liquidity

The current crisis highlights again that funding liquidity risk can indeed be crucial for financial stability. Designing policies to address these problems requires an understanding of the impact of incomplete markets and asset-market liquidity. Unfortunately, academics and policy-makers have thus far made little progress in this respect, which means that my following remarks will be more speculative.

Optimal policy intervention can be either *ex ante* or *ex post*. One *ex ante* mechanism Franklin and Elena discuss is regulation. They cite work by Allen and Gale (2004) and Gale and Özgür (2005), which show that capital or liquidity regulations for banks can indeed improve welfare. But the information requirements are enormous, which raises questions about the practical validity of such an approach. It is important to point out that the welfare argument in Allen and Gale is based on *ex ante* risk-sharing rather than considering the impact of bank failures on the real economy. The latter is certainly crucial from a policy perspective even though the extent of our understanding of these issues is insufficient to formally justify bank regulation from this perspective.

Another *ex ante* mechanism widely used by central banks and regulators is communication. A large number of central banks regularly issue financial stability reports with the aim of increasing awareness of financial stability issues and influencing risk-taking behaviour by banks. In addition, central bankers frequently make speeches related to financial stability. The current crisis should give some pause for thought. Notwithstanding the fact that the asset-backed commercial paper market was not specifically highlighted as a possible vulnerability, central banks around the globe had identified complex financial products, high leverage and trading in illiquid markets as financial stability risks before the turmoil (see IMF 2007; Bank of England 2007; ECB 2007; Geithner 2007). And publications demonstrate that these calls were acknowledged by the banking industry (see CRMPG II 2005; IFRI/CRO Forum 2007). Nonetheless the crisis occurred. Can we conclude that communication had no impact? Would the crisis have been worse without financial stability reports? Maybe central bank warnings were not acted upon this time. But given that central banks made valid attempts to identify the vulnerabilities, their reputations should be enhanced. But does this mean that the private sector will be more responsive in the future?

I remain doubtful about how much communication can achieve given considerable uncertainties and the incentives for excessive risk-taking by banks. One way for communication to become more than ‘cheap talk’ would be to develop reliable measures of financial stability and link those measures to policy instruments such as regulations, thereby affecting banks’ incentives to take risks.

Franklin and Elena briefly discuss the use of monetary policy to address financial crises. It is worth pointing out that policy-makers have a wider array of tools than simply changing interest rates, for example, they can provide liquidity with open market operations or act as ‘buyer of last resort’. A simplistic reading of the emerging literature on market liquidity suggests that during market liquidity crises central banks should buy assets. This seems optimal if, for example, market illiquidity is driven by search frictions as suggested by Duffie, Gârleanu and Pedersen (2006). A central bank could prevent the drying-up of market liquidity by stepping in to buy assets when there are surprisingly high liquidity demands. It seems that market liquidity risk could also be eliminated via a buyer of last resort if markets are characterised by a ‘cash in the market’ constraint as discussed by Franklin and Elena. In some sense, a buyer of last resort during market crises would conceptually mirror the lender of last resort function for a bank-specific crisis.

In practice this approach clearly faces great difficulties, such as differentiating between solvency and liquidity shocks or determining the fair value of assets. It also raises moral hazard problems frequently mentioned in the context of lender of last resort interventions. However, there is a historical precedent for a central bank acting as buyer of last resort. In September 2002, the Bank of Japan initiated a stock-purchasing programme, ultimately buying stocks with a total value of 2 trillion yen from commercial banks. The rationale was to avoid the crystallisation of market liquidity risk (see Bank of Japan 2002).<sup>5</sup>

With the exception of the Bank of Japan, which acted in very exceptional circumstances, central banks generally do not buy assets during crises. However, open market operations are an interesting alternative. Rather than outright purchasing, central banks can provide liquidity against collateral using repurchase agreements which are reversed after a specific time. It is interesting to note that the provision of liquidity against collateral is a policy instrument being used in the current crisis, but hardly discussed in the literature. During a liquidity crunch this could be an optimal policy response as it provides liquidity to all players and hence could prevent asset fire sales as well as influence the mood of the market until more fundamental information is available. As repos are reversed, no excess liquidity should build up over time. This should limit inflationary pressures and negative consequences for the economy. At the same time, as transactions are collateralised it is also unclear whether open market operations induce moral hazard, especially if haircuts are set appropriately and interest rates remain at the monetary policy target level.

Ultimately, central banks can lower interest rates to curb the effects of a market liquidity crisis as they have done after the 1987 crash or LTCM crisis. As Franklin and Elena briefly discuss, the interactions between market liquidity and the macroeconomy are not well understood, making it hard to discuss optimal monetary policy intervention.

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5. I would like to thank Marie Hoerova for pointing this historical episode out to me.

## Conclusion

Coordination problems are not a market failure *per se* but are themselves driven by incomplete markets and asymmetric information, which also underpin market liquidity risk. Focusing on incomplete markets and asymmetric information is therefore essential when designing optimal regulation or *ex post* policy interventions. However, more research is urgently needed to enhance our understanding of these issues; especially about the interactions between financial crises and the macroeconomy, and how monetary policy or open market operations could alleviate liquidity problems. It is unlikely that these issues will be resolved in time to guide decisions during the current turmoil. But further research will no doubt be of use when the next crisis occurs.

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# Innovation and Integration in Financial Markets and the Implications for Financial Stability

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Rob Hamilton, Nigel Jenkinson and Adrian Penalver<sup>1</sup>

## 1. Introduction

Fuelled by rapid financial innovation, deregulation and capital market integration, in recent years we have witnessed a period of tremendous growth and structural change in financial market activity and in financial intermediation across the globe. These developments are profound, with major implications for the performance, risk and management of the global financial system.

A few statistics help to illustrate the scale of these developments and the pace of change. First, growth in the financial sector has strongly outpaced that of GDP in the major industrial economies, with the share of the financial sector in total value added rising a third from 5 per cent to nearly 7 per cent since 1985 (Ferguson *et al*, forthcoming). Second, the global stock of financial assets has surged from just over 100 per cent of global GDP in 1980 to over 300 per cent in 2005 (Figure 1) with cross-border holdings rising even quicker. Foreign exchange market activity has increased twelve-fold since the first BIS survey in 1986, while turnover on the London Stock Exchange has increased five-fold in half this time (Figure 2). There has also been tremendous growth in the number and coverage of new types of derivatives and financial instruments. For example, the BIS reports that by the end of 2006 the outstanding value of interest rate swaps and other derivatives had reached over US\$400tr (8½ times global GDP), from under US\$75tr (2½ times GDP) 10 years ago (Figure 3).

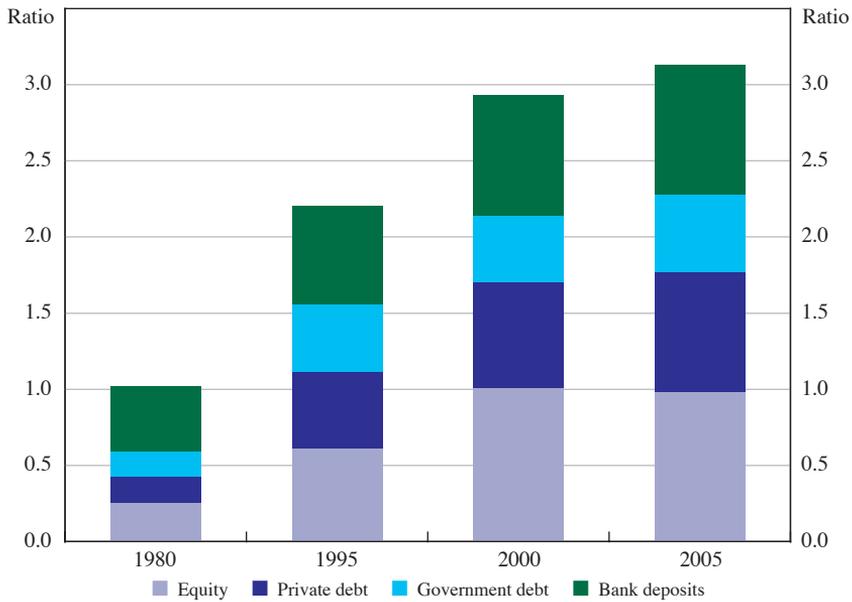
Statistics, though, do not completely capture the extent to which innovation and change have made the financial system more integrated and globalised. In recent years, there has been much greater scope to pool and transfer risks, potentially offering substantial welfare benefits for borrowers and lenders. That has been supported by the increased ability of financial institutions to manage risks within the financial system itself. But primitive risk does not disappear through financial engineering. Rather, it is transformed and reshaped. This transformation of risk poses challenges for risk management systems in financial institutions and for public authorities charged with supporting financial stability.

This paper seeks to review these issues. Section 2 argues that financial market deregulation and technological change have been key drivers behind the rapid growth and innovation in the provision of financial services. Section 3 discusses

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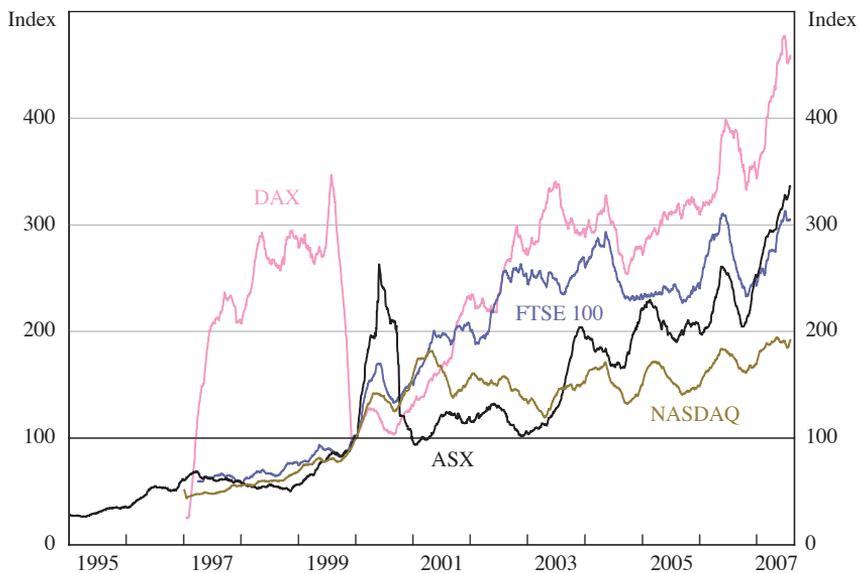
1. We are grateful to John Gieve and Laurie Roberts for helpful comments and Jake Horwood and Rachel Pigram for research assistance.

**Figure 1: Global Financial Assets**  
Ratio to world GDP

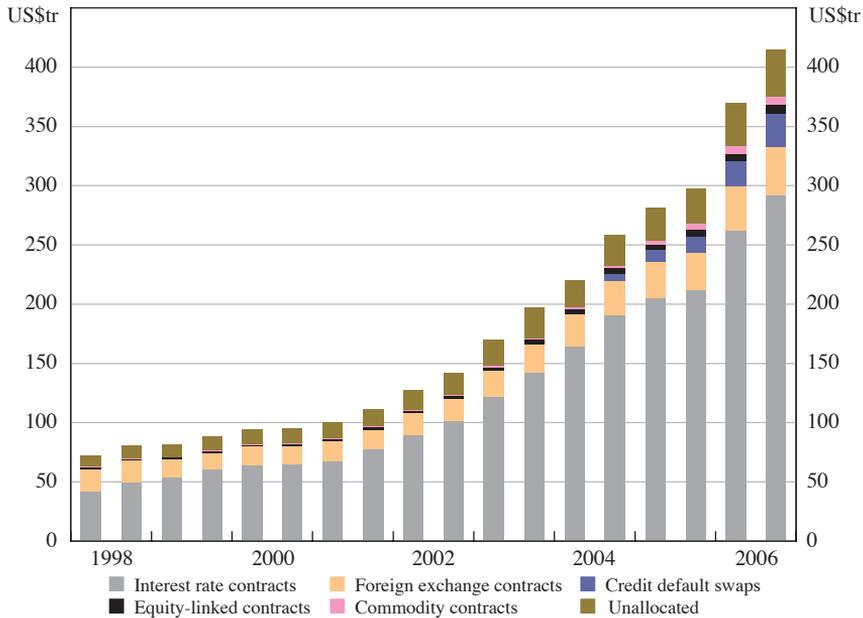


Sources: IMF; McKinsey & Company

**Figure 2: Index of Stock Exchange Transaction Volumes**  
January 2000 = 100



Source: Bloomberg

**Figure 3: Outstanding Notional Amounts of Derivatives**

Source: BIS

the welfare gains to households and corporations – the ultimate users of financial services – while Section 4 explores the main implications for the financial system. Section 5 looks forward and reviews some of the emerging issues for the financial sector and for the risks to financial stability. Section 6 draws out the challenges for financial stability authorities.

## 2. Drivers for the Changes in the Provision of Financial Services

As discussed by the Group of Ten (G10), there has been no single dominant cause of the rapid increase and changing nature of financial intermediation (G10 2001). Instead, there have been numerous supporting influences. We would highlight the fundamental importance of deregulation and heightened international competition, and of advances in information and communication technology that underpin financial innovation.

Widespread deregulation of the financial system in recent decades has had a major impact on the supply of financial services (Ferguson *et al*, forthcoming). For example, the removal of quantity rationing and price controls substantially expanded the freedom of financial institutions to increase their balance sheets, offer a wider range of services and compete with each other. Regulatory barriers to cross-border activity – including exchange controls – have been progressively removed in most countries, facilitating diversification of risk and again strengthening competition

and the ability to transfer technological advances and to exploit economies of scale. As one illustration, 30 per cent of G7 banks' lending is now cross-border, up from 7 per cent in 1970. And takeovers and mergers within the financial sector have mushroomed, with cross-border demand a significant driver. Of the top ten UK banks 20 years ago, five have merged or been taken over by other UK-owned institutions and two have been purchased by owners located overseas. In New Zealand, of course, the banking system is now almost entirely owned by Australian banks. The lowering of barriers to cross-border activity and ownership has contributed to the rise of large complex financial institutions (LCFIs), which now operate on a global scale. Equally, deregulation has reduced the cost of entry and promoted greater competition in financial markets across the spectrum, for example through rapid growth in non-bank financial institutions, such as hedge funds.

A second profound influence on the provision of financial services has been the huge advance in information technology and communication (Heikkinen and Korhonen 2006). The ability to assimilate data and to perform complex calculations has helped market practitioners to develop new financial products that decompose and repackage different components of financial risk. These new products can be matched more closely to the demands and risk preferences of both investors and borrowers and thus improve the completeness of financial markets. The innovation process has been underpinned by the widespread and ready electronic access to news and information on economic and financial developments and on market responses. That, in turn, has improved arbitrage and market pricing.

As one example among many, the whole process of securitisation and structuring of credit products would not have been feasible without advances in information technology. Electronic databases and increased processing power have enabled the storage, filtering and analysis of huge quantities of information, without which the pooling and tranching of loans would be prohibitively expensive. Technology has similarly supported the back-office functions of recording, tracing and reconciling the payment flows of these highly complex instruments.

Deregulation and improved technology have consequently spurred financial innovation and improved the pricing of risk in financial markets. Greater efficiency and competition in the financial system have in turn led to a fall in the costs of financial intermediation. For example, bid-offer spreads on standardised instruments have fallen sharply (Figure 4). The next section examines the implications of these changes for users of financial services.

**Figure 4: Bid-offer Spread on Foreign Exchange Transactions**  
22 January 1996 = 100



Sources: Bank of England; Bloomberg

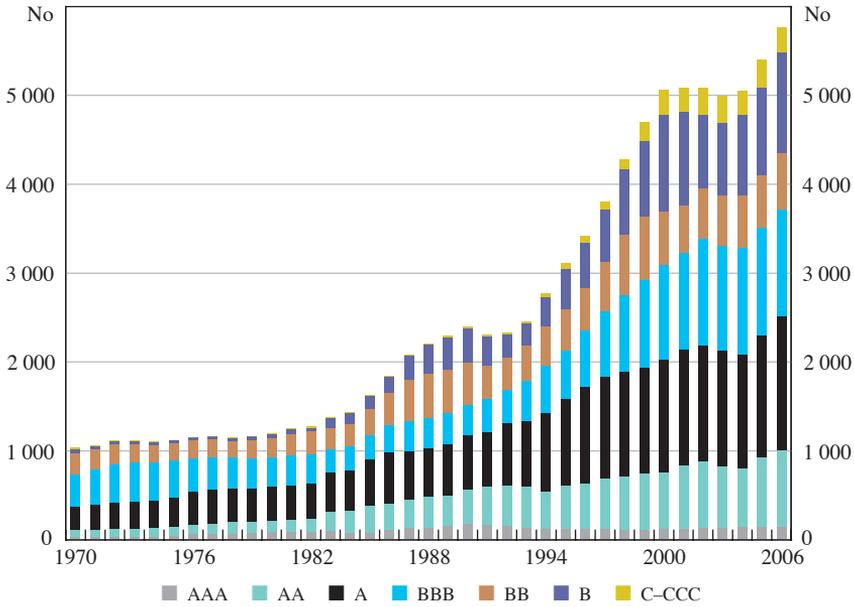
### 3. Impact on Users of Financial Services

Financial innovation and globalisation have substantially increased the availability of credit to households and corporations and widened the menu of financial products to suit diverse demands. These changes have supported the growth of economic activity (Levine, Loayza and Thorsten 2000). The gains in financial system efficiency have lowered the cost of capital for firms and improved the ability of households to smooth their lifetime consumption and to insure against unexpected outcomes.

The increase in market access and in the breadth of borrowing options has delivered products better-matched to customers' needs. For example, on the corporate side, over the past 20 years, the number of firms with direct access to capital markets has grown substantially (Figure 5). And there has been an increase in the availability of long-term debt (Figure 6), which may be more suited to the characteristics of corporate investment. Borrowing is readily available at both fixed and floating interest rates. Moreover, the ability of non-financial firms to manage their risks has been transformed by their increasing use of derivatives, particularly for managing interest rate and currency risk (Figure 7), but also for other exposures such as those to commodity prices.

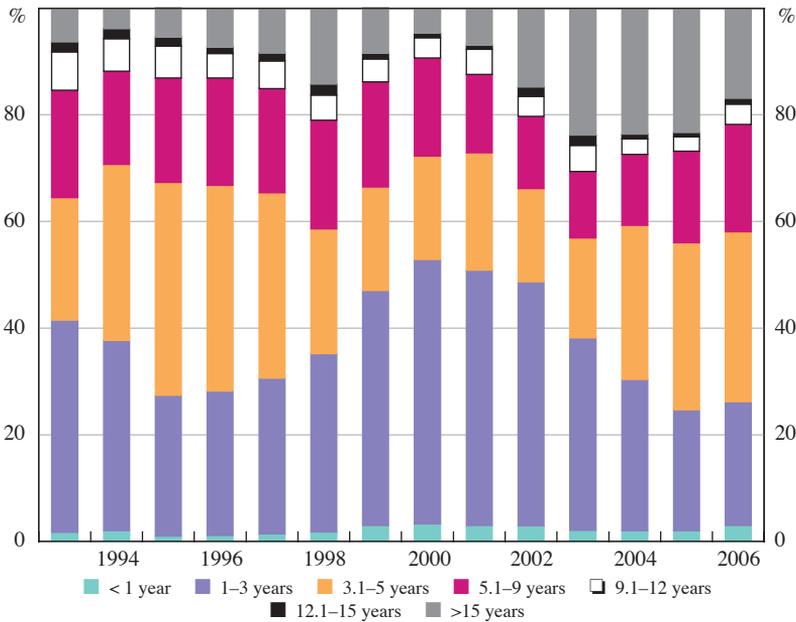
Households have also benefited from a wider range of mortgage and unsecured borrowing products. For example, 25 years ago, mortgage choice in the UK was easy – households could choose either a repayment mortgage, with interest based upon banks' standard variable rates, or an endowment mortgage, with interest again

**Figure 5: Number of Firms with Credit Ratings Globally**



Source: Moody's

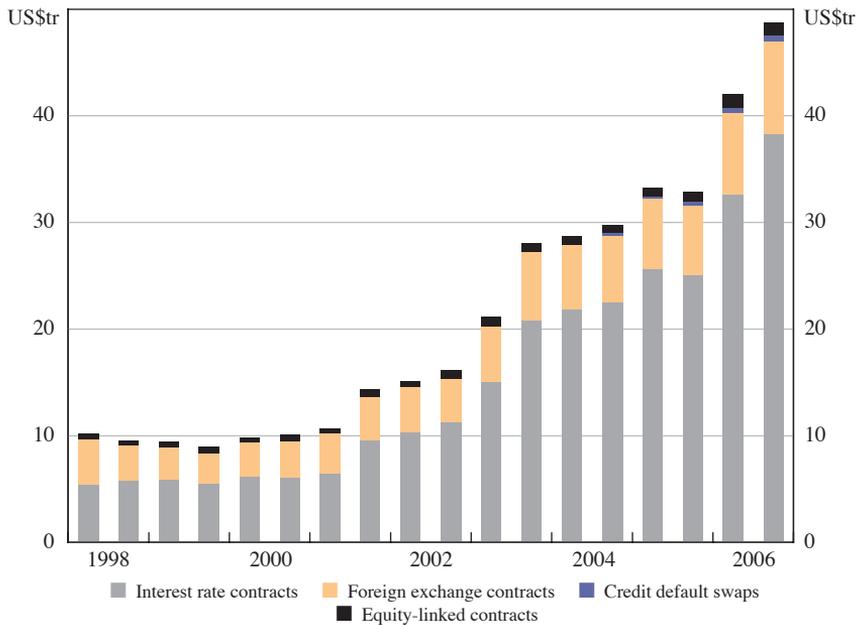
**Figure 6: Maturity Structure of Corporate Bond and Loan Issuance**



Note: Excludes issuance where the maturity is not recorded in the database

Source: Dealogic

**Figure 7: Non-financial Companies' Use of Derivatives**  
Notional value outstanding



Source: BIS

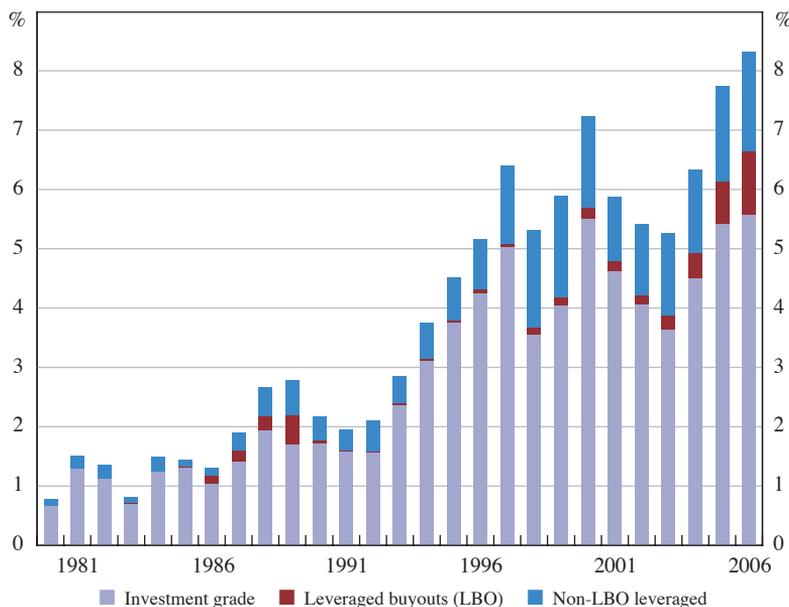
based on the standard variable rate, but with a separate investment fund aimed at repaying the principal. Now mortgage types include: repayment; endowment; pension; negatively-amortising; interest-only; and lifetime mortgages. The rate may be determined by reference to a floating, tracker or fixed rate for maturities between 2 to 25 years. And products may incorporate additional facilities such as cash back, payment of professional fees or lock-in periods. In addition to borrowing for house purchase, individuals have increasingly been able to undertake mortgage equity withdrawal – delivering borrowing for consumption at secured rather than unsecured rates. And the cost of secured funding has fallen – for example, in the UK the average spread on mortgages has fallen from 1.5 percentage points above LIBOR in 1999 to 0.3 percentage points in the first half of 2007. These options have broadened choice. And the process of evolution is continuing. The recent growth of the fledgling house-price derivatives market suggests that ultimately households may be able to hedge housing risk. Of course, the increase in complexity of households' borrowing choices increases their exposure to new risks, placing a premium on financial advice and education.

In addition to an increase in borrowing options, there has also been an increase in credit availability – reflecting a number of interrelated factors. First, the removal of quantity rationing, for example by reducing, and in many cases eliminating, the use of cash ratio requirements as an active mechanism for monetary control (King 1994). Second, the reduced cost of borrowing. And third, the increase in risk-based pricing,

which has supported the extension of credit to reach higher-risk customers and thus lowered constraints (Berger, Frame and Miller 2002). Access to capital markets by sub-investment grade firms has increased (Figure 5), and leveraged finance has risen sharply (Figure 8). Households have also had broader access to credit – for example, in the UK, two-thirds of adults had a credit card in 2006, double the proportion in 1984 (Figure 9). During this time, households’ total unsecured borrowing increased from 5 per cent to 24 per cent of household income. And across the G7 economies, household debt relative to income has increased by an average of four-fifths in the past 20 years (Figure 10),<sup>2</sup> suggesting a marked easing of credit constraints.

The range of investment vehicles available to households and firms has also changed fundamentally over recent decades. For example, 35 years ago, equities in the US were mainly held directly by domestic households; now, they are mainly held indirectly through institutional investors, with different funds providing a large menu of different risk/return trade-offs (Figure 11). The increasing range of options has enabled even small retail investors to develop more diversified, tailored and complex portfolios – including gaining exposure to property, commodity and foreign exchange risk. Once again, this has placed a premium on financial acumen, especially as previous investment returns may not provide a good guide to likely future returns.

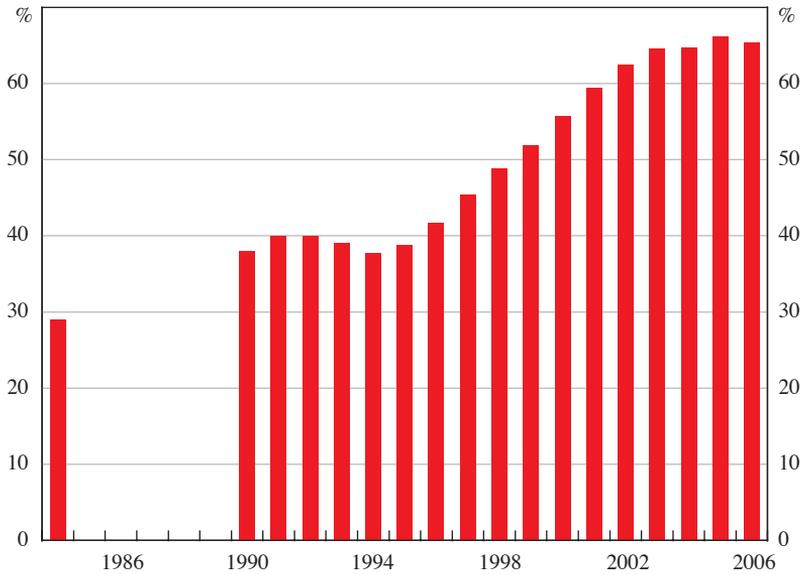
**Figure 8: Global Syndicated Lending to Corporations**  
Per cent of world GDP



Sources: Dealogic; IMF

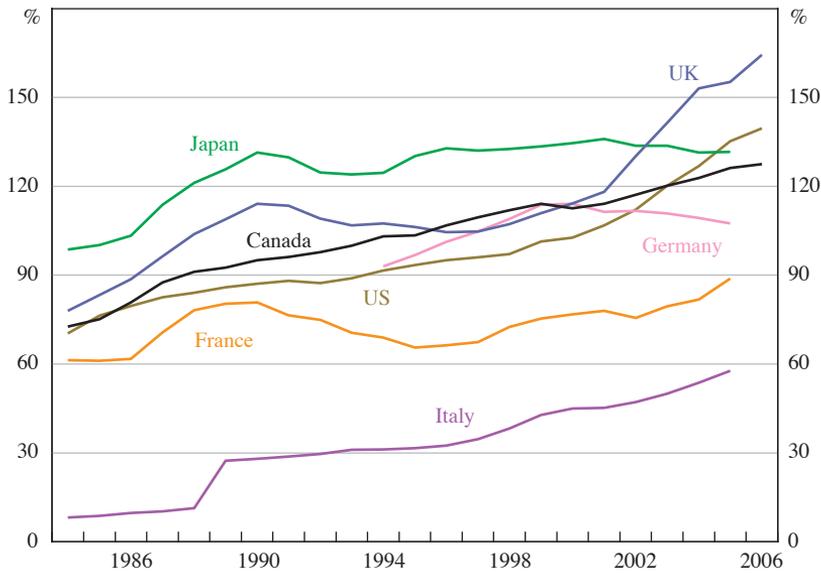
2. The trend has been even more pronounced in Australia, with the ratio of debt-to-income more than doubling in the past 10 years.

**Figure 9: Proportion of Adults in the UK with a Credit Card**



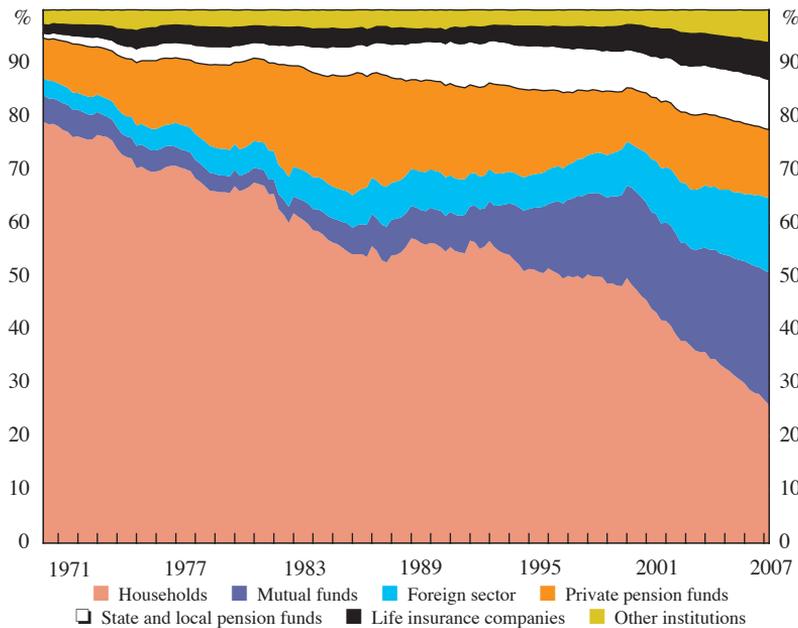
Sources: Association for Payment Clearing Services (APACS); Bank of England; National Statistics

**Figure 10: Household Debt-to-income Ratios**



Source: OECD

**Figure 11: Ownership of US Corporate Equities**  
As a per cent of total holdings at market value

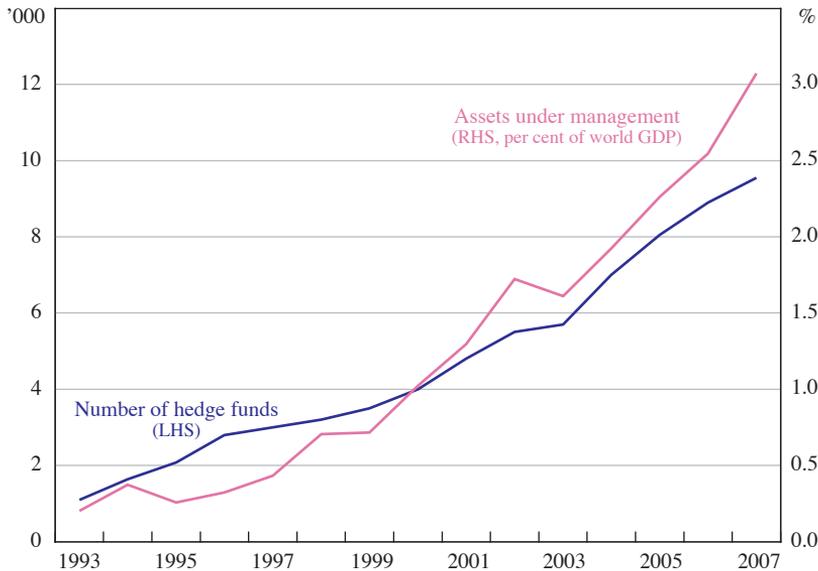


Source: Board of Governors of the Federal Reserve System

In addition to the greater choices over investment and borrowing opportunities, households in many countries are becoming increasingly responsible for financing costs which were previously socialised and borne by governments (Caruana 2007). These costs include pension provision, tertiary level education, health care and long-term old-age support.

Although the largest investment vehicles remain pension and mutual funds, there has been huge growth in alternative investment funds – aimed primarily at the wealthier investor – which offer the prospect of higher, but potentially riskier, returns. These include hedge funds, where the number of firms has increased by a factor of 8 in the past 15 years (Figure 12), and private equity companies. These newer investment vehicles look to achieve higher returns by more active management and/or by taking on higher risks – perhaps by moving down the credit or liquidity spectrum into volatile or illiquid instruments, or by using leverage. Lower costs of financial market participation have also led to an increase in the number of retail investors and ‘day-traders’, who actively participate in foreign exchange and other markets, with the involvement of Japanese investors in the yen carry trade a prime example.

A direct consequence of households and companies taking up a wider variety of financial market instruments is that their individual balance sheets have become more complicated. A household could, for example, be managing a hybrid residential mortgage loan, which allows equity withdrawal to finance other goods and services,

**Figure 12: Global Hedge Fund Activity**

Source: Hennessee Group LLC

a buy-to-let loan for an investment property, a pension, and an investment portfolio of domestic equities and foreign currency bonds. If well managed, a complex balance sheet like this example provides considerable flexibility for households to smooth consumption and to maximise lifetime opportunities. Given sensible use of diversification and a buffer of capital, households can also make themselves more robust to temporary shocks, such as a spell of unemployment. Companies can do exactly the same. Although sustained healthy economic growth and low macroeconomic volatility are almost certainly the strongest influences, the low rate of corporate defaults in recent years may in part reflect increased use of hedging products that strengthen companies' capability to weather temporary shocks. Indeed there may be a possible mutually reinforcing effect. Households and corporations that have increased their financial robustness do not need to make sharp adjustments to their expenditure patterns in the event of an external shock, thereby reducing the potential amplitude of the change in overall spending.

Nevertheless, agents attempting to optimise their balance sheets through additional use of financial instruments have to form an expectation of risks at a particular point in time, and so are not immune from expectational errors or from changes beyond their planning horizon. For example, a company may be able to swap its floating-rate loan for a fixed rate, hedge its foreign currency exposures, buy forward any commodity inputs, buy credit protection against the failure of a supplier and buy volatility protection against major movements in the value of assets in its staff's pension plan. By locking in prices today, the firm protects itself against the vagaries of short-term market volatility. But such hedges rely on accurate forecasts of future risks – and firms could find themselves under- or over-hedged.

In addition, immunity from market movements may also make it difficult to pick up latent deterioration in the firm's profitability, which may only become apparent when the hedges mature and the institution is forced to re hedge and refinance. This can make the assessment of credit risk more challenging because a balance sheet can look impervious to shocks in the short run but remain vulnerable to subtle shifts in fundamentals in the longer run.

#### **4. Implications for the Financial System**

Innovation, deregulation and integration are significantly changing the way the financial system operates and manages its risks.<sup>3</sup> This offers substantial benefits but also poses different and difficult challenges for financial institutions. This section examines the implications more closely.

The ability of financial firms to hedge and diversify exposures, as well as to transfer risks to other financial institutions or agents who are more willing or able to bear it, has transformed the way financial institutions manage risk in recent years (CGFS 2003). The rapid growth of derivatives and options underpins this transformation. For although derivative markets for physical commodities were first launched in 1898, their extensive use in financial contracts is of course a very modern development. The first financial futures contract was introduced on the Chicago Mercantile exchange only 35 years ago in May 1972. But by 2006, over 5 billion contracts were traded globally, with a dramatic increase over the past decade. Similarly, use of over-the-counter (OTC) derivatives has increased sharply – with the notional value outstanding increasing five-fold since 1998 (Figure 3). A particularly important innovation has been the development of the credit derivatives market. This has grown at a tremendous pace, with the International Swaps and Derivatives Association (ISDA) reporting an increase in the notional value outstanding from US\$0.6tr in 2001 to US\$34tr in 2006. Credit derivatives offer banks and other institutions the facility to lay off (and to take on) credit risks much more easily than before. And credit derivatives have also spawned the growth of synthetic credit products and broken the link with the physical supply of debt – credit positions on a particular corporation may be many multiples of the physical volume of debt outstanding.<sup>4</sup> The use of options has also increased dramatically, with the BIS reporting that the notional value of contracts has increased almost five-fold since 1998. These contracts have enhanced financial institutions' ability to hedge complex risks and enabled users to take on (and protect themselves against) exposure to specific risks – for example, by providing protection against extreme downside movements in a particular asset price.

The structure of the financial system is also changing. Historically, banks could only originate as many loans as they had the capacity to finance, subject to strict

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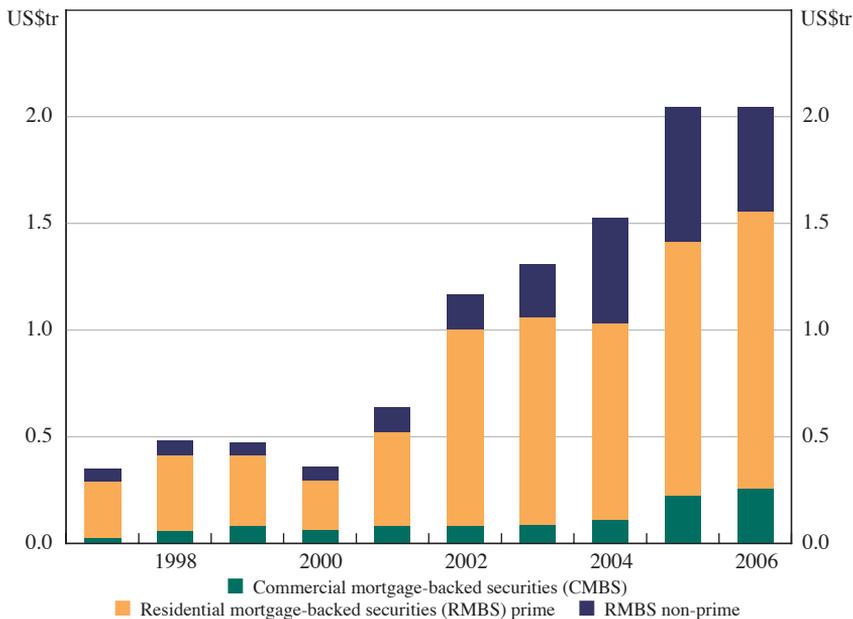
3. See also Rajan (2005).

4. For example, in the case of the bankruptcy filing of the US automobile components firm Delphi in 2005, the value of credit derivatives related to this company was more than 10 times the par value of its bonds outstanding.

concentration limits. But the ability to securitise and hedge portfolios of loans has enabled two key functions of banks – the origination and holding of credit risk – to be separated. The process started in the early 1970s, with residential mortgage-backed securitisations by government agencies in the US. Activity has grown very rapidly over the past 10 years (Figure 13), as banks have securitised retail mortgages and a wide range of other assets, most prominently commercial mortgages and consumer credit. There have been equally profound changes in credit risk management in recent years, underpinned by growth in credit derivatives. That has fuelled a surge in complex structured finance products, such as collateralised debt obligations (CDOs), which have tripled since 2004. CDOs can be backed by a relatively diverse array of bonds, loans or other assets, and by enabling the pooling and slicing of risk to meet investor demand they increase the scope of loans which can be on-sold.

Banks are taking advantage of the ability to separate the screening and monitoring of loans from the provision of term financing and moving more towards an ‘originate and distribute’ or ‘arms-length financing’ business model, whereby loans are originated and then repackaged and sold on as a security. This enables banks to maximise the value they can achieve from knowledge of borrowers’ and lenders’ needs through developing relationships, but at the same time economise on capital. Perceived differences between the regulatory and economic cost of capital may have increased the incentive to securitise and thus accelerated this process. The transition

**Figure 13: Global CMBS and RMBS**



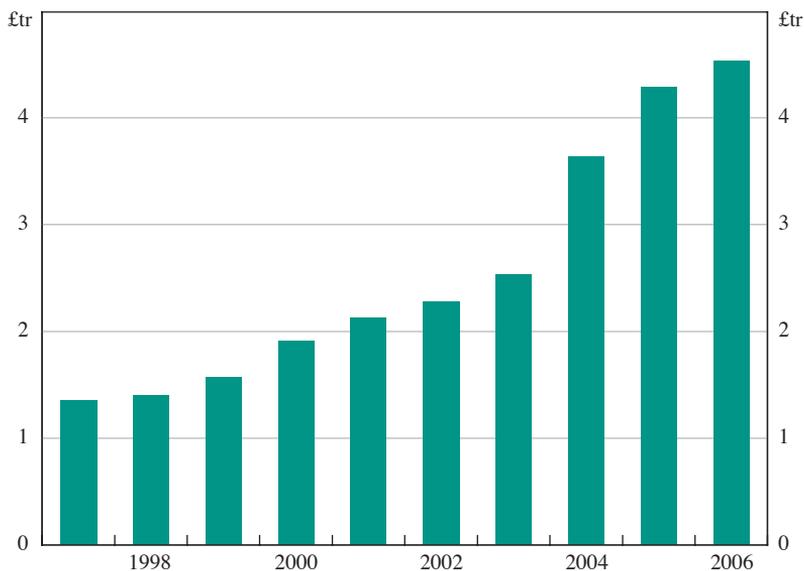
Source: Dealogic

towards greater arms-length financing is more pronounced in the United States and the United Kingdom than in many other countries (IMF 2006), but the underlying drivers are common across countries.

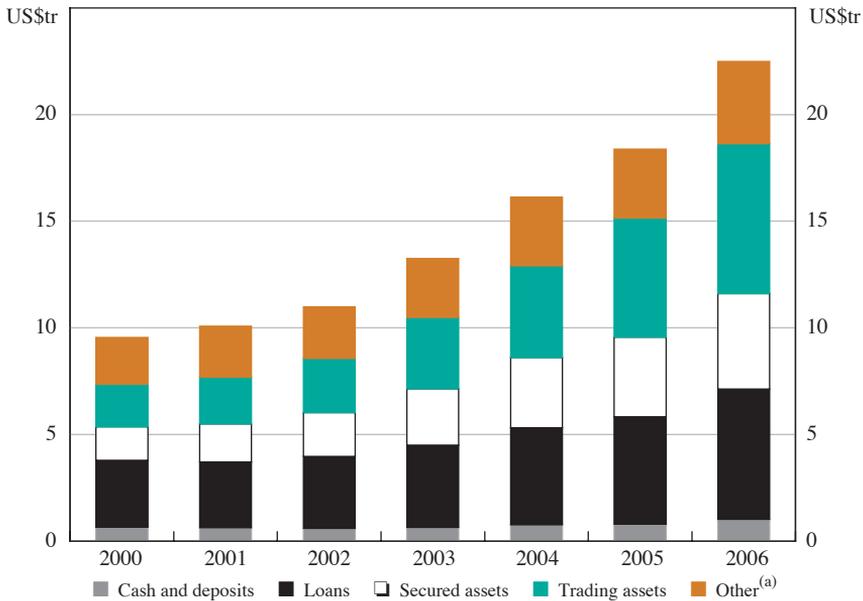
Arms-length financing can bring some advantages for the system as a whole. Credit risk can be dispersed amongst a wider range of investors, helping to reduce the concentration of exposure. Moreover, risk can be transferred to those with high tolerance or capacity to absorb it. In theory, credit risk could be moved away from the core settlement banks, thereby protecting the payments system from major credit shocks. But in practice, banks' balance sheets have still continued to expand rapidly in recent years – with the largest 10 UK banks tripling their total assets in the past 10 years, in part through acquisition as well as organic growth (Figure 14). Furthermore, the 16 LCFIs identified in the (April 2007) Bank of England *Financial Stability Report* (FSR) have more than doubled their balance sheet since 2000, supported by a large increase in holdings of trading assets – in part due to greater proprietary risk-taking, but also reflecting increased warehousing of assets supporting 'originate and distribute' activity (Figure 15).

Dispersed credit risk though does have potential costs. A lender with a concentrated exposure to a creditor has a powerful incentive to screen and monitor credit risk. The incentive weakens as risk becomes more and more dispersed. So greater arms-length

**Figure 14: Major UK Banks' Total Assets**



Source: UK banks' published accounts

**Figure 15: LCFIs' Total Assets**

Notes: The group of LCFIs (large complex financial institutions) includes 16 of the world's largest banks and securities houses that carry out a diverse and complex range of activities in major financial centres, chosen on the basis of their importance to UK banks and the UK banking system.

(a) 'Other' includes (among other items) receivables, investments, goodwill and property.

Sources: Bank of England; Thomson Financial; US Securities and Exchange Commission filings; LCFIs' published accounts

financing may well weaken credit assessment across the system as a whole.<sup>5</sup> And increased reliance is likely to be placed on specialists such as rating agencies.

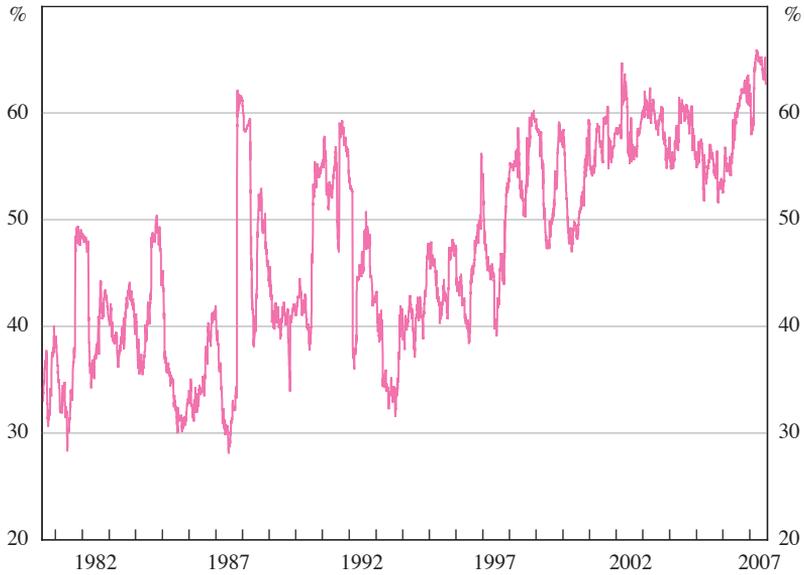
Increased use of securitisation as a funding source and risk management tool is also changing the nature of liquidity risks in the banking sector (IIF 2007). Historically, banks have been vulnerable to liquidity runs because they have had liquid deposit liabilities but illiquid loan assets. Securitisation affects this vulnerability in a number of ways. First, the mismatch in maturity between assets and liabilities is lessened if long-dated assets are typically sold. Second, banks can now sell down loans they retain on their balance sheet if they come under pressure in normal market conditions, as securitisation has created a market for what were previously illiquid assets (though care, of course, is needed to avoid any impression of weakness or a 'fire sale'). Third, banks can originate a large volume of loans from a given base of customer deposits and capital by turning over their balance sheet more quickly. Typically, originated

5. Reputational risk ensures that banks continue to have some incentives to assess credit risks properly. In addition, the market may expect them to retain some residual exposure to the loans they securitise – although banks could hedge some of this exposure through the credit derivatives market.

assets awaiting securitisation are built up in ‘warehouses’ financed by wholesale deposits. These deposits are generally less sticky than traditional customer funding. So while assets are more liquid, liabilities may be too, placing additional emphasis on active liquidity management and contingency funding arrangements.

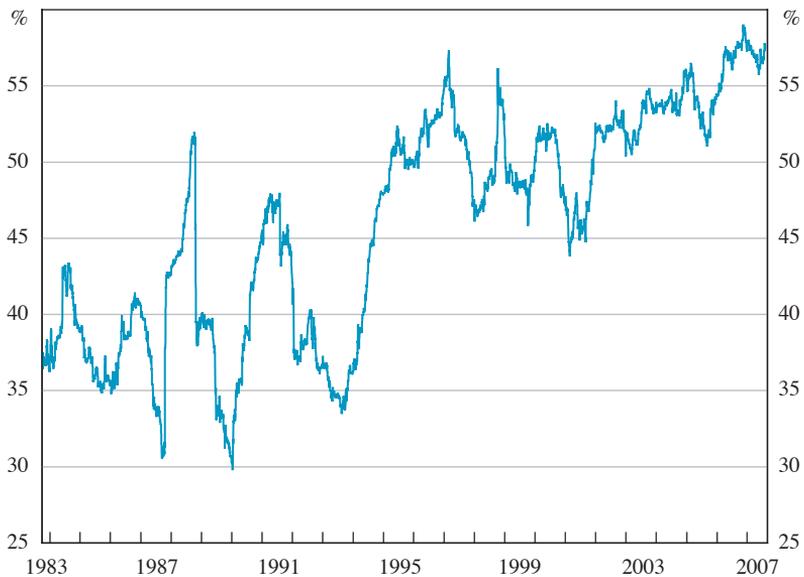
There has to be some difference of opinion to make a market, but not too much. Indeed Governor Warsh of the US Federal Reserve recently described market liquidity as synonymous with confidence (Warsh 2007b). However, market liquidity is potentially fragile if there are changes in fundamentals that increase uncertainty, because liquidity does not depend solely on a trader’s expectations about the change in risk but also reflects his or her beliefs about the expectations of other traders (and so on). A trader will be cautious about committing to buy a financial asset at a price they regard as fair, if they judge that other traders will consider it too high and so expect the price to fall further. This strategic behaviour may amplify shocks and lead to traders requiring a higher risk premium. Indeed it may lead them to take themselves out of the market entirely in response to adverse news. As a result, liquidity can quickly evaporate from markets in response to a fundamental shock (especially to expectations) and these dynamic reactions can contribute to the fatness of tails in the distribution of returns. If there is a corresponding flight to quality, there can also be sharp movements in the correlation between financial products. Market liquidity risk is therefore inherently difficult to price and manage.

The increase in institutions’ and investors’ cross-border activity is also leading to greater synchronisation and correlated movements across international markets. Through greater spreading and shifting of risks to holders overseas, domestic markets may thus be less vulnerable to country-specific shocks. But by the same token, increased globalisation of markets has raised the scope for spillover and contagion between markets, reducing the benefits of diversification as market synchronisation has increased. For example, the first principal component of equity returns across the US, UK, Japanese and euro area exchanges has increased from about a third in 1980 to around two-thirds (Figure 16), while a similar measure of the co-movement in changes in nominal bond yields has also increased strongly (Figure 17). Moreover, co-movement tends to rise sharply during times of severe stress, such as at the time of the 1987 stock market crash, as investors collectively seek to reduce exposure to higher-risk assets across the board, leading to pressure on market liquidity.

**Figure 16: Co-movement in International Equity Prices**

Note: First principal component of equity price changes in the S&P 500, FTSE 100, TOPIX and CDAX exchanges

Source: Thomson Financial

**Figure 17: Co-movement in International Bond Prices**

Note: First principal component of nominal price changes in euro area, Japanese, UK and US 10-year nominal yields

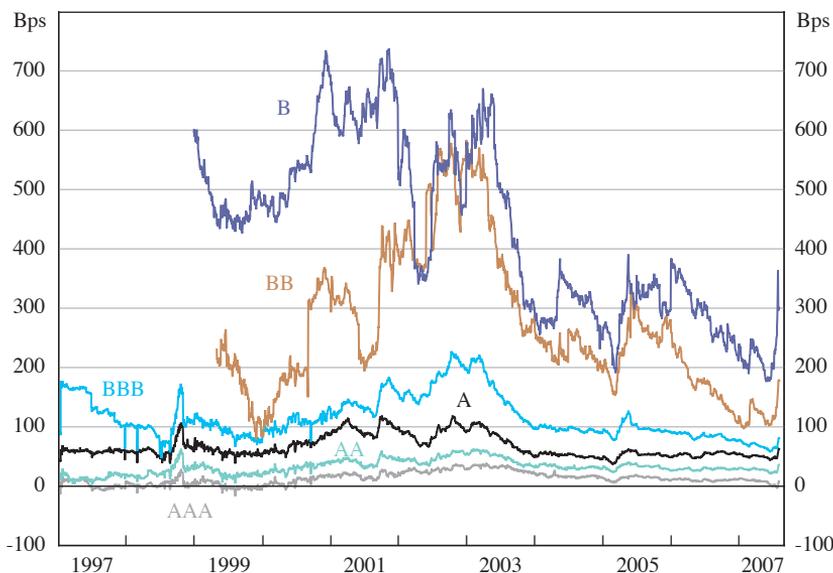
Source: Thomson Financial

## 5. Looking Forward – Issues and Risks

So how have these changes affected the performance of the financial sector in recent years, and what issues and risks do they raise looking forward? Financial institutions have been highly profitable in recent years. Economic conditions have been generally benign – strong global growth and low macroeconomic volatility have supported corporate profits and household disposable income. Moody’s report that global corporate default rates remain around their lowest levels since their series began 25 years ago. So corporate credit losses have been very low by historical standards. Credit premia have narrowed substantially in recent years, notwithstanding the marked increase of spreads very recently as conditions have tightened (Figure 18). Banks and other investors (such as institutional funds and hedge funds) have consequently made large mark-to-market profits on asset holdings in recent years. Very high financial market activity has also supported trading income and fee income.

Some of the gains made by the financial sector in recent years are consequently likely to be one-off, reflecting the adjustments in asset prices to an environment of lower macroeconomic volatility and sustained low inflation, supported by the remarkable pace of financial innovation and financial deepening, and, until very recently, the buoyancy of market liquidity, itself linked partly to accommodative monetary conditions which have now been largely unwound. Strong global liquidity conditions in recent years have reduced the return to the standard liquidity transformation function of the banking system. Low liquidity premia have encouraged banks to shift down the liquidity spectrum and/or increase the amount of market and

**Figure 18: UK Corporate Spreads by Credit Rating**



Source: Merrill Lynch

credit risk they are prepared to take. And this search for yield has encouraged firms to write protection against a wider range of financial market outcomes.

While a number of structural forces supporting greater financial deepening are likely to continue, such as the pressure to exploit economies of scale described above, and the extensive opportunities in emerging economies, the future environment for the financial sector is unlikely to be as benign as in recent years (Bank of England 2007).

The current situation in financial markets is illustrating some of the key risk management challenges, in particular the importance of collective behaviour and the scope for sharp price adjustments if confidence and market liquidity are jolted.

In advance of the current market turbulence, the compensation for taking future risk had fallen sharply given the marked narrowing of credit risk and liquidity premia in recent years. That, of course, presented no issues if the reduction in compensation had matched the reduction in perceived risks. But, in practice, as highlighted in Bank of England FSRs and elsewhere, there were reasons to suspect that this was not the case, as investors were seeking additional yield and market frictions were limiting full arbitrage.

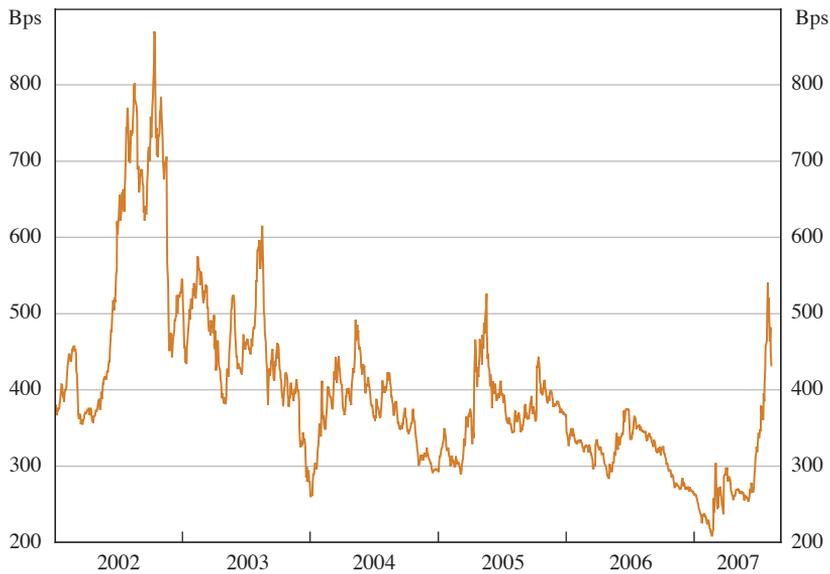
Before the recent correction in credit markets, a persistent theme from many market contacts was that the compensation for credit risk was too low in their view. Yet at the same time, the contacts judged that it was in their optimal long-run business interest to retain an active presence in the market, at the cost of running additional financial risk. That would enable them to maintain placings in league tables and thus avoid losing market share against their peers. Short-term performance targets for compensation purposes may have added to the incentives to remain with the herd and raised the costs of taking a contrarian position to provide effective market arbitrage. As noted in recent Bank of England FSRs, this collective behaviour increased systemic financial risk. The potential for a sudden, and potentially sharp, reversal in low risk premia was raised. Individual firms appeared to be overly confident of their ability to exit positions at limited cost, failing to take full account of the collective impact of a change in sentiment on market prices given the potential evaporation of market liquidity as other risk holders rushed to hedge or exit positions. That is one reason why the Bank's judgment in the April FSR was that the vulnerability of the system as a whole to an abrupt change in conditions had increased, notwithstanding the judgment that the system remained highly resilient.

Although events are still unfolding, the recent sharp correction in financial markets in response to a reappraisal of credit risks and the valuation of complex credit products, in the wake of the losses in the US sub-prime markets, demonstrates the importance of market liquidity and the scope for market adjustments to be amplified by collective behaviour in response to shocks.<sup>6</sup> It also demonstrates the importance of strong credit assessment as fundamental values are reasserted in the longer run,

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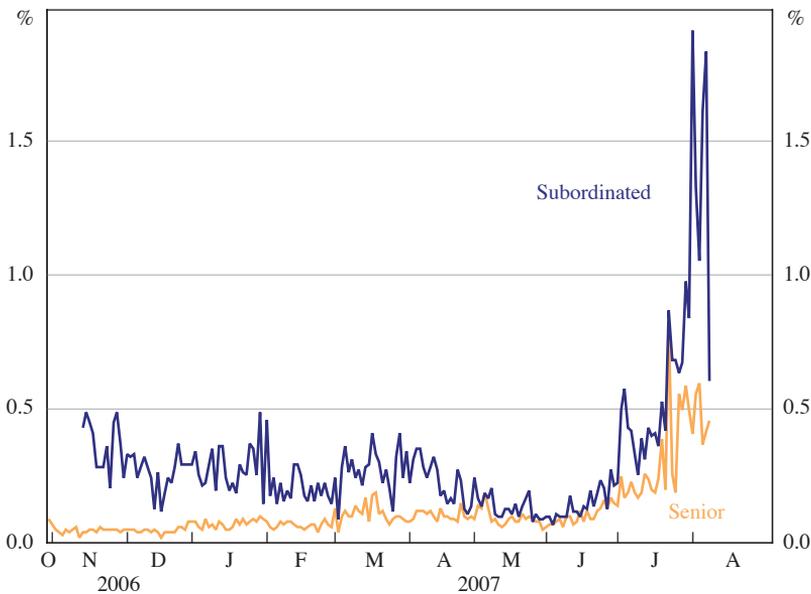
6. As highlighted by the sudden spike in the price of credit insurance on high-yield corporate debt (Figure 19) and by the sharp rise in the bid-offer spread on an index of leveraged loans (Figure 20). See also Bank of England (2006).

**Figure 19: North America CDX High Yield**  
5-year on-the-run spreads



Note: CDX is the umbrella term for the family of credit derivative indices for North American and emerging-market entities.  
Source: JPMorgan Chase & Co

**Figure 20: Bid-offer Spread on Leveraged Loans**



Notes: Bid-offer spread on the LevX 5-year index as a percentage of current mid-price. The senior index comprises 1<sup>st</sup> lien leveraged loan CDS; the subordinated index comprises 2<sup>nd</sup> and 3<sup>rd</sup> lien leveraged loan CDS.  
Sources: Bank of England; International Index Company

and, finally, the greater dispersion of risk internationally as losses are spread across a wide range of financial firms and investors.

Looking forward, sustaining the pace and rents from financial innovation might prove challenging, as margins on new products are quickly bid away and there are likely to be diminishing returns to increased complexity. Indeed, before the recent market turbulence, contacts were reporting that the arrangement fee and margin on a vanilla RMBS/CMBS had been depressed to such a point that the business was often seen by banks as a loss-leader, and was only undertaken in order to gain fees and commissions from related business. Moreover, question marks over the reliability of valuations of complex products such as CDOs given very thin and illiquid secondary markets have, at least temporarily, dulled the appetite for the more complex and risky instruments. Nonetheless, pressure to innovate is likely to intensify once again in the medium term, given strong global competition in financial markets.

As competition in global financial markets continues to increase, risk-adjusted returns are likely to fall, absent a further stream of major innovations that warrant exceptional returns for a time. It is worth recalling a basic economic principle that super-normal profits are not necessarily a good measure of financial stability. Indeed, from a baseline of fully competitive markets, high profit growth would be an indicator of increased risk-taking. As Bank of England Governor, Mervyn King, put it in his recent Mansion House speech: 'Higher returns come at the expense of higher risk' (King 2007). That is an old adage worth holding onto.

So how are these market developments affecting the risks to systemic financial stability? On the one hand, financial innovation and greater cross-border integration have facilitated the management and dispersal of risks, improving risk allocation and lowering sectoral and regional risk concentrations. Moreover, the growth of new investors, such as hedge funds, prepared to take contrarian positions, has added to market liquidity under normal conditions. These factors are likely to have strengthened the resilience of the financial system to withstand small-to-medium shocks, as such shocks are more readily dissipated. But, equally, innovation and integration have extended the ties between financial firms within and particularly across borders. In the event of a very large adverse shock these ties could consequently act as a conduit to transmit problems rather than to absorb them. And in such conditions, a lowering of the appetite for risk and pressure for withdrawals from investors could lead to asset managers increasing their liquidity buffers and thus adding to the drain on market liquidity.

## **6. Challenges for Financial Stability Authorities**

As highlighted in the earlier sections, innovation and the major structural changes in financial markets in recent years have delivered considerable benefits to consumers and users of financial services. A wider choice of financial products with much greater flexibility of terms and conditions is on offer for both savers and borrowers. And competition has enhanced efficiency and lowered costs. As recently discussed

by Governor Warsh, these developments have added to the depth and completeness of markets and to value-added and economic welfare (Warsh 2007a).

Yet, as also highlighted above, the financial system is a highly interdependent network and prone to microeconomic distortions arising from asymmetric information. Failure of a major institution may readily spill over to other parts of the financial system through direct credit linkages, through indirect channels such as the impact of failure on the value of common asset holdings or exposures, and through more nebulous channels such as the impact on confidence. More broadly, the consequences of the failure of a major institution on the financial system as a whole are likely to be much larger than on the institution itself, providing the standard justification for regulatory intervention to align the incentives facing financial institutions with public policy goals.

So how have the forces of innovation and integration affected the challenges for public authorities in preserving financial stability?<sup>7</sup> We would briefly highlight the importance of four areas of work in particular:

- First, improving the understanding of systemic risk and developing a robust toolkit to assess and analyse risks to financial stability remains a formidable challenge. Although stress-testing offers a promising avenue, the current state of the art is some way short of ideal. In particular, current approaches typically place relatively limited attention to default, to contagion risks and to system responses and interconnections. But of course these elements lie at the heart of episodes of major instability and financial crisis. At the Bank of England we plan to address this deficiency by developing a suite of models that focus more particularly on network links and financial system responses to shocks (for example, on liquidity and credit supply) (Jenkinson 2007a). This suite should aid our analysis and judgments. But it will also be essential to complement this analytical work with high-quality market intelligence to ensure that our assessment is grounded in a good understanding of rapidly evolving, complex financial markets (Haldane, Hall and Pezzini 2007). That is inevitably challenging given the pace of innovation and structural change.
- Second, delivering effective capital and liquidity buffers. An improved assessment of the threats to financial stability should assist the authorities in identifying areas of vulnerability and weakness in the system to address in conjunction with financial firms. One important strand of work is setting standards for capital and liquidity buffers to provide protection to the system as a whole. In recent years, attention has been focused on the development, and now implementation, of the Basel II capital standards. The new standards have improved the risk sensitivity of capital levels to the spectrum of risks faced by banks. Moreover, as emphasised earlier, market and funding liquidity risks are increasing in importance given the growth of capital markets, of securitisation, and of the originate and distribute model of banking. That in turn raises the importance of liquidity standards and supervision.

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7. See Bernanke (2007).

- Third, promoting resilient financial market infrastructure. As financial institutions and private agents rely increasingly on financial markets to trade, manage and hedge risks, the importance of reliable, robust infrastructure for trading, payments, clearing and settlement is paramount. However, there are a number of market failures such as network externalities and the tendency for natural monopoly, as well as collective action problems, which imply that the private sector alone may underinvest in infrastructure resilience, and provide a role for public sector intervention to ensure that broader social welfare objectives are captured (Jenkinson 2007b).
- Fourth, improving international financial crisis management planning. The sharp growth in global financial business and in cross-border financial consolidation, together with the increased pace of capital market activity, has increased the complexity and difficulty of managing and resolving any emerging financial crises. As noted above, though market developments may have lowered the likelihood of crises, they have, at the same time, increased the probability of a crisis spilling across borders should one occur. That places a premium on strengthening dialogue and preparations among authorities which may share common problems (Gieve 2006), for example, through the formation of interest groups.<sup>8</sup>

## 7. Conclusion

Deregulation and technological change have unleashed tremendous competitive forces on the global financial system in recent years, resulting in enormous growth and innovation in the provision of financial services. That has provided substantial benefits to the wider economy by providing households and corporations a much wider menu of instruments with which to borrow, lend and manage risk, though at the same time the broadening of choice and exposure to new risks has increased the premium on high-quality financial advice and knowledge. The breakdown of barriers to the supply of financial products and the large volume of risk pooling and shifting within and across borders have increased the interconnections and integration within the financial system as well as adding to the complexity of the system. Understanding and addressing the risks in an increasingly integrated and increasingly global financial system is a major challenge for financial institutions and financial stability authorities. Meeting these challenges is crucial to ensure that risks are contained and that the manifold benefits of innovation and integration in financial markets can be sustained.

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8. An example of this is the Trans-Tasman Council on Banking Supervision, which brings together the relevant authorities in Australia and New Zealand.

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## *Discussion*

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### **Jonathan Fiechter**

The turmoil in financial markets in recent weeks has demonstrated the value of conferences like this. They provide a chance to take stock of trends and emerging practices in our financial systems and to exchange views on the implications of these practices for financial stability.

Nigel Jenkinson and his two co-authors have produced a timely and thoughtful paper. As shown in Nigel's presentation, financial innovations, including structured finance products and financial derivatives, have led to a rapid growth in financial assets over the past 15 years, far in excess of the growth rate of the real economy.

A primary question for this session, and an issue likely to be debated in many capitals around the world in coming months, is whether financial innovation and the world of 'unfettered finance', to borrow Martin Wolf's description, contribute to financial stability. Credit risk that once might have been concentrated locally is now sliced and diced and distributed broadly across the globe. Is this a good thing?

In my brief comments, I want to focus on the effect of structured finance, and in particular, the securitisation of residential mortgages, on financial stability. I want to expand on the discussion of the effects of asset securitisation – what is referred to in Nigel's paper as 'arms-length financing'. My comments may be equally applicable to other types of credit but given the time constraints, I want to focus on residential mortgage finance.

I agree fully with Nigel's conclusions that financial innovations and structured finance have transformed the credit granting process. I also agree that financial innovation has the potential to improve the overall performance of our financial system.

But I take a more cautionary stance in assessing to what extent financial innovation has provided substantial benefits to the overall economy. My proposition is that securitisation and the development of structured finance have resulted in an increase in the overall level of risk in the financial system.

Let me be clear, upfront, that a higher level of risk in the financial system is not necessarily a bad outcome, so long as it is properly understood, valued and priced.

I readily accept the many benefits that arise from being able to structure credits in a way that allows them to be spread across a broad investor base. But I believe we are still learning the extent to which the structured finance process has transformed the nature of the credit intermediation function.

I would like to make three observations to amplify these points.

My first observation is that the growing complexity of financial instruments and financing structures, such as collateralised debt obligations (CDOs), has exceeded the ability of many of us to understand the underlying risks. Many of these instruments

and structures are not well understood in the market, have complex features that are difficult to model and, until recently, had not been tested in an environment of tight liquidity and a material level of defaults of the underlying assets.

I doubt that the ultimate investors in the various tranches of many of the new structured finance products fully understand the performance characteristics and default probabilities of the assets backing up the securities.

To illustrate this point, I would like to share with you the experience of a friend of mine who has been in the mortgage business for decades as a mortgage aggregator. He purchases pools of residential mortgages, subject to the individual loans meeting certain quality benchmarks. He has a team of analysts and with the aid of an expensive software program, the team analyses the default probability and loss potential of each mortgage loan based on factors such as the neighbourhood in which the property is located, the health of the local economy and the financial characteristics of the borrowers. In the past, he might typically have rejected about 5 per cent of the mortgage loans in the pool. Over a year ago, he reported that his rejection rate had risen to around 40–45 per cent. As a result, he dropped out of the securitisation business. When he notified the bankers who were selling him the mortgages of his decision, they told him it was not a problem – that it was easy to sell these loans to other securitisers.

This highlights a fundamental question regarding structured products. Is it really practical for an investor in a CDO, which may include various tranches of mortgage-backed securities, to go through the same type of analysis of the underlying mortgage loans that my friend went through? Rather than having whole loans to analyse, the CDO may be comprised of the riskier tranches of the mortgage-backed securities. Given the difficulty of analysing or placing a value on a CDO, it is likely that many investors in CDOs end up placing significant reliance on the credit rating of the CDO and the name and reputation of the entity that has set up the CDO.

A key question then is whether there are steps that could be taken to improve the transparency of CDOs and methodologies to facilitate more accurate valuations.

My second observation is that when the underlying mortgage assets default, loan workouts under these CDO structures will be far more difficult than for a portfolio lender or under a plain vanilla mortgage-backed security structure. As a result, models which rely on the historical default and loss rates of residential mortgages held in portfolio may underestimate the losses that may arise for mortgage loans that have been securitised.

When there is a general downturn in the economy, a banker (or mortgage insurer) will immediately contact borrowers who miss one or more monthly payments, and attempt to restructure the loans with the objective of keeping the borrowers in their homes. There is a well-accepted axiom in the lending business that the first loss is the best loss. In fact, pro-active bankers will identify ‘at-risk borrowers’ and contact them in advance of default to restructure the loans. Portfolio lenders in the US are quietly doing this right now for residential mortgage borrowers they deem as high-risk.

But for loans that have been packaged under these more complex financing structures, there are many more parties of interest. It may be more difficult to get the pre-approval of investors in the various tranches (each with a different default exposure) to permit the loan servicer to enter into negotiations with an at-risk borrower who has not yet defaulted on a loan. And not surprisingly, loan servicers, with limited credit exposure and no ongoing relationship with the borrower (unlike a portfolio lender), may be less aggressive than portfolio lenders in pursuing problem borrowers.

As a result, it may be that the historical probabilities of default and losses given default of mortgage loans held by portfolio lenders are not applicable to mortgage loans that have been securitised. Under the new financing model, the incentives (and ease) of working with troubled borrowers may no longer be the same.

My third observation relates to a statement in the paper that ‘... primitive risk does not disappear through financial engineering’. For a given level of credit risk in the financial system, spreading the risk ‘a mile wide and inch deep’ has obvious benefits. Because the credit risk is no longer concentrated in one or more lenders, the default of a pool of mortgage loans or credit cards or the failure of a large corporation no longer poses the same risk to individual institutions. Instead, the risk is spread across a number of investors in small bites.

But because the pain of a default is spread so widely, there has been an observable increase in the willingness of lenders to extend credit to higher-risk individuals and corporations so long as they are able to transfer some or all of the credit risk. If a mortgage broker, who earns fees based on the volume of loans originated, is several steps removed from an investor, then that broker may be more willing to extend credit further out on the risk curve to higher-risk borrowers. Similarly, a lending officer will have an easier time getting loans approved by the bank’s credit committee when the loans are being originated for sale rather than for the bank’s balance sheet.

I would posit that the result has been an increase in the overall level of credit risk being underwritten in the financial markets as borrowers that in the past might not have qualified for bank credit were granted loans. It is beneficial to society and to economic growth to broaden the range of borrowers with access to formal financial credit. And of course, there is nothing wrong with the provision of credit to weak borrowers, be they corporations or individuals, so long as both parties understand the risk and the credit is priced accordingly.

But the securitisation of financial credit may also have led to a loosening of underwriting standards. The combination of high levels of investable funds (easy money) and the insulation of the underwriting process from the assumption of credit risk appears to have resulted in reduced underwriting discipline. This has enabled the production of a high volume of loans that carry a high risk of default.

Mortgage loans that include features such as no income verification for the borrower (so called ‘no-doc’ or ‘liar’ loans), 100+ per cent financing (often in the form of ‘piggyback’ loans that combine a first and second loan), starting rates of interest at below-market rates (‘teaser rate’ loans), and monthly payments that do

not cover interest owed (negative amortisation loans) are not new. Portfolio lenders have offered loans that contained one or two of these features to select borrowers such as high net worth individuals or professional real estate investors for years. There have been few, if any, problems.

But in the past several years, the use of these instruments has exploded in response to a willingness on the part of the capital markets to purchase these ‘affordability’ mortgage loans even when issued more broadly to the general public. And more problematic, these mortgage loan features have been layered on top of each other. More curiously, the capital markets assigned a relatively small risk premium to securities comprised of these ‘affordability’ loans even when they were made to borrowers with tarnished credit histories – the so-called sub-prime category. Until recently, the demand from the capital markets for mortgage products appeared insatiable.

As a result, in the past several years, borrowers have been given access to loan amounts well in excess of what they might have qualified for in years past. While such loans are too risky for most portfolio lenders, the concern appears to have been reduced for loans that were originated, securitised and sold to a third party. A question for all of us from a public policy perspective is: what are the consequences when underwriting standards for loans originated for sale and distribution are less rigorous than those applied by lenders for their own portfolio? Is there a relevant role for government to step into?

This question is well illustrated by the very popular 2/28 and 3/27 loans. These are mortgage loans for which the initial interest rate is fixed for two or three years at a below-market rate of interest. After the initial two- or three-year grace period, the interest rate is reset (by as much as 400 to 600 basis points) to the fully indexed rate. Some borrowers taking out these loans were qualified on the basis of the initial teaser rate rather than the fully indexed rate. An implicit assumption of such a loan was that the borrowers would refinance before it resets to the higher rate – hence, they were sometimes referred to as ‘bridge’ loans.

All of this points to a potential vulnerability in the ‘originate and distribute’ model – an apparent reduction in credit underwriting standards. Interestingly, the disruption appears to have been greatest in the money markets of the developed countries. As markets re-price some of the riskier securities, it will be interesting to observe any changes that are demanded by investors and lenders related to the level of transparency of structured products, the retention of risk by loan originators, the equity contribution by the sponsor, etc.

# Banking Concentration, Financial Stability and Public Policy

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Kevin Davis

## Abstract

Although widespread industry consolidation over recent decades has resulted in a decline in the number of smaller banks, there has been little overall increase in various indicators of concentration. Technological and regulatory change suggest that ongoing consolidation will continue to reduce the number of smaller banks, and that large multinational banks will play an increasing role in domestic banking markets. More foreign and mid-sized domestic competitors may reduce concerns about the effects of concentration on competition but raise important issues for prudential policy and financial stability. Unfortunately, academic research on bank concentration provides limited guidance for policy-makers in countries such as Australia, where a handful of banks dominate the financial sector. Some of those policy issues and their interrelated nature, as they apply to Australia, are examined in this paper in the light of the available evidence.

## 1. Introduction

The structure of the banking sector has long been an issue of policy interest focused largely around a presumed tendency towards concentration and its effects upon economic efficiency, bank profitability, financial and hence macroeconomic stability. There has been greater tolerance of concentration in banking than in other industries, because of a presumed benefit of increased financial stability. Of 105 countries for which data on bank concentration were available for 2005, 85 had three-firm concentration ratios above 50 per cent, 53 above 75 per cent, and 31 above 90 per cent.<sup>1</sup>

The topic has remained at the forefront of debate in recent years for several reasons.<sup>2</sup> Within many national banking markets there has been substantial consolidation, reflecting influences such as regulatory and technological change. There has been substantial merger activity among large banking groups (including cross-border expansion), raising the issue of the impact of increased concentration both at a global and national level. At the same time, central banks and prudential regulators have responded to recent international experience of financial crises with an increased focus upon financial stability. Academic research into the implications for efficiency, stability and economic growth of alternative financial system structures

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1. Based on data in World Bank (2006).

2. For example, a major study of trends in financial consolidation was undertaken by the Group of Ten (G10 2001).

has grown markedly, both at the theoretical level and through empirical analysis based on the recent development of relevant cross-country databases.

A focus upon banks is not surprising, given their central role in financial systems. However, for several decades the boundaries between banks and other parts of financial markets have been blurring as banks have expanded into other activities including in securities markets, funds management and insurance. Other types of financial institutions have emerged, most recently hedge funds and private equity groups, albeit with significant involvement of large banks. These developments have served to further focus attention on the role of large banking groups in financial sector stability.

This paper addresses several questions with an objective of contributing to policy formulation regarding financial sector concentration in Australia. First, what does the empirical evidence suggest about trends in banking sector concentration? Second, do the economics and technology of banking mean that high concentration is inevitable? Third, what does the extant literature say about the impact of banking sector concentration and financial sector structure on financial system stability? Fourth, how should Australian policy-makers approach the issue of concentration in banking?

The main premise of the paper is that increasing contestability of domestic banking markets by multinational banks is changing the nature and policy implications of banking sector concentration for many countries. Large foreign banks, if permitted to compete in domestic retail and business banking markets, can provide an effective competitive counterweight to large domestic banks. Since Basel II (or the competitive advantages arising from sophisticated internal risk-rating models being implemented by large banks) may reduce the (already tenuous) competitiveness of small authorised deposit-taking institutions (ADIs), removing remaining impediments to access by foreign banks should be a prior step to any review of bank merger restrictions currently applying in Australia.

An increased role for large multinational banks in domestic banking markets requires a number of issues to be addressed by financial regulators. These include protection of depositors and resolution processes for large banks in financial distress. Since these issues would become more pressing were large Australian banks to merge, they also warrant attention prior to any review of bank merger restrictions.

Unfortunately, should a review of bank merger restrictions be warranted, there is relatively little policy guidance to be gained from either theory or evidence for countries such as Australia with high bank concentration ratios.

## **2. Trends in Banking Concentration**

Banking sector concentration can be considered at global, national or regional levels. Analysis is complicated because banks operate in multiple product markets which can have geographical boundaries ranging from small communities to the world economy. In both traditional banking products and other activities they are subject to varying degrees of competition from other types of institutions.

Table 1 illustrates the dramatic growth in the size of the world's largest banks over the past two decades. The 'top ten' institutions have varied substantially over time, reflecting both individual fortunes and developments (including exchange rate movements) in their home economies. Between 1985 and 1995, the ratio of the top ten banks' assets to world GDP fell from 25.7 to 22.5 per cent. However, between 1995 and 2004, it increased to 35.3 per cent as the banks' annual asset growth rate of 8.8 per cent outstripped world GDP growth of 3.8 per cent.<sup>3</sup> The largest bank's size increased from assets of 2.6 per cent to almost 6 per cent of the Group of Seven (G7) countries' GDP.<sup>4</sup> In 2005, the two largest banks (as measured by assets) were banks which had not featured in the top ten the previous year.

This increase in the size of the largest global banks has outstripped the growing importance of the financial sector overall, and suggests increased global concentration in the financial sector. For example, between 1995 and 2004 the top ten's ratio of assets to G7 GDP increased by 66 per cent while total bank assets to GDP increased by 15.5 per cent.<sup>5</sup> Some of this difference could reflect the expansion of the largest global banks into other activities but this does not appear to be the complete explanation. For example, in the United States the increase in the ratio of assets to GDP of all financial institutions was only 19 per cent, while the same ratio for banks increased by 13 per cent.

The data thus suggest that there has been an increase in the concentration of financial wealth under the control of the world's largest banks in the past decade.<sup>6</sup> While they still have a relatively small share of global bank assets, and there are regular changes in rankings by size, their importance for competition and stability in both global and multiple local financial markets creates an ongoing policy challenge involving a need for increasing coordination between regulatory authorities across countries.

Turning to domestic banking markets, overall there is no apparent trend towards increased concentration. Figure 1 plots the three-firm concentration ratios for various countries for 1995 and 2005. For the OECD countries, significant increases in concentration are observable in Switzerland and Spain, and to a lesser extent in Portugal and Norway (which were already highly concentrated), but a number of countries also experienced significant declines in concentration. One factor contributing to this development has been the growth in cross-border banking, particularly in Europe as a result of the European Economic Community initiatives towards developing a

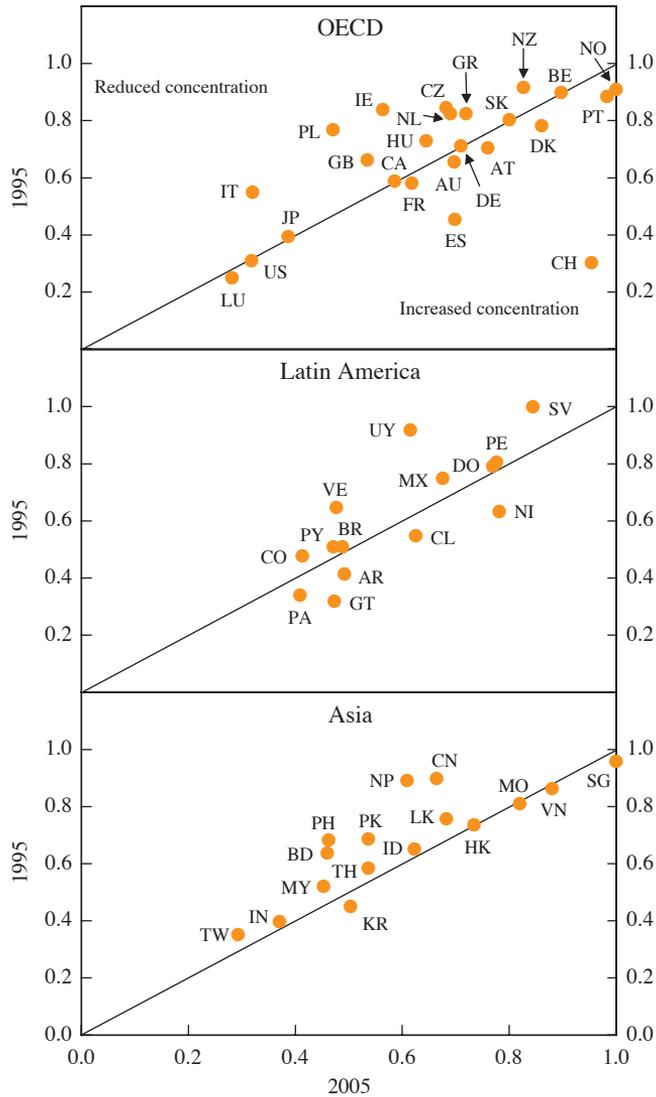
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3. These calculations use current price GDP in US dollars sourced from the IMF's *World Economic Outlook* database. Similar trends exist if PPP-based figures or GDP for the G7 countries are used.
  4. The growth rate of the largest bank in 2004 (UBS) was substantially more – since it did not even rank in the top ten in 1995.
  5. An (unweighted) average using data sourced from World Bank (2006).
  6. Also significant is the fact that the asset totals include those arising from activities such as wealth management. Indeed, two of the three largest banking groups in 2005 (Barclays and UBS) rank significantly lower (14<sup>th</sup> and 16<sup>th</sup>) when measured by equity, reflecting the relative importance to them of such 'low capital intensity' activities.

**Table 1: World's Largest Banks by Assets**  
US\$ billion

|    | 2005                           | Bank          | 2004                   | Bank          | 1995                 | Bank            | 1985         |
|----|--------------------------------|---------------|------------------------|---------------|----------------------|-----------------|--------------|
| 1  | Barclays Bank                  | 1 587         | UBS                    | 1 553         | Deutsche Bank        | Citicorp        | 167          |
| 2  | Mitsubishi UFJ F.G.            | 1 585         | Citigroup              | 1 484         | Sanwa Bank           | Dai-ichi Kangyo | 158          |
| 3  | UBS                            | 1 563         | Mizuho Financial Group | 1 296         | Sumitomo Bank        | Fuji Bank       | 142          |
| 4  | HSBC Holdings                  | 1 499         | HSBC Holdings          | 1 277         | Dai-ichi Kangyo Bank | Sumitomo Bank   | 136          |
| 5  | Citigroup                      | 1 494         | Crédit Agricole        | 1 243         | Fuji Bank            | Mitsubishi Bank | 133          |
| 6  | BNP Paribas                    | 1 484         | BNP Paribas            | 1 234         | Sakura Bank          | BNP             | 123          |
| 7  | Groupe                         | 1 380         | JPMorgan Chase         | 1 157         | Mitsubishi Bank      | Sanwa Bank      | 123          |
|    | Crédit Agricole                |               |                        |               |                      |                 |              |
| 8  | Royal Bank of Scotland Group   | 1 334         | Deutsche Bank          | 1 144         | Norinchukin Bank     | Crédit Agricole | 123          |
| 9  | Bank of America                | 1 294         | Royal Bank of Scotland | 1 119         | Crédit Agricole      | BankAmerica     | 115          |
| 10 | Mizuho F.G.                    | 1 268         | Bank of America        | 1 110         | ICBC (China)         | Crédit Lyonnais | 111          |
|    | <i>Total</i>                   | <i>16 494</i> |                        | <i>14 621</i> |                      |                 | <i>3 316</i> |
|    | Largest bank's assets/G7 GDP   | 5.9%          |                        | 6.0%          |                      |                 | 2.1%         |
|    | Top 10 banks' assets/G7 GDP    | 60.9%         |                        | 56.2%         |                      |                 | 41.3%        |
|    | Top 10 banks' assets/world GDP | 36.9%         |                        | 35.3%         |                      |                 | 25.7%        |

Sources: Bank assets – *The Economist*, 20–26 May 2006, 'A Survey of International Banking', Survey p 4; *Eurromoney*, August 2006, 'Bank Atlas', p 80; World GDP – IMF *World Economic Outlook* database, April 2007 (<http://www.imf.org/external/pubs/ft/weo/2007/01/data/index.aspx>)

**Figure 1: Bank Concentration – Selected Countries**  
Share of assets of the three largest commercial banks



Note: See Glossary for a listing of country codes  
Source: World Bank (2006)

unified financial market. In the emerging markets of Latin America and Asia, there are also no general signs of increased concentration over this period.

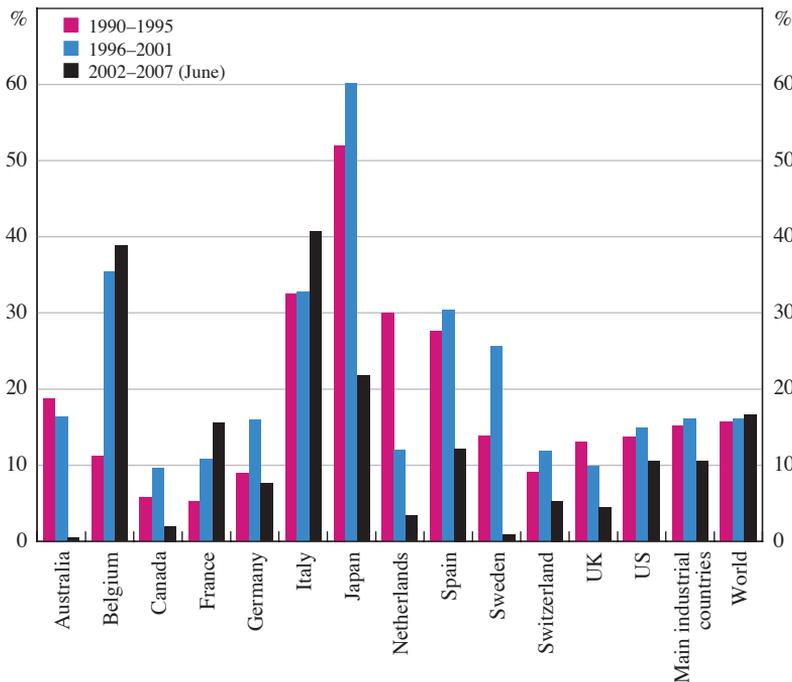
Three-firm concentration ratios provide only limited information but it is apparent from Figure 1 that national banking sectors around the globe are typically highly concentrated. The US (where the bulk of academic research on banking structure has been undertaken) is an outlier, with low concentration partly reflecting past restrictions on interstate banking. While the three-firm concentration ratio for the

US has not increased, this disguises significant consolidation in the US banking market. Between 1990 and 2005, the share of the industry's assets held by the top 100 banks increased from 68 per cent to 83 per cent, with the top ten's share of assets (domestic deposits) increasing from 25 (17) per cent to 55 (45) per cent. Around 50 per cent of commercial bank-holding companies existing in 1985 had disappeared by 2005 (Jones and Oshinsky 2007).

Figure 2 and Table 2 indicate the significance of mergers and takeovers in the banking sector worldwide over the past two decades and demonstrate a number of interesting phenomena.<sup>7</sup>

First, if the share of banking in total mergers shown in Figure 2 is compared to the financial sector's share of GDP (or employment) – which is typically in the range of 5 to 10 per cent – it is apparent that there has been relatively greater merger activity in the financial sector than in other industries, at least over the 1990s. Second, the number of bank mergers has declined since peaking at the turn of the century, but there has been a much smaller decline in the aggregate value of mergers. There have been fewer smaller institutions available as merger partners, and a greater role for

**Figure 2: Consolidation Trends in Banking**  
Banking/total mergers – by value



Note: Includes: commercial banks; bank-holding companies; savings and loans; mutual savings banks; credit institutions; real estate; and mortgage brokers and bankers

Source: Thomson Financial SDC Platinum

7. Amel *et al* (2004) present similar data for the period ending 2001.

**Table 2: Banking Merger Trends**

|                           | Number of mergers |           |           | Value of mergers<br>US\$ billion |           |           |
|---------------------------|-------------------|-----------|-----------|----------------------------------|-----------|-----------|
|                           | 1990–1995         | 1996–2001 | 2002–2007 | 1990–1995                        | 1996–2001 | 2002–2007 |
| Australia                 | 129               | 389       | 31        | 9.3                              | 25.2      | 1.5       |
| Belgium                   | 10                | 32        | 8         | 1.2                              | 33.5      | 24.8      |
| Canada                    | 40                | 248       | 17        | 3.7                              | 30.0      | 6.3       |
| France                    | 56                | 82        | 36        | 4.7                              | 56.8      | 60.6      |
| Germany                   | 24                | 69        | 27        | 5.5                              | 66.4      | 21.5      |
| Italy                     | 50                | 99        | 72        | 14.6                             | 79.1      | 94.6      |
| Japan                     | 14                | 117       | 81        | 36.4                             | 198.4     | 61.9      |
| Netherlands               | 20                | 66        | 17        | 12.6                             | 25.3      | 6.9       |
| Spain                     | 24                | 168       | 22        | 6.3                              | 42.5      | 27.6      |
| Sweden                    | 27                | 80        | 7         | 7.1                              | 25.7      | 0.9       |
| Switzerland               | 17                | 19        | 10        | 3.5                              | 27.1      | 5.6       |
| UK                        | 255               | 937       | 77        | 38.6                             | 154.5     | 40.2      |
| US                        | 1 946             | 3 091     | 1 004     | 151.8                            | 876.3     | 450.9     |
| Main industrial countries | 2 612             | 5 397     | 1 409     | 295.3                            | 1 641.0   | 803.4     |
| World                     | 3 024             | 6 472     | 4 538     | 343.2                            | 1 786.5   | 1 480.5   |

Notes: Includes the institutions listed in the note to Figure 2. The data for 2002–2007 are to June 2007.  
Source: Thomson Financial SDC Platinum

larger-scale mergers, including an increase in cross-border mergers.<sup>8</sup> As a broad generalisation, the changing size distribution of banking firms in national markets is largely the result of mergers rather than organic growth, showing up as fewer small and more mid-sized banking firms, but not in the measures of concentration considered above. Such changes may, however, show up in other measures of concentration such as Herfindahl indices.

One important feature of recent bank merger activity has been the importance of cross-border acquisitions. For the 106 countries for which data were available in a recent World Bank survey (World Bank 2007), there were 321 applications for foreign bank entry by acquisition over the five years to 2006. This compares to 592 applications for entry by establishing a branch or new subsidiary for the same set of countries.

There is little obvious evidence of any relationship between concentration and foreign penetration of domestic banking markets.<sup>9</sup> Table 3 presents data for

8. In Australia, for example, a large proportion of the mergers reported in Table 2 were between small institutions such as credit unions.

9. While advances in technology may make historical evidence of limited current relevance, the question of whether threat of foreign bank entry affects incumbent behaviour in concentrated domestic banking markets is clearly an important one warranting further research.

**Table 3: Foreign Bank Share and Concentration**  
End 2005

| Foreign share | Number of countries | Average foreign bank share | Average government bank share | Average five-firm concentration ratio |
|---------------|---------------------|----------------------------|-------------------------------|---------------------------------------|
| Per cent      |                     |                            |                               |                                       |
| Equals 0      | 4                   | 0                          | 4                             | 78                                    |
| 0–10%         | 18                  | 7                          | 25                            | 67                                    |
| 10–30%        | 24                  | 20                         | 20                            | 75                                    |
| 30–50%        | 17                  | 42                         | 13                            | 71                                    |
| 50–70%        | 14                  | 59                         | 13                            | 79                                    |
| 70–100%       | 21                  | 92                         | 2                             | 73                                    |

Note: Market shares and concentration measured in terms of commercial bank assets

Source: World Bank (2007)

98 countries, grouped by foreign bank market share.<sup>10</sup> For a significant number of countries, foreign banks have a large market share, but there is no obvious correlation between concentration ratios and foreign bank shares. There does, however, appear to be a negative relationship between government-owned bank market share and foreign bank market share (except for those few countries where foreign banks have zero presence).

Turning to Australia, where the four ‘majors’ dominate banking, Table 4 suggests that, if anything, concentration has been declining slightly.<sup>11</sup> Between 2004 and 2007, all indicators of the share of the four majors declined marginally, and the increased share between 2000 and 2004 can be primarily attributed to the takeover of the Colonial State Bank by the Commonwealth Bank of Australia (CBA) in 2001. The share of the four majors in the fast-growing securitisation market is relatively low, suggesting that the on-balance sheet figures understate the increasing role of other participants in lending markets. In domestic loan markets (excluding securitisation), four banks each with portfolios of more than A\$30 billion have emerged (compared to the majors with portfolios of more than A\$170 billion each) and another five each with portfolios of more than A\$10 billion. In domestic markets, those same four banks each have deposits exceeding A\$25 billion and deposits at another nine banks each exceed A\$10 billion. So, while the four majors still dominate the markets, a significant group of competitors of moderate size now exists.

These figures reflect both the growing role of foreign banks and smaller domestic banks in the Australian financial sector, with the impact of the former being particularly

10. These were countries for which data were available on each of banking sector concentration, foreign bank and government-owned bank shares for the end of 2005.

11. The Australian figures illustrate the dangers of relying on coarse measures of concentration such as the three-firm concentration ratios. For many countries, the relatively tolerable three-firm ratios tend to disguise the fact that there are one or more additional large banks, and thus may understate the true extent of industry concentration. For example, at the end of 2005, only 15 (14) countries out of 114 for which data were available had a five-firm concentration ratio for commercial banking deposits (loans) of less than 50 per cent, while 31 (28) had ratios in excess of 90 per cent (based on data from World Bank 2007).

**Table 4: Banking Concentration Trends – Australia**

|                                 | March 2000 | March 2004 <sup>(a)</sup> | March 2007 |
|---------------------------------|------------|---------------------------|------------|
| <b>Total resident assets</b>    |            |                           |            |
| All banks \$b                   | 700        | 1 107                     | 1 650      |
| Share of four majors            | 65.4%      | 68.5%                     | 64.8%      |
| <b>Amount securitised</b>       |            |                           |            |
| All banks \$b                   |            | 57                        | 109        |
| Share of four majors            |            | 24.4%                     | 23.2%      |
| <b>Gross loans and advances</b> |            |                           |            |
| All banks \$b                   |            | 729                       | 1 064      |
| Share of four majors            |            | 71.8%                     | 71.0%      |
| <b>Total deposits</b>           |            |                           |            |
| All banks \$b                   | 392        | 605                       | 843        |
| Share of four majors            | 63.9%      | 68.2%                     | 62.2%      |
| <b>Number of licensed banks</b> | 50         | 53                        | 54         |

(a) The takeover of Colonial State Bank by the CBA in 2001 accounts for virtually all of the increase in the four majors' share of assets between March 2000 and March 2004, and for around 75 per cent of the increase in their deposit share.

Source: APRA *Monthly Banking Statistics*

significant for policy-makers. Even if further consolidation of domestic entities occurs, successful entry by foreign banks may, in the longer term, offset any trend towards increased concentration. Domestic banking sectors appear likely to be increasingly shared between a number of very large multinational banks, together with smaller specialist domestic entities.

These figures also caution against reliance on ratios based on total banking assets (such as in the readily available databases commonly used). Four-firm concentration ratios for Australia calculated using domestic assets, loans or deposits (see Table 4) are substantially lower than when calculated using total assets of the banking groups.<sup>12</sup> Two factors are relevant here. First, the biggest banks have larger international operations than their smaller domestic competitors.<sup>13</sup> As can be seen from Table 5, loans and advances on the Australian books of the major banks range between 68 and 84 per cent of total loans and advances of the banking group. Second, the large banks have expanded their activities well beyond the boundaries of traditional banking. The ratio of total loans and advances to total assets of the large Australian banking groups in 2006 varied between 58 per cent (for National Australia Bank (NAB), which has significant life insurance business) to 78 per cent.<sup>14</sup>

12. For Australia, that latter figure was around 80 per cent for 2004 (higher than the figures in Table 4 by around 10 per cent).

13. It also appears to be the case that the figure for banking sector total assets used in the denominator of the calculations uses only the domestic assets of branches and subsidiaries of multinational participants.

14. Comparisons between the banks' activities within Australia are also complicated by the fact that two of the banking groups – Australia and New Zealand Banking Group (ANZ) and CBA – have non-bank subsidiaries accounting for around 10 per cent of their lending, while the other two majors – NAB and Westpac (WBC) – undertake most lending through the bank itself.

**Table 5: Major Australian Banks – Selected Financials**  
A\$ billion, September 2006

| Bank | Loans and advances |              |              | Total assets |
|------|--------------------|--------------|--------------|--------------|
|      | Domestic           |              | Global       | Global       |
|      | Bank               | Consolidated | Consolidated | Consolidated |
| ANZ  | 165.6              | 180.5        | 255.4        | 335.8        |
| CBA  | 208.5              | 219.8        | 262.0        | 369.1        |
| NAB  | 192.4              | 193.9        | 283.8        | 484.8        |
| WBC  | 195.4              | 195.7        | 234.5        | 299.6        |

Sources: banks' annual reports

### 3. Bank Concentration and Competition

Because concentration measures do not necessarily provide a good indication of market contestability, a number of recent studies of banking markets have applied techniques such as the Panzar-Rosse (1987)  $H$ -statistic. This is a measure of competition based on the estimated responsiveness of firm revenue to changes in factor input prices.<sup>15</sup> There is little relationship between this statistic and standard measures of concentration. Casu and Girardone (2006) examine banking markets for 15 European Union countries over the period 1997 to 2003 and find no evidence that their calculated  $H$ -statistics are related to concentration measures. Similar results are found by Claessens and Laeven (2004) in a study of 50 countries over the period from 1994 to 2001.<sup>16</sup> Yildirim and Philippatos (2007) find no significant link between concentration and competition (using the  $H$ -statistic) for 11 Latin American countries for the period from 1993 to 2000, but do find evidence that openness to foreign entry increases competition.<sup>17</sup>

15. The  $H$ -statistic is calculated by summing the estimated elasticities of revenue to factor prices, with a value of one indicating perfect competition, a value of zero (or less) indicating monopoly, and intermediate values indicating the degree of monopolistic competition.

16. While Bikker and Haaf (2002), in a study of 23 industrialised countries using data from the 1990s, report a negative relationship between their calculated  $H$ -statistics and concentration ratios, they do not control for variables relevant to competitive conditions such as activity and entry restrictions, which Claessens and Laeven find important.

17. This apparent lack of any relationship between measures of concentration and competition is consistent with the ambiguous results from a large literature examining whether concentration and efficiency measures such as net interest margins, operating costs and profits are related (after controlling for other relevant variables). Northcott (2004) reaches such a conclusion from a recent survey, although Canoy *et al* (2001) draw a cautious conclusion that studies based on the 1980s and 1990s do suggest a negative relationship between concentration and competition. Demirgüç-Kunt, Laeven and Levine (2004) in a cross-country study find no role for concentration in explaining net interest margins after controlling for regulatory impediments to competition and indicators of an economy's institutional characteristics, such as property rights. They also find that net interest margins are higher for banks with larger market shares, which they suggest is consistent with such banks extracting rents by use of market power.

For Australia, Claessens and Laeven calculate an  $H$ -statistic of 0.80,<sup>18</sup> which implies that the market is relatively competitive, despite the high degree of concentration. Bikker and Haaf (2002) calculate  $H$ -statistics for large Australian banks of 0.63 and 0.68 in 1991 and 1997 respectively. While these results suggest that high concentration does not impede competition in domestic banking markets, data limitations mean that the results should perhaps be treated with some caution. Consolidated data are used, thus incorporating offshore and non-traditional banking activities of the banks. Proxies for factor input costs (such as the ratio of labour expenses to total assets for unit wage costs) may be poor measures in a time of significant changes in the ways that banks deliver their services. The robustness of the calculated  $H$ -statistic – which is based on estimation techniques that assume cost minimisation – may also be questionable, since existing research (Avkiran 1999; Sathye 2001; Neal 2004) indicates quite low levels of average cost efficiency in Australian banking (relative to an estimated best-practice frontier).

Another concern is that the  $H$ -statistic was developed for single-product market industries, but in the case of banking it is applied to multi-product firms. It may not adequately reflect the state of competition (or contestability) in specific financial markets viewed as important by merger authorities such as retail and small business finance. In Australia, retail deposit and loan markets are dominated by the four majors and a small number of other domestic banks and foreign bank subsidiaries, with competition from an increasingly concentrated sector of small credit unions and building societies (CUBs), mortgage originators and securitisers, and credit card providers. The CUBs are specialised in retail (and some small business) financing, and it is instructive to compare their recent profitability with that of the banks, as shown in Figure 3.

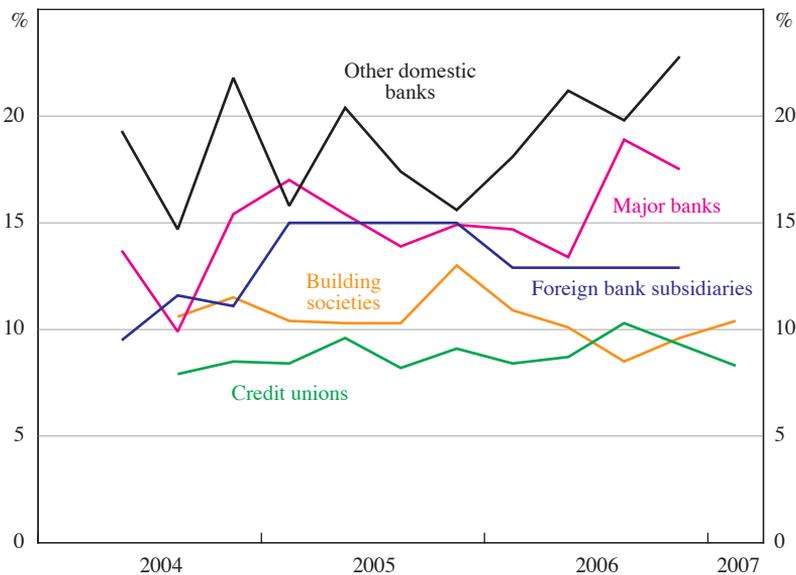
There are a number of possible explanations for the substantial gap between the rates of return of banks and CUBs. Most of the latter are mutuals, may not aim to maximise profits and operate with higher capital ratios than the banks. A higher return on equity for banks may be due to higher profitability in other markets.<sup>19</sup> The small scale of CUBs (only four of them exceed A\$5 billion in assets) may lead to higher average costs. However, the data are also compatible with an interpretation that Australian banks have been able to exploit a degree of market power in retail markets, possibly due to factors such as the limited competitive ability of the smaller CUBs, some impediments to foreign bank entry into retail finance, and customer switching costs. At the same time, however, bank interest margins have been declining (Battellino 2006) and fees charged to retail customers (while increasing in aggregate value due to increased use of banking services) do not appear to have involved increased fee rates (RBA 2007).<sup>20</sup>

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18. This is the seventh-highest value among the 50 countries studied.

19. The Australian Bankers Association (ABA 2004) estimates that retail business generates 56 per cent of the profit of the major banks (and that 66 per cent of their profit is from Australian activities).

20. Whether changes in margins and fees have fully reflected reductions in the cost of providing banking services due to technological advance is another question.

**Figure 3: Australian ADIs – Return on Equity**

Note: Annual averages are used for foreign bank subsidiaries for 2005 and 2006 due to the excessive volatility of quarterly reported profits data.

Source: APRA

There have been significant structural developments in Australian (and international) financial markets in recent years that are relevant when considering bank performance and competitive conditions. However, trends such as growth in funds management activities, increased importance of capital markets, marked growth in credit transfer mechanisms, a growing role of private equity and increased prominence of hedge funds have done little to reduce the relative importance of banking firms (and particularly the four majors) in Australian financial markets. Over the past decade, the banking sector's share of total assets of financial institutions (including managed funds) has remained at around 50 per cent (Table 6).<sup>21</sup>

While the relative importance of capital markets as a form of financing has increased over time, its growth has not been as significant *vis-à-vis* the banks as might be imagined. As Figure 4 shows, stock market capitalisation (reflecting external and internal equity funding as well as valuation changes) has trended upwards relative to bank assets, but bank financing clearly remains very important.<sup>22</sup> It is also apparent that the use of corporate bond markets by Australian non-financial companies has not increased relative to the size of the banking sector.

21. These figures represent the assets on the banking books, so that if the consolidated banking position were considered (including significant interests in funds management activities, insurance, etc) the relative share of the banking groups would be higher.

22. Increased use of equity finance rather than debt would be expected following the introduction of dividend imputation in 1987, which removed (for Australian investors) the double taxation of dividends.

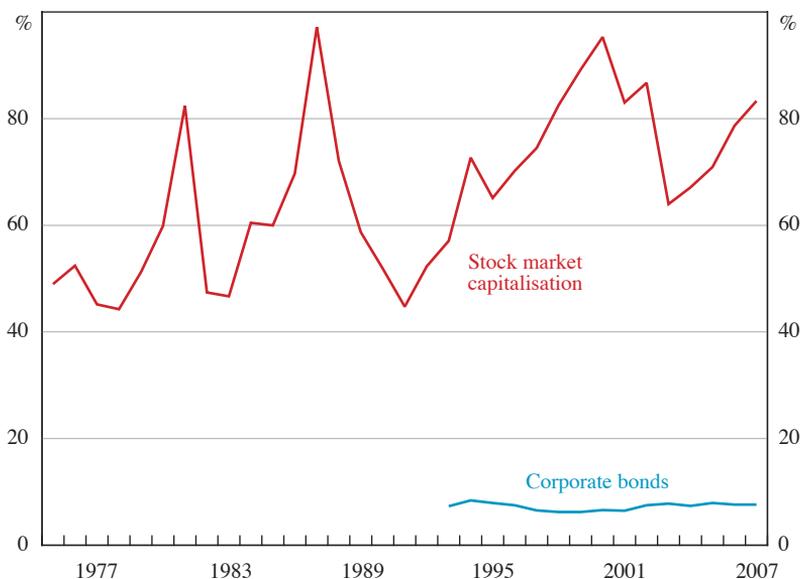
**Table 6: Assets of the Australian Financial Sector**  
Percentage share of total

|                                 | 1997 | 2002 | 2007 |
|---------------------------------|------|------|------|
| Securitisation                  | 1.7  | 5.7  | 7.0  |
| General insurance               | 4.9  | 4.4  | 3.5  |
| Other managed funds             | 7.4  | 9.4  | 8.9  |
| Insurance/Superannuation        | 26.5 | 25.8 | 24.1 |
| Registered finance corporations | 10.8 | 9.0  | 5.9  |
| Banks                           | 48.7 | 45.8 | 50.8 |

Notes: Building societies and credit unions are omitted from the data because of their small scale. Data in columns may not add up to 100 due to rounding.

Source: RBA *Bulletin* Table B.1 Assets of Financial Institutions

**Figure 4: Australia – Corporate Capital Markets**  
Ratios to bank assets



Notes: The corporate bond figure is calculated as short- and long-term debt securities issued in Australia by non-financial Australian companies. It excludes securitisations and international issues.

Source: RBA *Bulletin*, Tables B.1 Assets of Financial Institutions, D.4 Debt Securities Outstanding, F.7 Share Market

These figures indicate that the importance of banks in the overall financial sector is not declining, and is most likely increasing given the activities of the banking groups in non-bank financial markets. This creates two problems for public policy. First, the influence of large banks permeates the entire financial sector, meaning that issues of safety and financial sector stability must be viewed from a much

broader context than purely banking markets. Second, ascertaining the state of competition in retail deposit and lending markets, and the potential implications of increased concentration is only one part of the difficult task confronting any merger authority.

#### 4. Is Bank Concentration Inevitable?

There have long been concerns that economies of scale and scope will lead to concentration in the banking sector and dominance of the financial sector by a few large entities. Significant consolidation in the banking industry worldwide, accompanying the application of new electronic technology, has reinforced those concerns.

Anticipated cost savings or reduced risk due to diversification are generally advanced as the rationale for bank mergers, but potential to exploit increased market power and depositors' perceptions of increased safety (due to government unwillingness to allow the failure of large banks) are also relevant. Managerial hubris and personal preferences for growth and larger size may also play a role,<sup>23</sup> and although capital markets should inhibit excessive expansion and inefficiency, it is well documented that substantial levels of operating inefficiency do persist in banking markets.<sup>24</sup>

There is an extensive empirical literature investigating the characteristics of bank production processes so as to measure economies of scale and scope and levels of inefficiency. Amel *et al* (2004) provide a recent review of the literature and conclude that there is consensus on the existence of economies of scale, but only up to a relatively small scale, while there is little evidence in support of significant economies of scope. Short-term gains from mergers are not readily apparent, either in terms of cost saving or stock market reactions.<sup>25</sup>

Berger *et al* (2007) argue that technological developments have changed the underlying economics of banking in such a way that some of the negative effects of increased size have diminished. These include changes in service delivery methods and information processing techniques that may offset the advantages that smaller institutions possess in closeness and relationships with customers. While suggesting that recent research indicates that average cost savings may still occur at sizes of up to US\$25 billion or more and that large multi-market banks may have superior risk-adjusted performance, they also note that there is (US-based) evidence of

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23. Hughes *et al* (2003) find that good performance is more closely associated with internal growth than with growth via acquisitions for a sample of US bank-holding companies for the period from 1992 to 1994, and that while banks with non-entrenched management generally benefit from acquisitions, the reverse outcome occurs when management is entrenched – consistent with managerial self-interest and consumption of agency goods.

24. The impact of maximum bank share ownership restrictions (which are common internationally) on either market discipline or incentives to expand by way of merger do not appear to have been studied in the literature.

25. They do caution that gains may only be realised over the longer term, and that merger waves create difficulties in disentangling the consequences of individual mergers from underlying forces (such as technology changes), which reshape the industry structure.

some diseconomies (albeit declining) associated with geographical dispersion of activities across multiple markets. By examining how the performance of small single-market US banks is affected by the presence of large multi-market banks for both the 1980s and the 1990s, they conclude that ‘... technological progress allowed large, multi-market banks to compete more effectively against small, single-market banks ...’ (p 365) and suggest ‘... the possibility that the efficiency improvements in banking may have been primarily important for banks to expand geographically, rather than increasing scale per se ...’ (p 366). Whether these conclusions apply for multinational expansion or for concentrated branch-banking systems is an important question for future trends in national banking market structures.

Some insights into these issues for a concentrated national, branch-banking system are provided by Allen and Liu (2007), who estimate scale economies and efficiency measures for the big six Canadian banks over the period 1983 to 2003. They find evidence of scale economies (a 1 per cent increase in output would increase costs by 0.94 per cent), inefficiency overall (relative to a best practice frontier) of between 10–20 per cent, but with larger banks having slightly better efficiency ratings.

Contrasting results on scale economies are found by Bos and Kolari (2005) in a study of 985 large European and US banks (of US\$1 billion or more in assets, and average assets of over US\$50 billion) for 1995 to 1999. Cost function estimates indicate diseconomies of scale on the cost side, although profit function estimates suggest economies of scale exist on the revenue side. They find no evidence of economies of scope, and X-inefficiency appears to be somewhat higher for the European banks than for US banks. They also conclude that geographical dispersion of a bank’s activities has a negative effect on profits, and that while international expansion reduces cost efficiency, it increases profit efficiency.

One source of potential benefit from increased scale (or scope) may be a reduction in risk. The ability to implement more sophisticated and costly risk management systems is one possible benefit, while another lies in the diversification effect – although whether any such benefit is priced by the market is an open question. The available evidence on the relationship between size and risk is somewhat mixed. Carletti and Hartmann (2002) review some of the earlier studies on this topic, which typically examine whether variables such as volatility of bank earnings or stock prices, or  $z$ -scores (probability of failure) are related to bank size or change following bank mergers. They conclude that there is some evidence that size and risk are inversely related, but note that the study of US bank failures between 1971 and 1994 by Boyd and Graham (1996) indicates a higher failure rate of larger banks than smaller banks. Demsetz and Strahan (1997) find evidence that larger US bank-holding companies were more diversified than their smaller counterparts over the period from 1980 to 1993, but that this did not translate into lower risk due to greater leverage and larger commercial and industrial loan portfolios.<sup>26</sup>

Overall, there appears to be little evidence (Allen and Liu 2007 excepted) that very large banks gain substantial cost savings from increased scale or product

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26. Their measure of diversification is the R-squared of a regression of bank stock returns on market returns (and other factors).

diversification either from mergers or organic growth. There is, though, no evidence that larger banks are less efficient than their smaller counterparts, and the net benefits from geographical diversification appear unclear particularly given technological change of recent years. However, size, and the ability to exploit market power, may lead to economies of scale on the revenue side and higher profits. Looking forward, the relatively lower capital ratios envisaged for large sophisticated banks under Basel II may alter the relationship between profitability and size – although the net effect will depend upon the costs incurred by banks in developing sophisticated risk management systems to achieve internal ratings-based (IRB) status.

## 5. Concentration, Competition and Stability in Banking: A Trade-off?

For over two decades, following the work of Diamond and Dybvig (1983) and Bryant (1980), economists have had rigorous analytical models to support the long-held view that banking is susceptible to runs and crises. Since those analytical breakthroughs, there has been substantial effort directed at deepening our understanding of the nature and causes of instability in banking, both in terms of its origins and propagation (including contagion).<sup>27</sup> Canoy *et al* (2001), Lai (2002) and Allen and Gale (2007) provide overviews.

Historically, relatively high levels of concentration in banking have been tolerated, or even encouraged by governments, based on a view that a less competitive banking sector may be less prone to banking failure and crises, and more conducive to financial stability. There has thus been a view (often unstated) that there is a trade-off between the efficiency benefits of increased competition and the risk of instability in the financial sector arising from reduced concentration.

There have been a number of arguments advanced in support of that view. First, larger banks may tend to be more diversified (in terms of both geography and products), reducing the inherent risk of failure. Second, larger banks may be better able to implement sophisticated risk management systems, which increase their ability to measure and manage risk-taking *vis-à-vis* smaller banks. Third, higher profitability arising from lessened competition generates a *franchise* or *charter value* exceeding book value (Keeley 1990) which, because it depends on the ongoing survival of the bank, acts as a disincentive to excess risk-taking. Fourth, a smaller number of larger banks may be easier for regulatory authorities to effectively monitor and may involve less risk of contagion.

As Beck, Demirgüç-Kunt and Levine (2003) point out, there are equally plausible counter-arguments. The systemic importance of large banks may induce a too-big-to-fail attitude in governments, with the implied guarantee of survival leading to excessive risk-taking. Market power may also enable banks to charge higher interest rates on loans, possibly inducing greater risk-taking by their borrowers. Big banks

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27. Rapid growth of derivative and risk transfer markets has added new dimensions to the interrelationships within the financial system relevant to financial stability.

may be more opaque, and internal control systems may become less effective with large scale.

There have been many empirical and theoretical studies examining one or more of these aspects. Allen and Gale (2004, 2007) review (and develop) various models of banking markets which focus upon the implications of inherent characteristics such as imperfect information, incomplete markets and incomplete contracts for the optimal characteristics and structure of the financial sector. Given the limitations imposed by those inherent characteristics, 'constrained efficient' outcomes can involve financial sectors characterised by some degree of concentration and probability of financial instability. Different models they consider produce a variety of conclusions, but there is no general conclusion that greater competition increases financial instability nor that regulatory measures aimed at reducing financial instability increase welfare (since by distorting financial market structure and activities they can reduce static efficiency associated with the constrained efficient market structure).

The empirical literature has produced mixed results, partly reflecting the fact that there is relatively little correspondence between measures of bank concentration and competition or contestability. Because a concentrated market may be highly competitive, hypotheses about stability based on arguments about competition effects cannot be satisfactorily tested using data on market concentration.

One alternative is to consider the effect of banking consolidation on both individual bank risk and systemic risk as was done in the major study by the G10 (2001). They conclude (p 3) that 'the potential effects of financial consolidation on the risk of individual institutions are mixed, the net result is impossible to generalise ...', but that most risk reduction potential would appear to stem from geographic (including international) diversification. At the systemic level, the net effects of consolidation are also difficult to identify, but they point to increased importance of issues such as: greater difficulties in achieving an orderly exit of large complex banking organisations (LCBOs) and the risks of implicit adoption of a too-big-to-fail approach; increased interdependencies between large institutions; and increasing opaqueness of LCBOs and thus potential for a reduced role for market discipline (despite increased disclosure). They also note apparent evidence of increased interdependencies between LCBOs in the US, as reflected in the increased correlation between bank share prices (accompanying increased concentration and consistent with other indicators of interdependency such as interbank lending and derivatives activities). Increased correlation between share prices of the major banks has also been identified in Australia (RBA 2006), but attributed there to common profit experience rather than reflecting increased interdependencies.<sup>28</sup>

Beck, Demirgüç-Kunt and Levine (2006) focus on the relationship between concentration and crises. They estimate how the likelihood of a financial crisis

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28. Increased diversification by banks, by reducing idiosyncratic risk and increasing the correlation of bank returns with the common factor of market returns, could be expected to increase interbank return correlations without necessarily indicating increased interdependencies between banks. Such increased correlations could also reflect increased correlation in the discount rates investors use in pricing bank shares.

depends upon various banking system, regulatory and country characteristics for a sample of 69 countries over the period from 1980 to 1997. They find no evidence that increased concentration leads to greater banking sector fragility but that stability is higher in countries where regulations preventing entry or a wide range of activities are lower and where institutional conditions are conducive to competition. While their findings are consistent with the concentration-stability view, they suggest that the importance of competition indicates that something other than a possibility of higher profitability in a concentrated banking system (and Keeley's charter-value hypothesis) is responsible.

Another recent study (Schaeck, Čihák and Wolfe 2006) has focused on the relationship between competition and stability using cross-country data on the occurrence of crises and estimates of the  $H$ -statistic discussed earlier. Their results, using both a duration model and a logistic probability model to predict the occurrence (and timing) of crises for 38 countries over the period from 1980 to 2003, suggest that: greater competition is associated with lower risk of crisis; higher concentration *per se* does not increase the risk of crisis; and a more restrictive regulatory system may contribute to the build-up of instability.

Recent theoretical literature on concentration in banking has emphasised the fact that the economic functions of banking need to be considered when assessing what type of industrial structure is optimal. While competition is generally desirable given perfect information, information imperfections which give rise to financial institutions imply that a market involving institutions with some market power may be optimal. Allied to this is the fact that banking technology may involve economies of scale, leading to the emergence of large institutions as the most cost-effective operators.

Boyd and De Nicoló (2005) argue that increased banking sector concentration may lead to lower interest rates on deposits and higher interest rates on loans, but that the latter effect would induce borrowers to adopt more risky projects. This potential response is taken into account by banks in setting their loan rates. Boyd and De Nicoló demonstrate that, under certain assumptions about bank strategic interaction (among others), an increased number of banks leads to a lower overall level of asset portfolio risk.

Allen and Gale (2000 and 2007, Ch 10) develop models that help to explain the characteristics of banking market structure which may give rise to contagion. They consider the ways in which banks are interconnected (through mechanisms such as interbank deposit markets) and demonstrate that, in an incomplete network structure, liquidity shocks that lead to runs on one bank can trigger failures at other banks. Liquidity shocks in one region lead affected banks to liquidate assets (including claims on other banks) in a particular order, with incomplete networks inhibiting the countervailing adjustments involving other banks which might otherwise occur. These models do not provide conclusions on whether contagion or financial instability is related to banking sector concentration, but highlight the fact that careful analysis of inter-linkages within the financial sector is crucial for understanding the transmission and ultimate effects of shocks to the system.

## 6. Bank Concentration and Financial Sector Structure

Analyses such as that of Allen and Gale (2000) indicate that the structure and interrelationships within the financial sector, involving both institutions and markets, are potentially important for financial stability. Those analyses, while concentrating on the provision of liquidity by banks, tend to downplay one potentially important implication of the monetary nature of bank liabilities. This is the layering of financial claims emphasised in earlier banking literature, whereby non-bank financial institutions use bank deposits as their liquid reserves.<sup>29</sup> In such circumstances, providing that investors do not convert withdrawals from a financial institution into currency, switches in their preferences between different types of financial assets do not change the aggregate of bank deposits, only their ownership.<sup>30</sup>

Financial market conditions, participants and practices have changed substantially since the deregulation of financial markets began several decades ago. Adjustment mechanisms to external shocks or changes in investor preferences now involve changes in asset prices and interest rates, rather than simply the quantity adjustments assumed in the old derivations of money and credit multipliers. However, the layering of claims is potentially important for thinking about how the structure of financial markets may be relevant to the issue of financial stability.

Consider, for example, a simple financial sector involving banks and mutual (hedge) funds, with no holdings of base money (currency and central bank deposits) other than that held by banks. Liquidity or confidence shocks causing investors to withdraw funds (by cheque or electronic funds transfer) from a particular bank do not reduce the aggregate amount of base money held by the banking sector. (Recipients of those funds, including mutual funds, will have increased bank deposits.)

Interest-rate, exchange-rate and asset-price adjustments will be induced (through reactions of the affected bank and others), but in principle the interbank market can redistribute the available liquidity as required. Even if withdrawals of deposits from bank A were used to pay out loans at bank B, a new equilibrium could be established with interbank loans from B to A restoring A's liquidity and maintaining the scale of each bank's balance sheet (albeit with different composition). In practice, price effects could be expected to occur and the willingness of bank B to provide interbank loans may depend on whether the liquidity shock was random or due to some more fundamental features of A's business. In a concentrated branch-banking system, where networks are likely to be relatively complete, the risk of contagion occurring due to such shocks to bank liquidity appears relatively small, unless the resulting asset-price adjustments expose fundamental weaknesses in the structure of bank portfolios.

However, the layering of financial claims, whereby secondary non-bank institutions such as mutual (hedge) funds use bank deposits as a means of payment and liquidity,

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29. See, for example, Davis and Lewis (1980).

30. The standard models involving liquidity shocks may be able to partially capture this effect by assuming offsetting idiosyncratic liquidity shocks that cancel out in the aggregate, but they would need extra structure to reflect the layering of claims effect.

creates potential for an incomplete network and disorderly reactions to liquidity shocks. Consider, for example, decisions by investors to withdraw funds from a mutual fund, which runs down its bank deposit holdings and sells assets to meet that withdrawal. As well as the asset-price reactions, the initial adjustment is likely to involve a quantity effect, as the size of the mutual fund decreases, but only the ownership and not the total of bank deposits is affected. Only if the investor has withdrawn funds to reinvest with another mutual fund, or if banks expand their lending, is the initial contraction in size of the secondary institution likely to be avoided. Depending on the structure of relationships (including lending) between banks and such secondary institutions, the potential for incomplete network effects to occur seems more likely in the case of a flight to quality by investors from secondary institutions to banks, than within the banking sector itself.

While failures in secondary institutions such as hedge funds lie outside the responsibility of prudential regulators, the effects of such events are of concern to both them and central banks charged with a financial stability objective. It would thus appear that understanding the inter-linkages and adjustment process involving secondary financial institutions and banks in countries with highly concentrated banking systems is a more important agenda item for future research on financial stability issues than analysis of banking concentration *per se*.

## 7. Bank Concentration and Public Policy

In this section, the focus is upon the implications of banking sector concentration for public policy in Australia. As evident from previous sections, the Australian banking sector is relatively highly concentrated, the major banks play an important role across the entire financial sector, but the evidence points to a significant level of competition and a growing presence of foreign banks and (partly through mergers) modest-size domestic institutions in Australian financial markets. Internationally, available evidence (and theory) also appears to indicate no obvious relationship between levels of concentration and either financial sector stability or competition, as well as a lack of evidence for economies of scale at very large sizes. Also apparent is an increasing interest of large international banks for cross-border expansion into domestic retail and commercial banking markets.

### 7.1 Four pillars policy

Since the late 1980s, Australian governments have articulated a position which prohibits the possibility of mergers between the four major banks, known since 1997 as the four pillars.<sup>31</sup> It is based on the fact that, in addition to meeting conditions of the *Trade Practices Act 1974* regarding competition effects, banking regulation requires that any merger between banks needs to be approved by the Federal

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31. In Canada, which has a similarly concentrated banking sector, proposed mergers between the major banks were prevented in 1998, although there appears to be no specifically articulated policy of prohibition.

Treasurer. While there is no explicit prohibition on takeovers of the four majors by overseas banks, approval by the Treasurer would be required after consideration on national interest grounds.

The rationale for the policy is based largely upon concerns about ensuring adequate competition in the banking sector, and appears to reflect a fear that any merger between two of the big four would induce a merger of the remaining two.<sup>32</sup> Concerns have also been expressed (such as in submissions to the Wallis Inquiry held in 1996–97) that issues of too-big-to-fail and concentration of economic power would become more problematic if a larger institution were created by merger. The banks themselves have generally argued against the retention of the policy, on the grounds that it prevents achieving economies of scale and inhibits their ability to reach a scale necessary for effective competition in international markets.

Any discussion of the future of the four pillars policy requires that attention be paid to the alternative regulatory processes and responsibilities for approval of potential mergers. Internationally, there are a wide variety of practices. Carletti and Hartmann (2002) provide a review of approaches in the G7 countries, noting that it is common for financial regulators to play a role in merger processes. One reason is that bank mergers sometimes reflect regulator-aided solutions to the potential (or actual) failure of banks. But more generally, the special licensing requirements for banks suggest a role for the licence-granting authority, while concerns about the potential impact of mergers for prudential regulation and financial stability are also relevant.

In Australia, the Wallis Report (Financial System Inquiry 1997) argued for the removal of the then six pillars policy, on the grounds that competition policy as applied by the Australian Competition and Consumer Commission (ACCC) would provide an adequate substitute for the evaluation of anti-competitive effects of potential mergers. Harper (2000) indicated a potential role for the Australian Prudential Regulation Authority (APRA) in such an evaluation process, but limited primarily to advising whether any prudential concerns should be taken into account.

While the ACCC would undoubtedly consult widely in making any decision, the particular features of banking suggest that there is a major role for other public sector entities. Specifically, APRA through prudential regulation and bank licensing requirements, as well as the RBA through systemic risk concerns and its oversight of the payments system would warrant involvement.

Imposing a blanket ban may be a cost-effective form of policy if it is certain that any application for merger between the four majors would be rejected, although it prevents the case being put to the test. But also relevant are game-theory considerations. Were it believed that one, but not two, mergers among the big four would be permitted, removal of the blanket ban might induce merger applications to protect against private losses should the others merge. For example, consider the

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32. This view was expressed by the Federal Treasurer, the Honourable Peter Costello in an interview in 1998, where he also noted that ‘... if you can be satisfied that there’s new competition, then we’ll look at it at that point’ (<<http://www.treasurer.gov.au/tsr/content/transcripts/1998/061.asp>>).

highly simplified pay-off scenario outlined in Table 7 in which it is assumed that there is some natural pairing of banks associated with potential mergers. In such a scenario, each group would have an incentive to apply first for merger approval, even though (by assumption) mergers create no net social benefit. Given the difficulties for a merger authority in calculating social costs and benefits of mergers (perhaps particularly so in an industry such as banking) it would seem advisable to avoid a regulatory structure which might induce such pre-emptive merger applications.

**Table 7: Hypothetical Costs/Benefits of Mergers**

|                      |                                 | Banks A and B                  |                                 |
|----------------------|---------------------------------|--------------------------------|---------------------------------|
|                      |                                 | Merge                          | Don't merge                     |
| <b>Banks C and D</b> | Merge                           | Private benefit to A and B = 0 | Private benefit to A and B = -x |
|                      |                                 | Private benefit to C and D = 0 | Private benefit to C and D = x  |
|                      | Net social benefit <0           | Net social benefit = 0         |                                 |
|                      | Not permitted by authorities    | May be permitted               |                                 |
| Don't Merge          | Private benefit to A and B = x  | Private benefit to A and B = 0 |                                 |
|                      | Private benefit to C and D = -x | Private benefit to C and D = 0 |                                 |
|                      | Net social benefit = 0          | Net social benefit = 0         |                                 |
|                      |                                 | May be permitted               |                                 |

On the basis of the evidence reviewed earlier, the rationale for opposition to mergers between the four majors appears to be weakening. Other banks, multinational and local, have been increasing their share of domestic banking business – and this trend looks likely to continue.<sup>33</sup> Despite high profit rates of the major banks, competition in financial markets does appear to have increased.

At the same time, however, the arguments that such mergers are necessary or desirable on economic grounds do not appear strong. Recent empirical studies (surveyed earlier) do not find convincing evidence of economies of scale or scope for institutions of the size of the four majors. The assertion that increased scale (through increased size and concentration in domestic markets) is necessary to enable effective participation in global wholesale markets is untested. Its relevance is also questionable for the case of the four Australian majors who: (in 2005) all ranked in or near the top 50 worldwide (by asset size); had greater emphasis on large scale international wholesale funding than is common elsewhere; and would appear to have ready access to increased equity capital to fund increased offshore activities. Also the ability of a much smaller local bank (Macquarie) to compete in international investment banking, securities and wholesale markets would appear to weaken the argument, and suggest that 'culture' may be a more important issue than domestic commercial banking scale.

33. At the time of writing, BankWest, a subsidiary of the UK bank HBOS, had just announced plans for a major expansion of its retail banking network.

Mergers between major banks may be less of a concern if there were not restrictions on entry into retail banking markets or regulations that may reduce the ability of some participants to compete effectively and thus reduce contestability. There are two principal issues involved here.

## 7.2 Basel II regulatory capital requirements

The impact of Basel II is potentially relevant to future developments in banking market structure. Large banks, such as the four majors and their multinational peers, will be regulated under the internal ratings-based (IRB) provisions, which involve different levels of regulatory capital than will be required for smaller banks operating under the 'standardised' approach for particular types of activities. In particular, estimates of capital requirements available under the Quantitative Impact Studies undertaken by the Basel Committee indicate quite substantial reductions in the regulatory capital required for retail and housing mortgage lending under the IRB approach relative to the standardised approach. To the extent that bank internal economic capital allocations and loan pricing reflect regulatory capital requirements, entry hurdles into these loan markets for deposit-taking institutions may be higher for *de novo* entrants subject to the standardised approach than for multinational banks able to operate under the IRB approach.

Foreign banks operating in Australia as branches would fall into that latter category (if their parents have IRB status in their home country), but small domestic banks would not, and foreign bank subsidiaries may not be able (or find it worth incurring the cost) to achieve IRB accreditation by APRA. Consequently, any impediments to entry by foreign bank branches into retail banking, while possibly reducing prudential and financial stability concerns (as discussed below), may have adverse effects on future competition in retail financial markets. This needs to be viewed in the context of the challenges faced by small domestic institutions in matching competitive gains of larger banks with more sophisticated internal risk-based ratings systems and (potentially) lower regulatory capital requirements.<sup>34</sup>

## 7.3 Foreign branches and retail banking

When foreign bank entry into Australia was permitted in the 1980s, the option of entry via either a branch or subsidiary was allowed, but restrictions were placed on the permissible activities of foreign bank branches. Specifically, they are not allowed to accept an initial deposit of less than A\$250 000 from a customer, thereby effectively precluding them from competing in the retail deposit market. To the extent that foreign banks desire entry into retail banking and their preferred mode of entry is via a branch network, this restriction lessens potential competition in retail deposit markets.

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34. On the other hand, deposit insurance schemes (as discussed later) may work to the advantage of such smaller institutions (particularly if premiums are not fully related to risk) by reducing the advantages of institutional age, size and reputation as signals of safety to potential depositors.

Several considerations motivated this restriction. First, prudential supervision of foreign branches is the responsibility of home-country regulators. Although Australia has no explicit deposit insurance, perceptions of government protection of retail depositors meant that the complications arising from the failure of a foreign branch operating in retail deposit markets made this unattractive. Second, at that time, banking sector economics and technology made it unlikely that many foreign banks would seek to establish a retail market presence (and could do so via the subsidiary method), thus making the costs of such a restriction relatively small.

This regulation now seems an unnecessary barrier to entry into retail banking. Foreign banks are now more readily able to establish a domestic retail presence through new ways of delivering products and greater brand recognition through their other financial services activities. Their preferred method of operation appears to be via branches than subsidiaries.<sup>35</sup> Regulatory authorities have agreed on protocols for the supervision of internationally active banks, so concerns about inadequate home-country supervision of foreign branches have largely declined.

Removing the restriction on foreign branch participation in retail deposit markets would thus appear to be warranted on the grounds of increasing contestability and limiting concentration in these markets. It would, however, require the resolution of one issue – namely the protection afforded to Australian depositors should such an institution fail.

## 7.4 Failure management and depositor protection arrangements

Significant concentration in the banking sector creates potential complications for the operation of deposit insurance schemes, which may help to explain the pattern of adoption of such schemes internationally. Insurance schemes generally work best when they cover a large number of small independent risks.<sup>36</sup> Jones and Nguyen (2005) suggest that the increased consolidation of the US banking system,

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35. Available evidence on applications for foreign bank entry suggests that entry by way of branch is preferred to that of a subsidiary. In the 64 countries for which World Bank (2007) data were available and which permitted both branch and subsidiary entry, there were 416 applications for entry by branch compared to 115 by subsidiary in the period 2001–2006. (However, there were 15 countries where even though both types of entry appeared to be permitted, all applications were for entry as a subsidiary.) In Australia (where branch entry effectively precludes retail deposit-taking), the corresponding figures were 11 and 3.

36. This prompts the question of whether countries with high bank concentration are less likely to have in place an explicit deposit insurance scheme – a possibility which could also reflect the outcome of lobbying pressure by small banks in a less concentrated sector for introduction of such schemes (which are generally perceived to be to their relative advantage). There is a significant negative correlation between concentration ratios and the existence of deposit insurance schemes. However, Demirgüç-Kunt, Kane and Laeven (2007) have undertaken a detailed study of the determinants of introducing deposit insurance. They consider the role of a range of institutional, economic and social factors relevant to the political decision-making process, and while they do not include concentration *per se*, they find (contrary to expectations) that the relative importance of small banks delays the introduction of deposit insurance.

even though it remains relatively unconcentrated by international standards, poses threats for the viability of the US deposit insurance scheme.

Concentration in banking markets poses three potential problems for failure management and deposit insurance schemes. First, will a deposit insurance scheme be able to survive the failure of a large bank with a significant share of the deposit market? Second, is it possible to design a suitable funding mechanism (premium structure) for the scheme when the banks involved vary dramatically in terms of their size and range of activities and consequently in their risk-taking?<sup>37</sup> Third, will prudential regulators be able to arrange an orderly exit of a large complex banking organisation in financial distress or will they adopt a too-big-to-fail approach, thereby potentially distorting competitive conditions and inducing excessive risk-taking? These challenges are heightened when multinational banks are significantly involved in the domestic banking sector.

On the first issue, the essential problem is that (unless large banks are more risky than small banks) for larger banks demands upon the insurance fund are likely to involve less frequent, but larger claims. Jones and Nguyen (2005) suggest that expected losses arising from the hypothetical failure of one of the five largest US banks in 2003 would have exhausted the Bank Insurance Fund's reserves and imposed significant demands upon the banking industry and/or the taxpayer to meet the shortfall. However, as they note, the critical issue in this regard is the availability of liquidity to the Fund to meet required payouts to depositors, with access to credit from the government or central bank. If overall risk in the banking system is unaffected by concentration, the average premium rates required over a long horizon to meet deposit insurance claims will be unaffected. Higher concentration will make the Fund's reserve balance potentially more volatile, including periods of negative value, but that is of significance only if governments are unwilling to guarantee the Fund's liabilities (which may be the case) or if premium rates are increased significantly following a failure to rapidly return the fund balance to some desired target value. A more important consideration is whether governments will respond to the impending failure of a large bank by adopting a too-big-to-fail approach (considered below), which in effect overrides the normal operations of a deposit insurance scheme.

On the second issue, the inherent difficulties in designing a suitable premium structure for a concentrated banking sector were considered in the report of the Australian *Study of Financial System Guarantees* (Davis 2004). Concentration *per se* was less of an issue than sometimes thought for several reasons. The exposure of an insurance fund to large banks could be reduced by imposing a low maximum limit on individual deposits covered. Also, the balance sheet structure of the large Australian banks, involving significant wholesale and offshore funding, together with

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37. This problem also occurs when funding for the prudential regulator comes from levies on supervised institutions, as in the case of APRA. In Australia, a levy involving two components, both proportional to assets but with one component capped, has been adopted with a view to capturing those regulatory resource costs that are of a fixed nature and those that are related to institutional size and complexity.

the system of *depositor preference* would mean that insured depositors (and thus the fund) would have sufficient recourse to bank assets ahead of other non-depositor creditors. Concentration may affect the temporal clustering of claims on the fund, but unless this is viewed as a problem for the fund's solvency (because of absence of government backing of the fund), it does not have substantial implications for the determination of premiums.

Far more important is the third issue of whether the regulatory authorities are able to effectively manage the orderly exit of a large bank in financial distress. Difficulties here can lead to a situation in which too-big-too-fail status becomes anticipated, generating competitive advantages for the institutions concerned and encouraging excessive risk-taking. Having in place clear guidelines for the protection (and exposures) of bank customers and arrangements for dealing with a failed bank are important components of preventing this problem. The recommendations of the Australian Council of Financial Regulators for creating a Financial Claims Compensation Scheme are a step in the right direction warranting prompt implementation – as argued by the Australia-New Zealand Shadow Financial Regulatory Committee (ANZSFRC 2006).

However, allowing foreign bank branches to compete in retail deposit markets would require further consideration of depositor protection arrangements for their customers. Australian depositor preference arrangements and protection under the proposed compensation scheme would not apply, and Australian depositors may not be covered under the deposit insurance arrangements of the home country.

## 8. Conclusion

A growing body of evidence from empirical cross-country studies suggests that the relationships between banking concentration and bank size on the one hand, and financial stability, competition, bank efficiency and performance on the other, are complex and depend upon multi-faceted aspects of regulatory policy and institutional arrangements. Those latter features include *inter alia* regulatory and political attitudes towards, and mechanisms for, dealing with possible failures of large complex financial institutions. Theoretical studies also point towards complex relationships between financial sector structure and financial stability, which need to be better understood. There should, though, be no presumption that either high concentration or suppression of bank competition promote financial stability.

Consequently, the optimal design of bank merger policy, including allocation of responsibilities, assessment criteria and processes, is not a simple task. Any consideration of changes to existing policy needs to involve a cost-benefit analysis that takes into account the impact and desirable settings of a wide range of other interrelated policy instruments. In Section 7 of this paper, some of those interrelationships were examined in the Australian context of the four pillars merger policy. These included restrictions on foreign bank branches operating in domestic retail markets, interrelationships between Australian and overseas depositor protection arrangements and failure resolution mechanisms for large banks.

Changing merger policy, such as replacing the four pillars policy with some alternative merger evaluation process, does not imply that the new process would lead to approvals of mergers between large Australian banks. The brief review of empirical evidence in Section 4 suggests that it is difficult to identify private and social benefits from further increases in the size of large banks, although technological change in banking and telecommunications may be rapidly depreciating the relevance of that evidence. Design of a new policy approach would also need to take into account the lack of reliable information available about potential benefits and costs of mergers, and the incentives that the policy process gives to large financial institutions (both domestic and potential foreign entrants) to both contemplate mergers and expend substantial resources on lobbying for desired outcomes.

Given those complications, it might be suggested that the four pillars policy has the virtues of low administrative cost, simplicity and a degree of certainty. While the available evidence does not appear obviously inconsistent with this ban on mergers being socially optimal, it is not conclusive nor does it allow that assertion to be tested. Meanwhile ongoing changes in global banking indicate that a substantial review is required.

Global banks are increasingly engaging in cross-border takeovers and entry into domestic retail and commercial banking markets. The major Australian banks are potential takeover targets. Any serious takeover offers by foreign banks could be expected to trigger a political reassessment of the merits of the four pillars policy, if only on the grounds that all alternatives for change in control of a major Australian bank should be considered before approval is granted. Undertaking a considered and substantial review of bank merger policy arrangements, including their interrelationships with other settings of regulatory policy, seems preferable to the possibility of a hurried policy response to (or possibly unwarranted denial of) a foreign bank takeover proposal.

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# *Discussion*

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## **1. Ian Harper**

The discussion of Claudio Borio's and Franklin Allen's papers left me thinking that history has not been kind to the Wallis Committee of Inquiry into the Australian Financial System. It would appear that banks complement financial markets, rather than substitute for them, to a far greater extent than assumed by the Committee. This even led to speculation that the Wallis architecture of creating an integrated prudential supervisor separate from the central bank might have been – at least in hindsight – a mistake.

Reading Kevin Davis' excellent overview of the literature on banking concentration, competition and stability left me feeling much better about Wallis. At the end of his paper, Kevin calls for a 'considered and substantial review of bank merger policy arrangements' and I could not agree more. Of the 115 recommendations presented to the Government in the Wallis Report, only one was rejected: the recommendation that there should be no outright ban on mergers among financial institutions but that all merger proposals should be considered on their merits through the usual channels of the Australian Competition and Consumer Commission (ACCC) and, in this case, the Australian Prudential Regulation Authority (APRA) and RBA investigations. Far from accepting our recommendation, the Treasurer announced that 'for the time being' he would not authorise mergers among any of Australia's four major banks. Thus the so-called 'four pillars' policy was born and it remains in place some 10 years later.

When queried, as he has been over the years, as to what might suffice to change the Treasurer's mind on four pillars, his usual answer is to refer to the perceived lack of competition in the banking industry and the need for this to change significantly before he would consider changing the policy. Kevin's paper tackles the supposed link between bank concentration and competition head on. His careful review of the literature reveals no compelling evidence of rising bank concentration in any region, including Australia; if anything, concentration appears to be falling. Furthermore, mergers in domestic markets have tended to increase the preponderance of mid-size banks even as three- and four-firm concentration ratios have remained static. The growth of cross-border banking has increased the presence of banks that operate in more than one national market, enhancing competition in markets nevertheless highly concentrated according to the usual measures.

In short, Kevin's literature review leads him to conclude that there is no clear link between concentration and competition in banking markets. It would appear that banking is becoming more competitive without becoming less concentrated. One might even conclude that it would remain competitive, or become no less so, if the industry became even more concentrated, although Kevin declines to go this far.

He warns that a thorough analysis of competitive conditions in banking would need to consider the various markets in which banks operate. The standard tests of competition in the literature, including the Panzar-Rosse  $H$ -statistic, assume a single-

product firm whereas even moderate-sized banks operate across multiple markets. One would need to look carefully at competitive conditions in retail as opposed to wholesale markets and, within retail, at segments like transactions services and lending to small- and medium-sized enterprises, which have historically resisted normal competitive inroads.

In this context, Kevin identifies only one significant barrier to entry in retail banking that might usefully be removed as part of further enhancing competitive conditions. The current restriction barring foreign bank branches from taking deposits in Australia worth less than A\$250 000 was designed for an earlier time when confidence in foreign bank supervisors was lower than it is today. The growing presence of foreign bank branches in Australia, their potential to enhance competition in concentrated domestic retail banking markets, and the internationalisation of bank supervisory standards through the Basel Committee all tend to undermine the rationale for this restriction.

Even given his misgivings about competitive conditions in retail markets, Kevin recognises the potential of continuing improvements in the power and reach of technology, the incidence of cross-border banking and the growth of mid-size domestic banks operating in retail as well as wholesale markets to further erode any link between bank concentration and competition. In such circumstances, it seems puzzling indeed that the Treasurer feels the need to take the option of mergers among the major Australian banks off the table. At the very least, allowing the ACCC to consider one or more merger applications would test the strength of the arguments and permit closer scrutiny of conditions in actual markets in an Australian context.

One of the fears that Kevin raises at this point is that removing the ban on mergers among the big four banks would set off a scramble to be the first to merge. He offers a brief game-theoretic analysis in support of his conclusion. An unseemly race to the ACCC, together with the political pressure that would inevitably accompany such a push, would militate against the careful analysis of the proposal which good public policy in this area would demand.

While I agree that fears of only one merger being allowed would spark just such a race, I do not agree that this need be the outcome. If the link between concentration and competition really is very weak or non-existent, there seems no reason to rule out *ab initio* two mergers among the majors, bringing four down to two. Of course, neither merger may be approved; but the decision to grant one and refuse the other would need to consider the competitive imbalance, including the potential for price leadership, which allowing one dominant bank to emerge might elicit. Then again, maybe even that would not matter if concentration really is not linked to competition.

Kevin's second theme is the absence of a clear link in the literature between bank concentration and the stability of the banking system. Here his paper echoes the conclusions of Franklin Allen's theoretical work, especially with Douglas Gale, in which he argues that banking instability has much more to do with the absence of complete markets and complete contracts in financial markets than bank concentration *per se*. Even though one might assume this conclusion should put to

rest any concerns of the RBA or APRA that mergers among Australia's major banks might compromise systemic stability, Kevin makes the point that dealing with the failure of one or more very large banks post-merger is problematic. In light of this, the prudential authorities would need to be satisfied that allowing mergers among the majors would not lead their depositors, shareholders and directors to conclude that such a merged bank would simply be 'too big to fail' and therefore underwritten by the government *de facto* if not *de jure*. If this idea gained currency, a merger of majors could well exacerbate the risk of systemic failure by encouraging the merged bank to take on riskier assets than it otherwise would or should. The creation of one or more mega-banks might also play havoc with the proposed Financial Claims Compensation Scheme, which would be faced with concentrated risk among its insured depositors.

While these problems are real and, to some extent, mitigate the conclusion that concentration and stability are completely independent, the potential for heightened systemic risk following one or more mergers among the majors is not beyond the powers of the RBA and APRA to analyse, manage or oppose. Even if the ACCC could find no evidence of anti-competitive effects of bank mergers, the Treasurer, who would retain a right of veto under the *Trade Practices Act 1974*, would presumably block mergers determined to be contrary to the public interest on prudential grounds.

One of the ironies of the four pillars policy is that it actually increases the chances of one or more of Australia's major banks being the subject of a foreign takeover. Even though protected from domestic takeover, they are not immune to the dynamics of the global banking industry. Of course, the Treasurer again figures as the authority who must approve any foreign takeover of an Australian-owned entity. But, as Kevin again correctly points out, the circumstances of a serious tilt at one of our major banks by a foreign multi-national are hardly conducive to cool-headed analysis of the four pillars policy. It is likely that the Treasurer, even if only to shore up a decision to block a foreign takeover bid, might abandon four pillars in a rush in order to allow one or more of the domestic majors to mount a credible counter-bid. Neither Kevin nor I would wish to see the policy abandoned and mergers materialise without careful analysis. All the more reason to support Kevin's call for a measured review of the social benefits and costs of allowing mergers among the majors before circumstances force anyone's hand.

Notwithstanding the arguments Kevin advances, he and I both know that the major banks themselves take a different view. All four CEOs have spoken at one time or another against the four pillars policy. My question to Kevin is what he makes of this. Are the CEOs just wrong or self-serving or both? They tend to make one or more of the following claims:

- the Australian majors are getting to be too small to participate in major capital market deals, thus losing valuable fee revenue (The lack of any Australian major among the banks leading the merger between BHP-Billiton and Western Mining Corporation, including the ANZ – BHP's near century-long domestic banking partner – is often mentioned in this regard.);

- the Australian majors need a strong domestic base if they are to compete globally (The example of the Dutch banks, ABN/AMRO, ING and Rabobank, having been allowed to merge domestically and having since expanded internationally with great success is often cited as evidence of the so-called ‘national champions’ effect.);
- the major banks need to spend large sums on IT, risk management systems and global brands if they are to compete with global banks, either here in Australia or overseas, and these expenditures require step-increases in investment which cannot be afforded without an increase in their scale; and
- the only politically acceptable way to rationalise Australia’s extensive network of bank branches is to allow mergers among the majors, which would keep bank branches in most locations but reduce wasteful duplication, leading to cost savings.

On the face of it, these do not seem to be ridiculous arguments. I would like to hear what Kevin says to the banks when they ask him the same questions they ask me!

I have argued elsewhere that another inquiry into the Australian financial system would be timely. I am pleased to see that Kevin agrees with me – not, I might add, an altogether common event! Ten years is a long time in financial markets and it would be wise to review the performance of Australia’s new regulatory system in the light of a decade’s experience. Not only would such a review consider in more detail the evolving role of banks versus markets in our financial system, but it could canvass in detail the issues surrounding mergers among Australia’s major banks. It is high time that the four pillars policy was reconsidered.

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## 2. General Discussion

There was a lengthy discussion of the nature of financial crises and how policies should address moral hazard concerns. In the context of problems in the US sub-prime mortgage market, one participant wondered whether it was possible to provide sufficient liquidity without providing respite for those who should face up to their earlier mistakes. Another participant asked whether there were ‘good crises’ that policy-makers should leave to run their course, or whether all crises were ‘bad’ due to incomplete markets. Franklin Allen thought that the difficult distinction between insolvency and illiquidity was at the core of these problems, and that preventing the latter would assist in avoiding the former. On completeness, he noted that those in the field of finance often argued that markets were complete because of the potential for dynamic trading, but ultimately he thought that the fact that crises were not that infrequent demonstrated that markets are not truly complete.

There were also a variety of opinions expressed about the optimal relationship between the monetary policy function of central banks and prudential regulation. For example, one participant argued that separating these functions made sense because monetary policy expertise was not the same as regulatory expertise and that central banks with responsibility for both functions may place insufficient weight

on their regulatory responsibilities. On the other hand, Franklin Allen pointed out that the lender of last resort function of central banks is very important, citing the recent decision of the Fed to allow banks to use mortgages as collateral for their borrowings as an appropriate example. He thought that central banks had a key responsibility to provide liquidity so as to reduce asset-price volatility, which triggers bankruptcy and distress in a way that further exacerbates the original disturbance. The provision of liquidity by central banks was also important since markets often do not anticipate nor understand all possible states of the world. On the question of cooperation, he suggested that central banks might find it more difficult to carry out their responsibilities as the lender of last resort in countries in which supervisory responsibilities were dealt with outside of the central bank, and that this would certainly require a carefully coordinated response.

Much of the discussion was focused on the perceived shortcomings of particular markets and institutions. One participant was critical of the fact that in the securitisation market, originators of loans are not required to keep an equity tranche on their books. One participant argued that policy-makers somehow needed to focus more on underlying behaviours, particularly the factors that encouraged agents to all manage risks in the same way, whether it was because they adopted the same risk management ‘best practices’ – for example, the same value-at-risk models – or were over-reliant on the same prognosis from ratings agencies. In a similar vein, one participant questioned the usefulness of ‘stress testing’, arguing that in these exercises banks do not take sufficient account of contagion between institutions. While agreeing that stress testing has its limitations, Nigel Jenkinson argued that it was still useful in understanding the exposure of banks’ balance sheets to shocks. Another participant agreed, saying that it was better to conduct imperfect stress tests than none at all.

On the issue of concentration, although there was a broad consensus that greater concentration in the banking sector does not necessarily inhibit competition, particularly when foreign banks are present, there was a lively debate on what this meant for the ‘four pillars’ policy. One view was that allowing the ACCC to consider mergers would make the policy more accountable, even if merger applications were ultimately knocked back. However, other participants doubted that further mergers would lead to efficiency gains and thought that the four major Australian banks had sufficiently large domestic bases to expand offshore.

This led to a discussion about the possible impact of further mergers on financial stability with some participants wondering whether they would make some institutions ‘too big to fail’, though it was pointed out that the Australian majors may have already achieved this status. More generally, Kevin Davis argued that deposit insurance schemes need not be threatened by large banks if governments stood ready to provide additional funds and there was a good recapitalisation plan in place. There was also a brief exchange about the effect of the Basel II Capital Accord on competition in the banking sector with one participant wondering whether it would undermine the competitiveness of smaller banks. However, Kevin Davis suggested that the Accord would merely formalise the existing advantage of big banks.

# Regulatory Challenges of Cross-border Banking: Possible Ways Forward

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Stefan Ingves

## 1. Introduction

As the integration of financial markets has picked up speed in recent years, the subjects of supervision and crisis management of internationally active banks have gained in importance. Clearly, policy actions are needed to cope with the challenges arising from financial integration. One area in which such action is needed is supervision. To improve crisis preparation within Europe it would be useful to create a special body for supervision of the major cross-border banks. For the sake of this paper let us name this body the European Organisation for Financial Supervision (EOFS).

## 2. Lessons from the Past

Before elaborating on this proposal, it is important to note that financial and banking crises can involve large economic and political costs. There are several historical examples, such as the depression in the United States and the hyperinflation in Germany during the 1930s. After the Second World War, the conclusion was that the financial sector needed to be heavily regulated. Although this gave national authorities a certain control over risks in their own financial sectors, it also stifled competition, product development, efficiency and proper risk management. From the 1970s onwards, as these inefficiencies became larger and more apparent, many countries began to deregulate. Several countries, including Sweden, experienced costly banking crises partly because the new deregulated environment posed new challenges for banks as well as for regulators; challenges for which they were not prepared.

Eventually banks developed more appropriate risk management techniques and supervisors adopted a more risk- and process-oriented form of supervision rather than the previous rather formalistic approach. This has clearly lowered the risk of financial crises.

## 3. Internationalisation of Banking

Following deregulation, most banks remained predominantly national. Only in the past decade have we seen the emergence of some big cross-border banks with major activities in several countries. And this financial integration is accelerating. Clearly, this development is positive for the economy. It stimulates competition and product development across countries, and allows banks to take advantage of economies of scale and scope. The spread of cross-border banking has reached different levels in different parts of the world. In Europe it has been increasing

rapidly in recent years, but there are also several active cross-border banking groups in the Pacific region.

This integration is not without challenges. In particular, supervision and crisis management arrangements have to be addressed before the next crisis erupts. A useful parallel is perhaps the most burning global issue: the problem of global warming and climate change. The challenges of financial integration share some of the same characteristics as the environmental problems facing us; in particular, the problem of negative externalities.

The impact of industry emissions on the environment is the classic example of what economists call negative externalities. If the market is left on its own, polluters will not bear the social costs of their pollution. The same reasoning can be applied to financial crises. A crisis that severely affects the functioning of the financial system will result in substantial costs across the economy. These losses in output go far beyond what financial firms can possibly take – or be willing to take – into account when conducting their day-to-day business activities.

With regard to both pollution and financial crises there are ways to manage negative externalities. Public intervention can be used to internalise the negative externalities. For industries polluting the environment, authorities can impose taxes or issue emission rights, for example, to compensate for the social cost of pollution. For banks and financial firms this is achieved by regulatory and supervisory measures, such as capital requirements and rules for the establishment and conduct of business, as well as provisions giving central banks the right to grant emergency liquidity assistance.

#### **4. Many Stakeholders, but No Single Authority**

If the negative externalities can be contained within national borders, it is relatively straightforward to empower national authorities to act on both environmental problems and financial calamities. However, negative externalities are much more difficult to contain when they spread across national borders. To correct them requires some kind of supra-national organisation or some form of cross-border agreement.

For example, when banks become important in several countries, there may be a mismatch between the problems faced by, and the roles of, financial supervisors in different countries. Prevailing regulatory structures have very few supervision and crisis management arrangements that are designed to manage cross-border crises. Given that financial markets have become more integrated over time, the lack of adequate cross-border regulatory structures creates a number of challenges.

#### **5. Challenges**

One challenge presented by cross-border banking is that it increases the interdependence between countries. In particular, problems in the banking system in one country are more likely to spill over to the other countries where the bank or group is active. This can be illustrated by one of the largest Swedish banks, Nordea.

It has substantial activities in four of the Nordic countries, and is a significant part of the financial system in all these countries. Therefore, any serious problem in Nordea will most likely affect all four countries.

A second challenge is that decisions and actions by national authorities are likely to have considerable implications for financial stability in foreign economies. This is of course particularly true in cases where foreign operations are run through branches, meaning that they are subject to foreign supervision. However, in Europe at least, the consolidating supervisor also has an increased influence on foreign subsidiaries, within the new capital regulation framework of Basel II. In the Nordea case – which is now a group with a subsidiary structure – the Swedish consolidating supervisor can influence the risk management of the group as a whole as well as the different subsidiaries. Nordea has now announced plans to convert its subsidiaries in the Nordic countries into branches. When, and if, this plan becomes a reality, Swedish authorities will have the full responsibility for supervising three foreign branch networks, all of which may be of systemic importance in the different host countries.

A third challenge is that the legal distinction between branches and subsidiaries is becoming blurred. Increasingly, banking groups are starting to organise themselves along business lines rather than along legal and national lines, concentrating various functions in different centres of competence. While there are several examples of this trend, Nordea is again an illustrative case to consider. To reap the benefits from economies of scale and scope, Nordea has chosen to concentrate certain functions, such as treasury operations, credit decision-making and risk management to specific centres of competence within the group. It is therefore questionable whether the different entities within the group really are self-contained, even if they are legally independent subsidiaries. With this structure, it is also less likely that the group as a whole can survive a failure of one of its entities. Hence, operationally and in economic terms, Nordea increasingly resembles a bank with a branch structure. A consequence is that the present regulatory structure may be less suited for efficient supervision and regulation of the group.

A fourth challenge is that the practicalities of supervision and crisis management are greatly complicated as the number of relevant authorities multiplies. In normal times, this means that the regulatory burden for financial firms rises. Also, the need for supervisory cooperation increases, which demands new supervisory procedures and the creation of common supervisory cultures. During financial crises, it is important to share information and to coordinate actions but it may be difficult to do this in an efficient manner because time is such a scarce commodity.

A fifth challenge is that conflicting national interests emerge as banks become truly cross-border. National authorities have a national mandate and are responsible to the national government or parliament. They are therefore unlikely to take into account the full extent of the effect of their actions on other countries. Different countries may also have different priorities in terms of resources for supervision and crisis management, or in terms of their regulatory structures. One reason may be that financial systems differ quite significantly between countries. Additionally, the use of public funds can never be completely ruled out when dealing with crises.

In a cross-border context, serious conflicts of interest can arise when it comes to agreeing on how to share the potential burden of such interventions.

All these challenges have a common theme. Increasingly, national financial stability is becoming dependent on the activities of banks and authorities in foreign countries. Also, given the roles and responsibilities of these authorities, conflicts of interest are likely to occur. The typical illustration of this problem is a bank that is of limited size in the home country but has a systemically important branch network abroad. While a potential failure of the bank would not create any substantial disturbance in the home-country economy, the consequences for the host country could be destructive. The host country is likely to end up with the bulk of the bill for resolving any failure, so the willingness to conduct close supervision of the bank is substantial in the host country. However, the same cannot be said for the home country.

Financial integration also raises a number of practical issues. Do the current legal frameworks provide authorities with the necessary tools for supervising cross-border banking groups in an efficient way? And do the authorities themselves have arrangements in place to produce comprehensive assessments of the operations and the risks of these groups? Under the prevailing regulatory structures, I am afraid that the answer to both of these questions is likely to be no.

## **6. Policy Actions Are Needed**

To deal with the challenges outlined in the previous section, existing regulatory frameworks must be revised. We must find a way for countries to cooperate closely and establish mechanisms for coordination and conflict resolution.

### **6.1 Motives for a coordinated financial supervision**

The analysis so far is uncontroversial both in terms of identifying the challenges raised by integration and of the need for action. However, it may be more difficult to reach agreement on how to proceed. A number of alternative solutions have been suggested. For example, proposals such as prohibiting foreign branches from doing business domestically or extending home-country responsibility have been discussed.

A more efficient solution is to gradually move towards the creation of a common international body with a mandate to conduct supervision of banks with substantial cross-border activities. The simple rationale is that the creation of such a body is the only way to fully manage conflicting national interests. Such a body would have several other benefits. A single authority supervising cross-border banking groups would increase the comprehensiveness and the effectiveness of supervision. For the firms subject to supervision, it could also mean that the regulatory burden would eventually be reduced considerably.

In a European context, the idea of a EOFS may at first glance seem too idealistic, and in some respects it is. It may be virtually impossible to make countries give

up parts of their sovereignty to a supra-national authority. However, looking at this from a European perspective, there is hope. Within the European Union there is already a framework for supervisory and regulatory cooperation, based on the common legislative process in the form of European Union directives and regulations. Moreover, some institutional arrangements for supervisory cooperation are already in place, even if they do not have any legal powers. It may therefore be easier to make progress in Europe than elsewhere in the world. Still, even in Europe, it is not very likely that a fully fledged pan-European supervisor can be established in the near future. Therefore, the EOFS proposal should be seen as a gradual process rather than a fast-track to a European Financial Supervision Authority.

## 6.2 Institutional set-up and powers of EOFS

Because the EOFS is a new creation, it is important to outline how it should work and what its institutional set-up should be. The mandate of the EOFS would be to undertake a form of supervision of the major cross-border banks at the European level. As the focus is strictly on prudential supervision, the supervisory tasks related to market conduct and consumer protection would remain with national supervisors.

Aligned with the EU principle of subsidiarity<sup>1</sup>, the supervisory duties of the EOFS should only include the banks with major cross-border activities. This would require a three-layered structure. The 8 000 or so European banks that mainly operate domestically would remain under the exclusive supervision of national authorities. The regionally oriented banks, active in a few countries, could use a structure similar to that of today, where supervisory colleges deepen cross-border cooperation. The limited number of truly pan-European banks would on the other hand be dealt with by the EOFS.

The initial tasks for the EOFS would be threefold: first, it should gather information about the banks and groups with significant cross-border activities; second, with the information acquired, unified risk assessments should be produced for the institutions subject to EOFS supervision; and third it should oversee the activities and risks of these institutions.

The EOFS should, at least at the outset, second staff from national supervisors and central banks. Initially the EOFS should probably have only limited powers, namely to collect information and undertake on-sight inspections together with national supervisors. All other powers, such as licensing activities, regulations, interventions and corrective actions would still remain the responsibility of national supervisors. Consequently, the EOFS would act alongside the national authorities in producing comprehensive risk analysis of the designated banking groups and providing advice on policy actions to the national authorities. In the event of conflicting interests between authorities, the EOFS could also act as a neutral mediator.

Further, the coordinated European supervision of banks and groups with significant cross-border activities would facilitate a more efficient management and resolution

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1. Subsidiarity can be described as the principle that any public tasks or regulations should be handled at the lowest level of government, where it can be made to work efficiently.

of cross-border crises. It would be easier to reach a common assessment of the systemic importance as well as the solvency of the bank or group in question.

In this sense, the EOFS in its embryonic stage would function more like a non-regulatory central bank than a traditional supervisor. The EOFS would conduct macro-prudential oversight and act as an enlightened speaking partner for the supervisory authorities.

It is important for the EOFS to be a separate agency with an independent status. This is necessary not least because the EOFS would need a high level of operational independence and integrity to be successful. It is also important to achieve a necessary division of power. The EOFS should cooperate closely with other organisations but should be free from direct guidance and involvement from national authorities as well as from the European Commission and the European Central Bank (ECB). Therefore, it should be given the same independent status that the ECB has today. Also, with many other pan-European regulatory bodies already in existence, it should not be too hard to come up with appropriate financing arrangements.

If successful in its initial role, the tasks of the EOFS could be gradually extended by assuming additional supervisory powers for the truly cross-border banks. However, it would first have to prove its merits.

As long as the EOFS operates in addition to the national authorities, another layer of supervision will be added to the present structure. From an industry perspective this would imply a greater regulatory burden. However, hopefully this is something that authorities and banks can live with if overall supervision improves and if the proposal results in a lower regulatory burden in the future.

People acquainted with the present regulatory and institutional set-up within the EU may ask if a version of the EOFS does not already exist, considering the present consolidated supervisory model and the role of the Committee of European Banking Supervisors (CEBS). However, even if both of these functions have their obvious merits, they do not quite satisfy the same needs. The mandate of the CEBS is to promote harmonisation of regulatory frameworks and not to conduct ordinary supervisory work. Even if the consolidated supervisor has group responsibility, it is an undeniable fact that the authority answers to the home-country constituents. Thus, the EOFS would contribute important functions in addition to the present regulatory structure within the EU. The EOFS should be an institution with real resources and not a 'talk shop' primarily designed to build consensus.

## **7. Conclusions**

To summarise, it is apparent that during the past decade, the banking sector has become increasingly active across borders. This rather new form of financial integration is clearly positive. It enhances competition and stimulates economic growth. However, the development also raises challenges for the regulatory community. The answer to these challenges should not be increased protectionism. Instead, it is necessary to find new forms of cooperation and supervision that allow

the benefits from integration to be realised. The proposal to create a special body with the mission to supervise the major European cross-border banks is an appropriate way forward. Since this proposal may seem rather radical to some people, and infeasible in the shorter term, the gradual approach would make it possible to reap some benefits while at the same time strengthening the financial stability arrangements. The time has now come to set up the means to achieve this goal.

The European focus of this proposal is based on the fact that there are already institutional arrangements in place that can be used as a platform for achieving the goal of supra-national supervisory frameworks. However, the underlying challenges of financial integration are of a global nature. Therefore, even if it is not possible to achieve the same solutions outside Europe, it should be of wider international interest to at least move in the direction of enhanced cooperation between supervisory authorities. Hopefully, this proposal can serve as an inspiration for further discussions on this issue.

Considering that financial integration is already widespread and that the process of revising present regulatory structures will most certainly be demanding and protracted, there is urgency in starting the process. History shows us the importance of having proper regulatory structures in place. Therefore, it would be highly unfortunate if the appropriate measures have not been taken before the next major financial crisis occurs. For once, it would be encouraging to see pre-emptive policy actions rather than a crisis being the catalyst for such actions.

Thus, in the same way that the international community is facing increasing challenges to cope with the negative externalities in the environmental area, financial regulators have to face the consequences of financial integration. It is important to show enough courage and determination to tackle the negative externalities that a potential financial crisis would entail – before it hits us.

In this context, it is also important to note that the issue of financial integration comprises many more aspects than merely setting up supervisory structures for cross-border banks. For example, questions on how to establish proper arrangements for emergency liquidity assistance and deposit guarantee schemes also need to be considered within the same context. Even though these issues are of a somewhat different nature, they do require the same type of supra-national considerations. The simple reason is that it is only when the frameworks for regulation, supervision and crisis management match the actual structure of financial markets, that the negative externalities of financial crises can be managed properly.

## *Discussion*

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### **Grant Spencer**

In general I agree with Stefan Ingves' proposition that cross-border banking generates negative externalities and makes transnational conflicts of interest more likely. Small host countries such as New Zealand are particularly vulnerable to such conflicts and externalities, particularly in times of crisis. There are a number of different ways to approach this issue, one of which is Stefan's solution involving the creation of a supra-national supervisory agency. However, rather than comment on his specific proposal, I will outline the approach that we are taking in New Zealand in the context of our relationship with Australia.

The four major Australian banks account for around 90 per cent of New Zealand's banking assets, which total about NZ\$300 billion. This is considerably larger than the majors' share in the Australian market. Until the mid 1990s the majors' New Zealand operations were reasonably self-contained. Since then however, technological developments and the drive for cost savings have prompted the banks to centralise many of their core functions in Australia. This ultimately left the New Zealand subsidiaries looking in some respects more like state branches than stand-alone banks.

This trend in the majors' New Zealand operations tended to increase the dependence of the NZ banks on their Australian parents. Combined with differences between the regulatory and legal frameworks in Australia and New Zealand, this raised a number of prudential challenges. For example, if during a financial crisis an Australian bank with a branch in New Zealand became insolvent and was ultimately liquidated, Australian depositors would have a preferential claim over the bank's assets in Australia, even though these may have been partly supporting the New Zealand operation.

Through the late 1990s and into the early part of this decade, the Reserve Bank of New Zealand (RBNZ) became increasingly concerned about the stand-alone viability of the Australian majors' operations in New Zealand. Our policy response included four main elements:

1. requiring the local incorporation of large banks and retail deposit-takers from countries such as Australia that have legislation giving home-country depositors a preferential claim;
2. developing an outsourcing policy for large banks;
3. changing the law to reduce the potential for conflict in the event of financial crises in Australia and/or New Zealand; and
4. developing closer ties between the RBNZ and the Australian Prudential Regulation Authority (APRA).

Local incorporation was achieved at the end of last year after the incorporation of the one major bank which was still operating a branch in New Zealand.

The key element of the outsourcing policy is the requirement that large banks must have the legal and practical ability to control and execute any outsourced functions sufficient to achieve the following, even in the event of stress or failure:

- settling outstanding obligations;
- controlling the core retail New Zealand dollar banking transactions; and
- controlling risk management functions such as data management and financial monitoring.

The RBNZ's approach to this policy has been focused on outcomes. This means that banks do not necessarily have to locate their systems within New Zealand. However, if important functions remain in Australia, the New Zealand subsidiary must still have legal access and control during a crisis. Discussions are ongoing about the arrangements necessary to support such outcomes.

I would also say that we have taken a more flexible approach to the question of the location of wholesale banking systems in New Zealand than we have to the location of retail banking systems. This is because we believe that the benefits of locating wholesale systems offshore are likely to exceed the potential risks. We also take into account the trade-off here between stability and efficiency and so we focus on core capabilities and transactions.

In the legislative arena we have worked with our friends at APRA and the Australian Treasury to bring about changes to the *Reserve Bank of New Zealand Act 1989*, the *Australian Prudential Regulation Authority Act 1998* and the *Australian Banking Act 1959*; all of which occurred late last year. There are two main elements to these legislative changes. The first is that both APRA and the RBNZ are now required to support each other in carrying out their statutory responsibilities relating to financial stability. The second requires the two supervisory authorities to avoid actions likely to have a detrimental effect on the stability of the other country's financial system, where practicable. These changes will not necessarily avoid conflict altogether, but at least we have developed a legal framework whereby each supervisory authority is required to take into account the other country's circumstances during a crisis.

Finally, we are working toward closer trans-Tasman ties in general, with perhaps the best example being the establishment of the Trans-Tasman Council on Banking Supervision in 2005 (members of which are the Australian Treasury, the New Zealand Treasury, the RBNZ, the RBA and APRA). This council meets twice a year, with its initial focus being the legislative changes I mentioned earlier and more recently investigating whether there are protocols and rules that can improve our ability to deal with a crisis. We are also fostering closer links with APRA through staff secondments, increased frequency of meetings, participating in each other's visits to the large banks and our Memorandum of Understanding relating to information sharing and collaboration on supervision issues.

In conclusion, the RBNZ's aim is to recognise the trend towards globalisation of financial services while at the same time giving protection to the core New Zealand banking system in the face of external shocks. The banking system in New Zealand is an important infrastructure asset and we need to protect its effectiveness. Different

solutions to this issue may suit different regions. Thus, Stefan's proposal to set up a new supra-national prudential supervisor for cross-border banks may work well in the European Union where there is a long history of close political ties and a well-established common infrastructure. However, it may not be the optimal solution for us. The key point here is that, in a crisis, small host countries are going to be the most vulnerable. Therefore, small host countries have to take a lead role on this issue and find a solution that will work for their particular circumstances.

# The Evolution of Risk and Risk Management – A Prudential Regulator’s Perspective

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John Laker

## 1. Introduction

The decade since the Reserve Bank of Australia’s 1996 Conference on ‘The Future of the Financial System’ has been a period of remarkable strength for banking systems in advanced industrial countries, particularly Australia. Banking institutions have enjoyed strong growth in business volumes, high asset quality and record profitability and they have proven their resilience in the face of episodic market and other shocks. The period has also been characterised by intensifying competition in banking, which has put margins under sustained downward pressure, and continued innovation, which has altered the complexity of banking activities. The increasing power and sophistication of technology, the growth of electronic commerce and greater use of outsourcing arrangements have led to fundamental changes in the manner in which banking institutions produce and deliver their services and manage their risks.

The current strength of banking systems is attributable, in the main, to the favourable macroeconomic environment and benign credit cycle, particularly over the last few years. In many countries, a greater household appetite for debt in a low-inflation, low-interest-rate world has also been a major driving factor. The policy implications of rising household indebtedness are explored in other papers at this conference.

Another contributing factor, though one that tends to receive less attention, is the improvement that has been taking place in risk management within banking institutions. New technology and instruments aside, one of the most positive developments is that the risk management function in banking institutions is now more clearly identified and resourced, more integrated into their overall operations and generally commands more authority. Global regulatory initiatives such as the new Basel II Capital Framework have been a major catalyst for improvement but the greater sensitivity of boards and senior management to risk issues has also provided critical impetus.

This paper discusses the evolution of risk and risk management in banking over the past decade, from the perspective of a prudential regulator. The Australian Prudential Regulation Authority (APRA) is Australia’s integrated prudential regulator of banking institutions, insurance companies and most of the superannuation (pensions) industry. In the banking system, its mandate is to protect the interests of depositors by promoting prudent business behaviour and risk management on the part of individual banking institutions – not to eliminate failures, but to keep their incidence low.

The paper addresses four main themes:

- i. the changing nature of risks in banking, particularly in sustained good times;
- ii. the evolution of risk management;
- iii. the movement to risk-based prudential supervision; and
- iv. developments in economic capital modelling.

Naturally, APRA’s perspective on these themes is shaped by its coal-face experience with Australian banking institutions but our comments are intended to have wider applicability. In Australia, banking institutions comprise banks, building societies and credit unions, a broad grouping known as authorised deposit-taking institutions (ADIs) but described in this paper as banking institutions for convenience.

## 2. The Changing Nature of Risks in Banking

The current risk profile of the Australian banking system has been shaped by a number of broad developments:

- sustained balance sheet expansion driven by double-digit growth in housing lending, traditionally a safe asset class;
- the erosion of traditional retail deposit bases because of product innovation and competition for financial assets;
- a consequent diversification of funding sources and financial activities;
- technology-driven efficiencies that have contributed to a pronounced reduction in cost-to-income ratios; and
- a relatively cautious approach to offshore expansion.

Leaving aside the mainly wholesale activities of some foreign-owned banks, the current risk profile of the Australian banking system is, in many respects, a ‘conventional’ risk profile for retail banking institutions.

As part of its risk-rating system, described later in this paper, APRA forms a judgment about the significance of each of the inherent risks facing a supervised institution, according to the contribution of each risk to the overall business profile of the institution. Though not too much should be read into the precision of the weightings themselves, the ranking is interesting. For banking institutions, the highest significance weighting is for credit risk; the weighting is well above that for operational risk and considerably above that for market risk. This ranking is consistent with the weighting of risks in economic and regulatory capital modelling in Australia.

The ranking for **credit risk** is not surprising. In contrast to overseas counterparts, the larger Australian banks retain the greater part of the credit risks they originate on their balance sheets. Though participants in securitisation markets (mainly for housing loans) and credit derivatives markets (for corporate loans), they do not make substantial use of these markets to divest themselves of credit risk; for the

four major banks, the value of assets that have been securitised is less than 2 per cent of the value of assets retained on their balance sheets. However, regional banks and some smaller banking institutions make greater use of securitisation markets, mainly for funding but also for regulatory capital management purposes.

For the larger Australian banks, the originate-to-distribute model is not predominant and the principal-agent problem or agency risk associated with that model is not APRA's main focus in the credit area.<sup>1</sup> In general terms, agency risk is the risk of loss to a principal from an agent's decision to resolve conflicts of interest in favour of the agent rather than the principal.<sup>2</sup> APRA has 'clean sale and separation' requirements to address agency risk in securitisation by making it clear that the banking institution is not the agent of the investor and the investor cannot rely on the institution for assessing risks on the assets that have been originated. APRA's main focus, however, is how banking institutions manage credit risk on the balance sheet. The exposure of the Australian banking system to the housing market and to highly-g geared households has been a particular credit-risk issue for APRA – and a vulnerability identified in the International Monetary Fund's Financial System Stability Assessment of Australia in 2006 (IMF 2006) – but stress testing suggests that banking institutions would be resilient to a significant housing market shock.

The ranking for **operational risk** is also not surprising. Defined in the Basel II Capital Framework as the risk of loss resulting from inadequate or failed internal processes, people and systems, or from external events, operational risk is one of the larger risks now facing banking institutions, an obvious consequence of the greater complexity of banking activity and its increasing dependence on technology and specialist skills. From a prudential perspective, the recurrence of small operational problems would not be an issue in a large, complex banking institution; the concern is the unusual individual problem or event that carries potentially large exposure to financial losses or loss of reputation. Two such problems have materialised in the Australian banking system in recent years:

- in 2001, a major Australian bank lost around A\$3.0 billion because of errors in the valuation model for the mortgage portfolio held by its United States subsidiary; and
- in 2004, 'rogue' foreign currency options trading at that same bank resulted in a loss of A\$350 million, an overhaul of the Board and senior management and a considerable dent in reputation.

Two particular sources of operational risk have been growing in importance. The first is outsourcing. As the value chain involved in developing, marketing and managing banking products is analysed and dissected, the outsourcing of some functions within that chain has become more commonplace. Cost pressures and

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1. The BIS 2007 *Annual Report* described the principal-agent problem in securitisations and derivatives in the following terms: 'What are the implications if originators no longer feel the need for due diligence, and the ultimate buyers do not have the skills or the information required to manage the risks inherent in the complex instruments they are buying?' (BIS 2007, p 9).

2. The seminal work in this area is Jensen and Meckling (1976).

the specialised nature of particular functions, which require large investments to achieve necessary critical mass, have also encouraged banking institutions to turn to external service providers in Australia and, increasingly in recent years, offshore (‘offshoring’). This trend towards greater specialisation in service provision is a global one. Nonetheless, outsourcing gives rise to a number of risks, including counterparty, contractual and business continuity risks, and these risks can be accentuated when the service provider operates from a different country and legal jurisdiction.

The second source is technology risk. Electronic commerce in financial services, particularly internet banking, has revolutionised the provision of banking services in Australia, as elsewhere, but it has also exposed banking institutions to costs and reputational risk from service disruptions, whether accidental or malicious. The recurrence of such incidents, and the failure of large and expensive information technology (IT) developments in some banking institutions, have put pressure on boards and senior management to seek improved IT security and better management of substantial IT projects and, where relevant, IT outsourcing contracts.

The other current risks in the Australian banking system that complete the picture of a ‘conventional’ risk profile are market risk and liquidity risk.

Australia banking institutions are active in financial markets and foreign-owned banks in particular have stepped up their trading in derivative instruments. However, banks carry only small net exposures to **market risk** from trading activities. The market risk capital charge for the major banks using their internal models has been around 1 per cent of capital over recent years. In the context of the Basel II Capital Framework, APRA will require banks accredited to use the more advanced Basel II approaches to hold specific regulatory capital against interest rate risk in the banking book, based on their internal risk measurement models. APRA’s decision reflects the fact that this risk can be a substantial one, it is quantifiable, there is substantial homogeneity in how it is managed among the larger Australian banks and there is evidence of active hedging, if not actual trading, of this risk on banking books.

In view of the significance of this risk, continuing margin pressures and the ease with which the risk can be hedged or traded, interest rate risk on the banking book is likely to be the subject of increasing supervisory focus globally.

The management of **liquidity risk** by Australian banking institutions has undergone considerable change over the past decade, especially the recourse to a broader range of wholesale funding sources such as offshore debt markets and securitisation. This recourse to wholesale funding reflects the need to fund strong balance sheet growth from sources other than household savings, which have been increasingly directed from traditional deposit products into superannuation and wealth management products. In 2006, offshore liabilities accounted for more than a quarter of total liabilities in the domestic books of Australian banks, a figure that is much higher than in most other banking systems.

The IMF’s Financial System Stability Assessment identified the high reliance on wholesale funding as another vulnerability of the Australian banking system. Nonetheless, wholesale funding is now well embedded in funding strategies. It provides greater diversification of funding sources – in terms of investors, regions,

currencies, markets and instrument types and tenors. At the same time, it strengthens market discipline on the borrowing institutions by exposing them to a much more sophisticated investor set, particularly offshore investors who may be especially sensitive to country-wide credit concerns.

Australian banking institutions manage liquidity risk through a range of strategies, including setting limits on maturity mismatches, holding high-quality liquid assets above a benchmark level, diversifying liability sources and developing asset-sale strategies. As part of APRA's prudential framework, larger banking institutions also model two scenarios – a 'going concern' and a five-day name crisis scenario – to demonstrate that they have adequate liquidity in both situations.

The current risk profile of the Australian banking system would not be complete without recognition of two other, and more subtle, risks to which institutions are exposed, particularly after a period of sustained economic expansion. These are strategic risk and agency risk.

To avoid confusion with operational risk, **strategic risk** can be defined as external risks to the viability of a banking institution arising from unexpected adverse changes in the business environment with respect to the economy, the political landscape, regulation, technology, social mores and the actions of competitors.<sup>3</sup> These risks can manifest themselves in the form of lower revenues (reduced demand for products and services), higher costs, or cost inflexibility (inability to reduce fixed costs quickly in line with lower-than-anticipated business volumes).

For Australian banking institutions, perhaps the most significant strategic risk over the past decade has been the erosion of their traditional business of intermediating between depositors and lenders. This has happened in two distinct ways. First, as noted above, the increased attractiveness of superannuation as a savings vehicle has meant that funds that might otherwise have been placed with banks as deposits have been invested in superannuation and wealth management products. Many banking institutions have responded to this strategic risk by investing, substantially in some cases, in wealth management operations. As a consequence, Australian-owned banking groups now account for around 40 per cent of total retail funds under management, a share that has doubled over the past decade; for the five largest banks, income from funds management has grown to around 14 per cent of their total income.

Second, in housing lending particularly, new channels have arisen for bringing lenders and borrowers together, bypassing banking institutions. Unregulated mortgage originators, making use of broker networks, have been very successful in originating, packaging and securitising loans, and distributing the resulting debt securities directly to investors. In response, banking institutions have themselves turned to broker networks to extend their distribution capabilities and, as noted above, some institutions have sought to capitalise on these new channels by moving more to an originate-to-distribute model.

Strategic risk confronts Australian banking institutions in a number of other ways.

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3. For a discussion of this definition, see Allen (2007).

For the larger banks, international expansion is a strategic risk issue. Outside more ‘traditional’ markets such as the United Kingdom and New Zealand, Australian banks have been taking a cautious approach to international expansion as they seek to identify sources of competitive advantage in other markets. By not committing large amounts of capital offshore, the near-term risk of misadventure is commensurately small. On the other hand, however, banks may consider that a failure to develop market knowledge and product delivery capabilities offshore may, in rapidly globalising markets, result in an erosion of their competitive position relative to major international banks, even in the Australian market.

For smaller banking institutions, the strategic risk issue is the long-term viability of a business model which has competitive strengths – personalised customer service and low fees – as well as limitations, in the form of high cost structures and difficulties in diversifying income sources and raising external capital. The traditional customer base remains vulnerable to the offer of more extensive electronic banking services typically offered by larger competitors.

For foreign banks seeking to build their presence in retail banking in Australia, the strategic risk is that any short-term gains in market share acquired through aggressive pricing in lending and deposit markets might not be held if this pricing cannot be sustained or is matched by established participants.

Some further comments on **agency risk** are needed to round out the current risk profile of the Australian banking system. Agency risk in the specific case of originate-to-distribute models was touched on above. A more general form of agency risk arises if the interests of management are not aligned with the interests of shareholders and creditors.

An obvious area of potential agency risk after sustained good economic times is executive compensation. In the Australian banking system, executive compensation arrangements in listed institutions tend to involve a fixed annual salary and share options conditional upon performance. Typically, the option grant is zero if performance, often defined as total shareholder return relative to a benchmark group, is in the bottom half of the benchmark group; from the 50<sup>th</sup> to the 75<sup>th</sup> percentile of performance, the grant increases and a cap typically applies around the 75<sup>th</sup> percentile. The performance period is often five years.

Executive compensation that helps to deliver strong risk-adjusted returns on capital over time and rewards genuine out-performance of competitors does not raise prudential issues of itself. For a prudential regulator, agency risk issues arise if compensation arrangements encourage management to focus on a shorter-term horizon than the long-term approach that would also be in depositors’ best interests. Incentives to drive up the share price more rapidly than competitors can tempt management to pursue aggressive growth strategies or to ‘hollow out’ the institution by paring back capital buffers or cutting costs, particularly in middle and back offices where risk management functions reside.

As a prudential regulator, APRA does not involve itself in the details of executive compensation arrangements. These are matters for boards and shareholders. Nonetheless, growth strategies, the size of capital buffers and the resourcing of

risk management areas are major elements of APRA's supervision of banking institutions and form crucial inputs into its risk-rating system, discussed below. Moreover, boards of banking institutions seeking accreditation to use the more advanced Basel II approaches must sign off that the performance assessment of, and incentive compensation for, senior executives with profit centre accountability take into account the amount of risk assumed and the management of that risk.

### 3. Improvements in Risk Management

Generally speaking, the quality of risk management in the Australian banking system has improved substantially. The spur was the substantial losses incurred by a number of banking institutions in the early 1990s recession in Australia, particularly those exposed to the commercial property market. More recently, the development of the Basel II Capital Framework has been an important catalyst. Improvement is evident across all aspects of risk management – its governance, risk management frameworks, risk identification and measurement, and risk modelling.

The **governance** of risk management in banking institutions, from the board down, is stronger and demonstrates greater accountability. Boards are more active in their oversight of risk issues, consistent with the primacy of their role in determining the institution's risk appetite, approving its risk management strategy and policies, and ensuring that management is monitoring the effectiveness of risk controls. Boards generally now have a risk committee as well as an audit committee and there has been a more pronounced separation of the risk management and audit functions. This has sharpened the independence of risk management and has led to a broad industry concept of 'three lines of defence':

- the business unit and relevant line management (first line) – primarily responsible for business unit strategy, performance management and risk control;
- the risk management unit (second line) – sitting outside the business unit, but working with any specialist risk management staff inside the business unit to provide technical support and advice to assist the business unit and senior management with risk identification, management and reporting within an institution-wide framework; and
- the internal and external audit function (third line) – providing independent assurance on the effectiveness of the business unit and the institution-wide risk management and control framework.

Boards have shown willingness to fund projects for longer-term improvement of risk management, to listen to and seek the views of the chief risk officer and risk management staff, to probe senior management about risk issues and to hold senior and line managers accountable for outcomes associated with poor management of risk.

In the credit risk area, boards are moving away from a more traditional role of reviewing major transactions and exceptions, to reviewing credit risk policies and processes and identifying the portfolio effects and desired outcomes of credit risk management. From a very low starting point, operational risk management now

receives substantial attention as an integral part of the total risk framework in a banking institution. In the area of traded market risk, more resources have been committed to providing genuine market risk oversight and to updating or rationalising supporting IT systems. Escalation procedures have been strengthened and the culture in traded market risk units is more actively managed.

Generally, the **risk management frameworks** of banking institutions have become better structured and more comprehensive over the past decade. Institutions are moving to common approaches and terminology across the main risks types and a more careful delineation of risks, especially between credit and operational risk. In the larger institutions, economic capital modelling and capital allocation for performance measurement purposes is more integrated with risk management frameworks. Progress in economic capital modelling is discussed later in this paper.

Operational risk management frameworks are more detailed and more closely integrated with the systematic approach applied to credit and traded market risk. The frameworks now typically involve the assessment of and measurement of high-impact operational risk scenarios, in addition to the more traditional risk control assessments. In outsourcing, it is becoming more common for larger institutions to establish central coordinating units specifically responsible for identifying, establishing, monitoring and managing outsourcing arrangements, so as to ensure desired service levels and expected economies are achieved and any problems adequately dealt with.

For traded market risk, improved governance is interacting more effectively with risk management controls to identify inappropriate or unsanctioned activity. Segregation of duties has been strengthened.

**Risk identification and measurement** has improved significantly, although data quality issues remain. Stress testing has been an important contributor to this advance.

Credit risk portfolio measurement and management has been strengthened and there are now dedicated credit risk management IT systems (in contrast to risk management requirements being built into accounting or loan origination systems) that provide improved credit management information. This extends to better information on aggregate exposures to individual large customers and exposures to individual industries. However, banking institutions still have some way to go in being able to report quickly on trends in average credit quality, beyond backward-looking information on loan arrears and defaults.

In the area of operational risk, improved measurement of losses has involved the building of loss databases (covering internal and external events) as well as the assessment of operational risk exposures through the application of quantitative methods and high-impact scenario analysis. There has also been substantial growth in the use of risk registers, mitigation strategies and project governance arrangements to better manage operational risks. Accompanying this has been a more systematic approach to IT risk management, which is incorporated into the institution-wide risk profile and managed as a business risk, not just an IT risk.

The upgrading of IT systems in the traded market risk area has strengthened reconciliation procedures, which has led to improved data and risk reporting. Stress testing frameworks are now more comprehensive in this area. In liquidity risk management as well, stress testing frameworks separate to APRA's name-crisis requirements have been developed by a number of banking institutions; other institutions, however, have not given as much thought to the potential events that could trigger a liquidity crisis, the severity and duration of a crisis or the potential impact that market-wide disruptions may have on the institution's liquidity position.

Finally, the larger Australian banking institutions are making much greater use of **risk modelling** and **quantitative approaches** to risk management and the allocation of capital, as part of the general evolution of economic capital modelling in Australia.

Credit risk models are more sophisticated, with effective validation and monitoring regimes that contrast with the more theoretical validation techniques of a decade ago. Credit scoring has been introduced for secured as well as unsecured retail lending. Traded market risk modelling has been enhanced to handle more exotic or less liquid products and there has been an increased focus on non-traded market risk modelling. In addition to the Basel II Capital Framework, advancements in quantitative methodologies and the desire of banking institutions for reliable model outputs are factors driving this modelling work.

Operational risk modelling is a significant element of the Basel II Capital Framework for banking institutions using its advanced approaches. Operational risk models and measurement practices are evolving rapidly. Both the industry and APRA recognise, however, that there are significant sources of uncertainty in modelling operational risk, in terms of the data, assumptions and modelling choices. There is also an emerging recognition that scenario analysis will play a significant role in the measurement of capital required for extreme loss events. APRA has been at the forefront, globally, in the development of scenario analysis in this area; it has been working closely with institutions to identify assessment biases in scenario analysis and ensure that business unit participation in extreme loss exercises produces consistent results. APRA also requires the advanced Basel II banking institutions to appropriately identify and assess uncertainty in their operational risk measurement and modelling assumptions and parameters, and measure the capital impact via sensitivity analysis. This approach provides the basis for applying an appropriate degree of conservatism in the calculation of capital requirements.

As models evolve and data accumulate, better model validation should be possible and the degree of uncertainty should reduce. However, it may be some time before the distribution of extreme loss events (which are 'heavy in the tails') becomes more certain.

As a general point, the benefits of more extensive use of risk modelling need to be assessed cautiously. Experience confirms that models do not work in all the circumstances to which they are exposed. Examples of misspecification or inapplicability include use of the wrong probability distributions or assuming continuity in markets which prove discontinuous under stress. Complex models

may also prove unreliable when used to calculate prices of new and less-well-understood financial instruments, which do not trade in deep markets. In the case of complex models, another caution is that those responsible for risk oversight of the model may not have the necessary understanding of the model’s complexities and parameter sensitivities, and may allow the model to run without appropriate checks and balances. For these reasons, model governance and validation are a major focus of the accreditation process for banking institutions wishing to use their internal risk measurement models under the Basel II Capital Framework.

The improvements in risk and risk management over the past decade inevitably draw attention to the issue of data quality. More of the day-to-day operations of banking institutions are becoming automated in some form and these rely heavily on relevant and accurate data. So does the modelling within institutions for risk management and capital allocation. Poor data quality can compromise decision-making, have a detrimental impact on behaviour across an institution and ultimately lead to a failure to meet business objectives.

Against this background, APRA has begun consultations with banking institutions on developing data management requirements. APRA envisages that a banking institution would identify, assess and manage data quality as part of its overall risk management framework, and would have a risk assessment process to determine how critical data are to its operations. A good, well-documented data management framework would include a description of the data architecture, data controls, data validation, appropriate IT environment controls and independent review of data quality and key processes and controls.

#### **4. The Movement to Risk-based Prudential Supervision**

Over the past decade, the increasing sophistication of risk management in Australian banking institutions has influenced, and has in turn been reinforced by, a strengthening in the framework of prudential regulation. This has involved a move to more ‘principles-based’ regulation and the development of a risk-based approach to the supervision of individual institutions. Similar changes have been underway in the United Kingdom and other advanced industrial countries.

A principles-based approach to regulation recognises the complexity and diversity that exists among financial institutions and seeks to avoid one-size-fits-all regulatory requirements. It involves the replacement of detailed prescriptive rules and attention to processes within institutions, with high-level standards focused on outcomes. In the past few years, APRA has augmented the framework of the Basel Capital Accord, which has underpinned capital adequacy requirements for banking institutions, with more principles-based prudential standards dealing with governance, ‘fit and proper persons’, outsourcing and business continuity management. These standards (harmonised across the insurance sector as well) have been aimed at enhancing the calibre and decision-making processes of those charged with running supervised institutions and strengthening the ways in which institutions identify and manage their risks.

Risk-based supervision aims to ensure that supervisory attention and resources are targeted at institutions whose activities are posing greater risks or have larger systemic impact. Although the distinction can be overdrawn, the approach contrasts with traditional rules-based approaches that focus on compliance with legislative and regulatory requirements and, in particular, on verifying asset quality and provisioning.

The centrepiece of APRA's risk-based supervision is a robust system for identifying and assessing emerging risks in a supervised institution, and for deploying APRA's resources. The risk assessment model, known as the Probability and Impact Rating System (PAIRS), involves a *joint* assessment of the likelihood that an institution will fail to honour its financial promises (probability rating) and the impact that the failure of the institution would have on the financial system (impact rating).

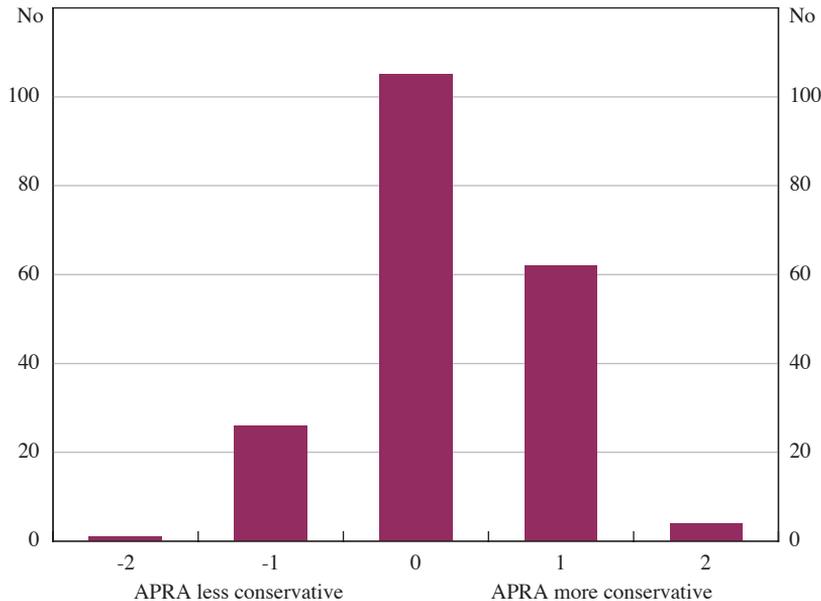
**Probability ratings** are determined through a structured framework in which supervisory judgments about an institution – based on on-site and off-site supervision, statistical returns, communications with boards and management, audit reports and other information sources – are formally weighted and scored. This framework has three building blocks: the *inherent risks* facing the institution arising from the types of products and services it offers, its strategies and risk appetite; the effectiveness of *management and controls* in mitigating these risks; and the extent of *capital support* to meet unexpected losses. The elements that comprise each of the building blocks are weighted according to their significance to the overall risk profile of the institution and then scored on a scale ranging from zero to four (with higher scores indicating an increased likelihood of failure).

The PAIRS model takes the weightings and risk scores to produce an estimate of the 'overall risk of failure'. This is the PAIRS probability rating – the likelihood that unexpected losses resulting from the institution's net risk exposures would exceed its capital resources, leading it to fail. In producing this estimate, the relationship between the individual building blocks and the overall risk of failure is not assumed to be linear. The experience of major credit rating agencies is that the relationship between ratings and the observed default rate is exponential. In the PAIRS model, as the risk scores deteriorate, the overall risk of failure rises significantly. Hence, any weakening in an institution's risk profile is strongly signalled to supervisors.

The determination of probability ratings in this way has been described as a form of 'meta-regulation', in which the regulator relies on, and reviews, an institution's own system of accountabilities and controls (Black 2004). A number of mechanisms, including benchmarking against similar institutions and comparisons with external credit ratings, are used to ensure that PAIRS probability ratings are as accurate and consistent as possible. As Figure 1 shows, APRA's PAIRS ratings are centred very close to external ratings but tend to be a little more conservative.<sup>4</sup> This is not surprising. Ratings agencies include in their assessment a judgment about the

4. Figure 1 charts the differences between Moody's, Standard & Poor's and KMV ratings, and current PAIRS ratings. The external ratings are translated into equivalent PAIRS rating bands of 'Low', 'Low Medium', 'High Medium', 'High' and 'Extreme' and then compared to the current PAIRS rating. For example, an entity may have an external rating of 'Low' while its current PAIRS rating is 'Low Medium'; this would indicate that APRA is more conservative by one band.

**Figure 1: PAIRS and External Ratings Agencies**  
Combined rating differences



Source: APRA

likelihood that APRA will intervene effectively should an institution find itself in difficulty; the PAIRS ratings, on the other hand, make no pre-judgment about APRA intervention. All cases where PAIRS ratings vary substantially from external ratings are closely reviewed.

The **impact rating** is an assessment of the potential adverse consequences that could ensue from the failure of a supervised institution. At this point, APRA relies on a single scalar – total resident Australian assets – to determine impact ratings (subject to management override in exceptional cases). This provides a workable measure for the direct impact of failure; however, it does not capture any indirect effects on the industry or more systemic effects on the broader economy. This is an area for further research.

Under APRA’s Supervisory Oversight and Response System (SOARS), the probability and impact ratings of an institution are combined (with equal weightings) to determine APRA’s supervisory response. Where PAIRS involves substantial calculations and judgment, SOARS is simply an overlay of supervisory stances, designed with the aim of minimising the risk of regulatory forbearance.<sup>5</sup> There are four supervisory stances of increasing intensity, from routine supervision for ‘Normal’ institutions through to vigorous supervisory intervention for institutions in the ‘Restructure’ stance, which are in need of new capital, management, ownership, or possibly all three. The SOARS grid has been set so that the larger the regulated

5. Information on PAIRS and SOARS can be found on the APRA website at <<http://www.apra.gov.au/PAIRS/home.cfm>>.

institution, the earlier and more pro-actively APRA responds to a given risk of failure.

The PAIRS/SOARS model shares a number of features with the risk-rating models used by the Office of the Superintendent of Financial Institutions (OSFI) in Canada and the Financial Services Authority (FSA) in the United Kingdom, and other models.<sup>6</sup> However, there are differences:

- the use of an impact rating is not universal, but is appropriate for a prudential regulator such as APRA, which supervises a wide range of institutions by size;
- most other models do not separate their risk-ratings and supervisory responses. In the OSFI approach, for example, institutions are assessed (equivalent to a SOARS stance) directly from the risk grid. The FSA approach is similar to OSFI's, except that the FSA combines prudential, behavioural and market conduct responses in the same overarching model; and
- PAIRS produces a probabilistic estimate of the likelihood that a supervised institution will fail. Other regulators provide only a 'low'/'medium'/'high' risk split, or equivalent, and these qualitative descriptors are not mapped to failure probabilities.

In APRA's view, a risk-based approach has considerably improved the efficiency and effectiveness of APRA's supervisory activities and helped to reinforce standards of risk management in the Australian banking system. Nonetheless, in sustained economic good times, the discriminatory power of a risk assessment model may not be easy to assess. As one performance measure, APRA has developed 'transition matrices' to track the migration of institutions between the different supervisory stances. Over the past four years, the great majority of institutions (in banking as well as other regulated industries) in 'mandated improvement' or 'restructure' at some point have either improved or exited the industry, with only one small failure as such (in superannuation). Of the 176 institutions that have been in these two stances, 55 have improved, 24 remain in their SOARS categories, 1 has been downgraded and 95 have exited (Table 1).

**Table 1: Entities in Mandated Improvement or Restructure**  
2003–07

| Current stance       | Mandated improvement | Restructure | Total      |
|----------------------|----------------------|-------------|------------|
| Normal               | 14                   | 3           | 17         |
| Oversight            | 37                   | 1           | 38         |
| Mandated improvement | 16                   | 0           | 16         |
| Restructure          | 1                    | 8           | 9          |
| Exit                 | 68                   | 27          | 95         |
| Failure              | 1                    | 0           | 1          |
| <b>Total</b>         | <b>137</b>           | <b>39</b>   | <b>176</b> |

6. For the OSFI approach, see OSFI (c 1999); for the FSA approach, see FSA (2006).

Before leaving this section, it is worth asking whether the more flexible, risk-based approaches to prudential supervision being pursued by APRA and counterparts overseas are compatible with the new Basel II Capital Framework.

Use of the standardised Basel II approaches raises no particular issues. These simply add greater granularity to capital requirements and allow banking institutions to utilise external ratings, where available. On the other hand, the very detailed rules associated with the more advanced Basel II approaches to credit, market and operational risk might suggest that a return to a rules-based approach to supervision is unavoidable.

The answer lies in understanding what Basel II’s detailed rules are seeking to achieve. The more advanced Basel II approaches allow banking institutions to factor their own risk estimates into their capital requirements. The detailed rules serve to ensure that those estimates are robust; that they are not simply based on recent experience or the good part of the economic and business cycles; that they are subject to independent validation; and that they are surrounded by a sound governance process. From a supervisor’s perspective, robust risk estimates enable a sharper focus on material risks and a more prompt reaction as risks change.

However, it is the supervisory review process of Pillar 2 that is most clearly aligned with a risk-based approach to supervision. The stated aims of Pillar 2 are to ensure that banking institutions have adequate capital to support all the risks in their business and to encourage these institutions to develop and use better techniques to monitor and manage their risks. In APRA’s view, Pillar 2 will clearly support its risk-based approach to supervision, ensuring that supervisory resources are focused on emerging risk issues while minimising supervisory intervention into well-run banking institutions.

## 5. Developments in Economic Capital Modelling

The improvements in risk management over the past decade, particularly in larger Australian banking institutions, have been crucial formative steps in the evolution of economic capital modelling in Australia. The advanced Basel II approaches have sought to capture and add impetus to such developments globally.

Economic capital for a banking institution can be thought of as the maximum amount of unexpected losses potentially arising from all sources that could be absorbed *while remaining solvent*, with a given level of confidence over a given time horizon. It contrasts with regulatory capital, which can be thought of as the maximum amount of unexpected losses that could be absorbed *without any loss to depositors*, with a given level of confidence over a given time horizon.

In principle, to quantify the amount of economic capital needed to provide the level of confidence chosen, an estimate of the probability distribution of all possible profit and loss outcomes for the banking institution would be required, incorporating the potential unexpected losses from all relevant risks. From this distribution, the institution’s board and management could determine the level of equity capital needed to maximise shareholders’ wealth over the longer term. Disincentives would

be in place to ensure that activities that fail to achieve returns on allocated economic capital in excess of the cost of equity would be avoided; incentives would be in place to ensure that activities that generate returns in excess of the cost of equity would be encouraged. In this ideal world, financial performance measures based on returns on economic capital would pervade all aspects of the institution's risk management, product pricing and performance evaluation and compensation.

The principle that performance should be measured and evaluated against the capital needed to support the risk was introduced some years ago by major global banks for loan pricing and, soon thereafter, for financial market trading activities, with the use of value-at-risk, or VAR, concepts. Return on risk capital, rather than absolute dollar trading profits, became a key input to performance evaluation and reward for traders. Multi-risk economic capital models with coverage beyond credit and market risks were the next stage of development. However, since the initial proposals in 1999, it has been the Basel II Capital Framework that has provided the spur for large, complex and internationally active banks to develop and drive their businesses according to risk-adjusted performance, based on economic capital models.

For the larger Australian banks, the objective of accreditation to use the more advanced Basel II approaches has led to a substantial investment in risk identification, measurement and management, as described in Section 3. This investment is already yielding returns in the form of the higher potential profitability that a better understanding of the risk dynamics of the banking business provides. Nonetheless, the achievement of comprehensive, consistent and accurate measurement of overall risk exposures still appears some way off. There are differences in economic capital modelling methodologies in terms of risk coverage, risk definitions, exposure measurement and risk aggregation. There are also significant differences in the relativities between modelled economic capital numbers and equivalent Pillar 1 regulatory capital estimates. These problems are certainly not unique to Australian banks.

The dimensions of the economic capital modelling task ahead can be illustrated by reference to the Pillar 2 risks that have received less attention than the credit, operational and market risks covered by Pillar 1. Pillar 2 does not seek to provide an exhaustive list of potentially material risks, but it does identify a number of risks, including liquidity risk, strategic risk and reputational risk. The difficulty in treating these risks is related mainly to precise definitions and measurement methodologies; in the case of liquidity risk, however, there is debate about whether it belongs in an economic capital modelling framework at all.

The main argument for excluding liquidity risk implies a simple two-state world: if a banking institution has sufficient liquidity, it does not need capital support but if it lacks sufficient liquidity, no amount of capital support will save it. This ignores a middle ground where the need to generate liquidity unexpectedly to cover a maturity mismatch may involve costs that add to potential unexpected loss, without necessarily triggering insolvency.

There is general acceptance that strategic risk, discussed in Section 2, should be included in any comprehensive economic capital model. Capital is needed to enable a banking institution to ride out temporary changes in market conditions and to allow it sufficient time to adapt its business model to more permanent changes in the competitive environment. However, the absence of sufficient meaningful historical data makes measurement a problem, particularly with regard to the low-probability, high-potential-impact strategic losses that are a major concern to banking institutions. Some blend of subjective stress testing with statistical methods where available data permit might be the best that can be achieved.

Reputational risk may arise by way of group contagion or from the institution’s own actions; in the latter case, reputational loss may well be the consequence of another risk event rather than a risk event in its own right. Either way, the potential impact needs to be taken into account in estimating potential overall unexpected loss. In quantifying the impact of a serious operational failure, for example, the cost of the resulting damage to the institution’s brand and franchise may far exceed the direct cost of the operational risk event itself. Quantification of potential reputational damage is difficult given the limited historical data available, but the risk is potentially too important to ignore. As with strategic risk, some combination of subjective stress testing with statistical techniques where sufficient data exist would seem to offer most promise.

## **6. Looking Ahead**

Over the past decade, a supportive macroeconomic environment, sustained balance sheet expansion, diversification and continuing improvements in risk management have produced a robust and highly profitable banking system in Australia. Based on traditional indicators, the financial condition of banking institutions, generally speaking, has arguably never been better nor the quality of risk management higher. Risks appear well contained, although the exposure of banking institutions to the residential property market and highly-g geared households remains a continuing focus of policy and supervisory attention.

Looking ahead, the challenges for banking institutions and the prudential regulator are to maintain this robust position in the face of uncertainties in the macroeconomic outlook, innovation and growing complexity in financial products and markets, and constant pressure on costs. Three particular challenges can be singled out.

For banking institutions, continuing good times can erode the incentives for boards and senior management to maintain, or where necessary upgrade, investment in and resourcing of risk management functions. In an environment of ever-changing risks, such investment is essential but may not always be easy to defend if share markets are preoccupied with short-term performance that may not take account of risk.

For the prudential regulator, the move to a principles-based approach to prudential requirements brings challenges in establishing appropriate principles and, very importantly, in being able to judge whether a specific solution proposed by an

institution is adequate to meet the relevant principle. The approach places particular demands on the skills, experience and judgment of supervisory staff.

Finally, for banking institutions and prudential regulator alike, market expectations of continuing good times will be problematic. The premise of economic capital modelling, and the preferred starting-point for prudential regulation, is that owners of banking institutions will reward management for acting in their *long-term* best interests by increasing the value of the institution through maximising returns relative to risk. Market myopia and incentive structures that reward growth for growth's sake, or adventurism in new markets or territories, will undermine the best-conceived risk management frameworks in any banking system.

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# *Discussion*

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## **1. Jenny Corbett**

John Laker's paper addresses four main themes:

- i. the changing nature of risks in banking, particularly during a period of economic expansion;
- ii. the evolution of risk management;
- iii. the movement to risk-based prudential supervision; and
- iv. developments in economic capital modelling.

It describes the journey that both banks and regulators have taken in recent years to improve their assessment and management of risks, and concludes that although progress has been made there are subtle new risks now facing depository institutions. Moreover, the long period of good times may not be conducive to dealing with these risks appropriately.

The paper ranks the risks facing Australian banks in descending order of importance as credit, operational, market and liquidity risks. Although credit risk may be thought of as low in a banking system with such a high share of mortgage lending as in Australia, Laker notes that most of the risks remain on banks' balance sheets because they make relatively little use of securitisation. Operational risk – one of the largest risks facing banks – is mainly concerned with low-frequency, high-impact events, with its precise nature changing with technology and business models. For example, the risk from outsourcing now looms large. In the assessment of the paper, liquidity risk, though growing through the greater use of wholesale funding, is currently well managed.

The paper identifies two more subtle risks that are not the focus of regulatory (or Basel) attention but may warrant closer attention. 'Strategic risk' – which is distinct from operational risk – involves changes to the business environment. In the Australian context this arises from changes to household saving and deposit behaviour and increased competition for banking business. 'Agency risk' can be of the 'classical' form, arising from misaligned incentives between principals and agents. It may also arise in the form of governance risk whereby interests of stakeholders (depositors and shareholders) may not be served by boards and managers (for example, by awarding excessive salaries). Both of these will need more attention in the future.

In assessing the response to these risks the paper argues that risk management systems are getting better. For example, internal systems are generally improving and boards are paying more attention to risk management. Partly as a result of changed regulatory requirements, there is a better system of risk identification and measurement in place and more use of risk modelling. Although the paper's description of changing risk management processes inside banks is interesting, it is too limited. It would be useful to have a more systematic way of judging how extensively these improved systems are being implemented and whether or not they

make a difference to performance. This is not merely a curiosity but is important in revealing whether we have the means to judge the success of the regulatory philosophy described in the second half of the paper. It should be possible for the Australian Prudential Regulation Authority (APRA) to provide a broad-brush picture of the extent to which depository institutions use various techniques, without breaching confidentiality. If this information were broken down by the size of institutions it would also be possible to assess whether it matters for outcomes. One can imagine a matrix showing different types of institutions and their use of different types of risk management systems. Over time this would provide a view of the improvements in the quality of internal governance.

Next I would like to discuss some of the risks that are missing from the list in John's paper. For example, is the paper too sanguine about risk in the Australian banking system given the sector's concentration, reliance on mortgages, falling margins and the growing gap between lending and the deposits that have traditionally funded them? These conditions look somewhat like Japan's banks in the 1990s – and we know what happened there. In Japan there was a decline in high quality corporate borrowers, which led banks to seek alternative higher-risk borrowers. However, because their traditional lending was mainly collateralised by apparently high-quality fixed assets (most often land) Japanese banks had not developed sophisticated credit assessment methods. As the value of the collateral fell, the failure to understand the real quality of the borrowers became critical. The result is history. Can we be sure that our internal governance structures are sufficient to withstand such a squeeze? This is why measurable data on internal structures would be valuable.

Another source of concern is the potential for cross-border contagion, given Australian banks' increasing dependence on wholesale international liabilities. Although this and other papers presented at the conference argue that this risk is mostly hedged, and that the only significant source of cross-border contagion would be New Zealand, the International Monetary Fund has identified it as a vulnerability (IMF 2006).

While technology risks are mentioned under operational risk for individual institutions, there may also be a systemic concern about the growth of electronic finance. Not only do new technologies open new avenues for fraud, they also mean that new players can enter conventional markets easily. Although any deposit-taking activity immediately brings an institution under the supervision of APRA, the non-regulated sector continues to grow. Since it is hard, even impossible, to anticipate the types of new products and services that may be offered there will certainly be regulatory lag in deciding who should be covered by which regulator. There is considerable scope for research on whether disclosure and reputation effects alone will be sufficient to ensure efficiency and soundness in these sectors. Furthermore, new technology encourages new linkages between the regulated and unregulated sectors and enormously increases the speed with which shocks can be transmitted across the system. All this puts pressure on regulators to be extremely fleet of foot.

The description of risk management included in this paper is not intended to go beyond Australia, yet it does purport to reflect the operation of a ‘best-practice’ system. So, to what extent do these lessons extend to other systems? Most of the papers at the conference use evidence from banking systems of English-speaking economies. While they do not all resemble each other that closely (Australia stands out in many respects), they are more similar to each other than to banking systems in the neighbouring Asian region. There, banks still lend mainly to corporations and although household debt is rising, this is not in the form of mortgages, nor is it securitised to any large extent. If risk-based supervision is to be used in differently structured systems, do the same principles apply? Perhaps the answer is that some do and some do not. Since APRA is in a position to advise and help build capacity in our region it would be interesting for them to reflect on the universality of their ‘principles-based’ approach.

The second part of John’s paper describes APRA’s approach to risk-based prudential supervision, now regarded as international best practice. Risk-based supervision may be seen as part of a philosophy that regulation should be ‘principles-based’ rather than rule-driven. It is intended to avoid the straightjacket of one-size-fits-all policy and to allow an approach that is tailored to the circumstances of individual institutions.

The term ‘principles-based’ means augmenting Basel capital requirements with, among other things, principles on governance standards, fit and proper criteria for responsible persons, outsourcing and business continuity. One problem with this approach is the regulatory burden it creates. Not only is it labour intensive for the regulator but it creates a significant burden for the regulated entity. The average mutual institution in Australia is likely to require a Board policy document to respond to each of APRA’s policies and guidance documents. This can run to around 40 policy documents with an average length of 20 pages, creating around 800 pages of policy documentation that needs to be reviewed by the Board. While this may not be a major driver of the consolidation trend noted by Kevin Davis, it is a non-trivial issue for small institutions.

The paper also outlines APRA’s particular approach to risk-based supervision – the Probability and Impact Rating System (PAIRS) and Supervisory Oversight and Response System (SOARS). For each institution the model calculates the probability of failure based on supervisory judgments, the inherent risks of the business model, management controls and the degree of capital support. This gives the PAIRS rating (an overall risk of failure), which is not disclosed. This probability is then combined with a rating for the impact that such a failure would have in order to place the institution in a SOARS category. There are four categories: normal; oversight; mandated improvement; and restructure. These are disclosed to institutions but are not made public. The paper argues that this system is an effective, best-practice approach but the evidence provided makes it difficult to assess this claim. For example, the paper shows a ‘transition matrix’ of the number of institutions that graduate from a poor state, to either a better state or exit the industry. However, these snapshots do not say anything about whether the regulatory system helps the institutions to improve their status (plausible but hard to prove) nor whether institutions exit more smoothly and with fewer losses than under alternative systems.

The paper also raises the issue of whether the principles-based approach is compatible with Basel II, noting ‘... the very detailed rules associated with the more advanced Basel II approaches ... might suggest that a return to a rules-based approach to supervision is unavoidable’. The paper argues that there is no conflict between the two approaches but perhaps the issue merits more discussion. In particular, the old debate about rules versus discretion cannot be regarded as irrelevant, even in the developed markets of Australia, the United Kingdom and the United States and certainly not in developing countries’ financial systems. Does risk-based supervision give too much discretion?

This is not mere semantics. During the discussion in other sessions, participants argued that regulatory discretion and forbearance has been a big part of crises. Discussions tried to distinguish between ‘cyclically-adjusted prudential policy’ and ‘discretion which is sensitive to specific circumstances’, with the sense that the former is difficult to achieve while the principles-based approach is trying to capture the latter. This might be regarded as splitting hairs. Recalling the supervisory philosophy of the 1990s, the best practice in the world at the time, prompt corrective action (PCA), was regarded as a panacea because it stopped regulatory forbearance. It established clear rules about the classification of institutions that removed the possibility of collusion between the regulator and regulatee. In Japan, supervisory forbearance was considered so severe that PCA was formally introduced in the late 1990s. The slow and painful transition to rules-based supervision was seen as a triumph of modern views over the vested interests of both supervisors and financial institutions until very recent times indeed. It is not yet clear whether principles-based supervision will be accepted by those who fought against regulatory discretion. Are we so sure that the discretion implied by a principles-based approach will not be a problem for Australia? The IMF had sufficient concerns to raise some relevant issues in its recent Financial System Stability Assessment for Australia (IMF 2006).

Another issue that the paper ignores is who should regulate. The paper notes that APRA was an amalgamation of regulators following the advice of the Wallis Commission and faced an early challenge with the collapse of the insurance company HIH. The Wallis Commission had strongly recommended separation of supervisory powers from central banking. While the paper argues that APRA has made good progress in addressing its earlier weaknesses, it does not comment on whether the structure is now optimal, nor how it compares to the alternatives. However, that debate is far from over. In the present circumstances, where liquidity risks threaten the stability of the financial system in many countries, it is clear that there must be close cooperation between regulators and lenders of last resort. If we believe that liquidity provision is likely to be a core task in the new global financial system, there is a stronger case for connecting the two institutions. On the other hand, there is the argument for specialist expertise within a dedicated regulator and the question of conflicts of interest.

What if the macroeconomic stance of monetary policy (the responsibility of the central bank) and regulatory requirements conflict? Which is to dominate? Japan’s experience is again relevant here since arguably the anti-inflation stance of the Bank of Japan unduly constrained liquidity provision in the early 1990s. Would

policy have been better if the two functions had been linked? Would the regulatory arm have been able to reassure the monetary policy arm that liquidity provision was necessary but would not prop up failing institutions? If they had, such action would certainly have raised fears about the independence of monetary policy. It also runs the risk that safety nets will be extended inappropriately to other parts of the financial system.

If the argument cannot be settled in theory, is there empirical evidence to tell us whether it matters? Čihák and Podpiera (2006) examine a large sample of countries and find that: 33 per cent have a single prudential supervisor; 6 per cent have one agency supervising banks and securities firms; 11 per cent have one supervisor for banks and insurers; 9 per cent have one for securities firms and insurers; while 44 per cent have multiple sector supervisors. The majority of countries still have multiple supervisory agencies but the striking feature of the data is how varied the international experience is. Of those countries with a single regulator, perhaps a third use the central bank for the task. In the Asian region that proportion is generally higher, at least for the supervision of the banks. A key issue though is whether the supervisory structure has an effect on outcomes. Attempts to gauge the effectiveness of integrated supervision are inconclusive (Čihák and Podpiera 2006); income levels and the general quality of the economic regulatory system matter more.

In conclusion, this paper gives an informative and detailed picture of what regulated institutions and APRA have done in recent years to better manage risks. It cautions against the complacency that can arise during an extended economic expansion, but is perhaps slightly guilty of not looking harder at where the next risks are coming from and asking questions about whether the regulatory structure is best suited to dealing with them.

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## 2. General Discussion

Stefan Ingves' proposal for a new pan-European body to supervise the cross-border activities of European banks generated considerable debate. One participant thought that such a body could strengthen the regulatory process but was less certain whether it would adequately take the interests of host countries into account. It was suggested that the same ends could also be achieved via clear and transparent agreements between home and host countries. In response, Stefan argued that such arrangements would be inadequate for meeting the challenges of cross-border banking and they have already become too numerous to manage easily. Another

participant wondered whether Stefan's proposal was aimed at preventing crises or resolving crises once they had begun. Stefan reiterated that his proposal was aimed at preventing crises. Some also expressed the view that although a pan-European body might be appropriate in the European Union where there is a history of inter-governmental cooperation, it was less clear that an organisation with similar powers would be appropriate in other regions of the world, such as Asia.

There was also some discussion of how liquidity crises should be dealt with when they involve institutions with cross-border activities, and the appropriate relationship between central banks and prudential regulators. One participant suggested that if central banks remain separated from regulators, their success in managing crises could be enhanced by holding regular war games. Stefan argued that it is difficult to ring fence liquidity and that central banks are better equipped to deal with such crises than regulators. He also opined that although the optimal relationship between central banks and prudential regulators is unclear, a problem with combining the functions is that central banks tend to have more expertise in monetary policy and may not devote enough time to their prudential responsibilities.

John Laker's paper brought forth a number of questions about prudential regulation in Australia. One participant asked if, because of systemic considerations, APRA put more resources into supervising banks than insurance companies. Another wondered whether APRA had devoted sufficient attention to building up the necessary skills to manage financial crises and whether they conducted regular war games. John responded by saying that APRA does not distinguish between banks and insurance companies *per se* when allocating resources – although the impact of any given institution on the stability of the financial system was a key factor. He strongly defended APRA's ability to manage crises, citing the experience gained during the collapse of the insurance company HIH. A number of people expressed reservations about quantitative risk modelling, particularly the way some institutions use it as a profit centre and the difficulty of obtaining accurate confidence intervals for estimates of risk. John Laker acknowledged these concerns, but reinforced that APRA closely monitors what constitutes best-practice risk management and uses this information to make recommendations to any lagging institutions.

# Wrap-up Discussion

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## 1. Avinash D Persaud

Whenever financial markets drop precipitously, there are calls for central banks to cut interest rates and for regulators to extend the scope of regulation. Market participants eagerly join the clamour for rate cuts, but are less eager for greater regulation.

As we have discussed throughout the past day and a half, monetary policy and financial regulation have vital contributions to make to financial stability. But knee-jerk policy responses are more likely to be part of the problem than the solution.

I recognise that the central bankers represented around this table are less prone than others to these pressures. I also recognise that sometimes when central bankers ease policy amid market turmoil, there are often reasons that are not always outwardly visible at the time. With that in mind, I hope no-one assembled here takes too personally my critical look at where we have travelled in the journey towards financial stability. These criticisms are not directed at anyone or any country but to us all.

### 1.1 Avoiding the SOX Syndrome

During quiet times, it is easy to forget that one of the key challenges of policy formulation in a crisis is fashioning policy in the fog of war, where good judgment is easily lost and it is hard to differentiate reality from illusion. It is understandable that in such times, policy-makers judge that it is better to act now and live another day to deal with any adverse consequences than to forever regret that they did not do so. No one wishes to be viewed as a latter-day Montagu Norman.<sup>1</sup>

Yesterday, one of our colleagues remarked that the Sarbanes-Oxley (SOX) response to the severe loss of confidence in corporate America after the Enron and Worldcom debacles was an example of this ‘in the heat of the moment’ over-reaction. To avoid succumbing to the SOX Syndrome, it is important that policy-makers are ruthless in requiring policy to be aimed at solving a specific market failure, not just quelling the screams of those who claim that unless they are bailed out, the entire system will collapse. This is easier said than done, especially when the ground beneath you is shaking and sizeable chunks of the financial system are dropping around you. Until they are relocated to Mars, central bankers cannot be as impervious to political pressures as their constitutions might suggest.

It is important therefore that policy-makers have some independent benchmarks of performance in the area of financial stability. Regulators and central bankers consider it important to defend policy publicly, but are they clear in their own mind

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1. Governor of the Bank of England (1920–1944).

about what policy success or failure looks like? If this year's cold and damp English summer is anything to go by, we cannot be in hell, but how do we know that we are not mistaking purgatory for heaven?

## 1.2 Policy performance issues

Politicians understandably avoid indicators or benchmarks of policy success, but independent central bankers can be more courageous – *at least in private*.

Franklin Allen presented to us an interesting paper on the fundamental market failure at work in financial markets and the implications of incomplete markets. Although the current situation is fluid, it is not clear to me from our discussion yesterday that the current failure in the financial markets is that monetary policy is excessively tight. It is important to get this judgment right. It is not so easy to drain off previous injections of liquidity. Many emergency rate cuts appear to have contributed to new, later crises.

The problems that gripped financial markets in August 2007 related to the loss of confidence in the value and valuation of credit instruments and uncertainty about the credit quality of their counterparties. The announcement by central banks that they would widen the range of instruments that can be used as collateral, hopefully at a memorably painful discount, would appear to have a better chance of dealing with the problem than a blanket cut in interest rates. I think Walter Bagehot would have approved.

Your average regulator's private benchmark for success is that there has been no bank failure under his or her watch. But the spread of the financial system beyond both banks and national borders means that this is too narrow and short-term a benchmark. It is possible today for local banks to be safer, but for the international financial system as a whole to be less so.

While there is much disagreement over the details, I think there is broad consensus over the objectives of financial stability policies. The opposite of financial stability is indiscriminate volatility in the availability of credit and capital. We wish to avoid several years of feasting, followed by famine. But there are trade-offs. The Soviet financial system had elements of stability, but this stability was delivered at enormous economic cost.

In considering whether we have achieved the right balance in this trade-off between efficiency and stability I would consider three issues in addition to the degree of generalised volatility in the financial system. First, is monetary policy less frequently used than before to bail out parts of the financial system? Today, monetary policy is increasingly focused on controlling inflation and so it would not be a sign of a successful financial and regulatory system if monetary policy had to set aside this task on a regular basis to rescue the financial system.

A second issue is whether greater risk-taking is a result of a better allocation of risks to those with a capacity to hold these risks. If credit, market and liquidity risks are being held by those with a greater capacity to bear them, more risks can be safely taken in aggregate than otherwise. But if institutions with a capacity for one

type of risk are selling it to several institutions without such a capacity, in order to earn fees and reduce regulatory reserves, this is not a sign of success.

A third issue is whether participation in financial markets is becoming more diverse. In a diverse financial system when one sector wants to sell an asset, for reasons specific to the way that sector values that asset, another sector may be happy to buy the same asset because they value its characteristics differently. Diversity supports stability.

These issues – frequency of policy interventions, allocation of risk to areas with a capacity for risk, and the degree of diversity – are all highly relevant to financial stability.

However, it is not clear to me that we are making substantial headway in the battle for financial stability – despite a significant and costly increase in the scale and reach of regulation over the past 20 years.

Let me make myself clear. I am not saying that banks have become less safe. I am saying that we should expect more from our heavy investment in financial stability. There has been a step change in regulation since 1985. We have far more regulations, regulators and compliance officers. The regulation of market and credit risks is far more sophisticated than before. None of this is without cost, either in terms of the financial costs of regulation, barriers to entry into the industry or restraint on product innovation. I am not against regulation or the extension of surveillance to new players, but I am concerned with the effectiveness of regulation and it is not clear to me that the financial system as a whole is substantially more stable than before. Do we have markedly fewer market runs and fewer emergency rate cuts? Do we wonder whether there has been a trade-off between bank safety and system stability?

During my career in the markets, I can recall the international policy response to the October 87 crash, to the Savings and Loans disaster in the US, to the Tequila crisis, to LTCM, to the bursting of the global dotcom bubble and now the response to a potential credit crunch. My friends in central banks who remember the war stories of old may argue that the frequency of emergency rate cuts or action have not increased, but I would rejoin that it has not noticeably declined. Indeed, the frequency of these policy interventions raises the question of whether monetary policy can successfully moderate the economic cycle (as opposed to aggravating it), if every four years or so – a period less than the average amplitude of a full economic cycle – there are emergency rate cuts.

Further, as I will argue in a moment, there are reasons to believe that risk is moving to places that do not have a capacity to bear the risk, making the system more fragile for a given amount of risk. The degree of effective diversity in the financial system has also become more limited, contributing to frequent market runs. Equally worrying is that these are trends that are encouraged by our current version of expensive and pervasive regulation.

When I hear some say that the absence of bank defaults means that we have won the battle of financial stability, I get an uneasy feeling, followed by visions of a President being airlifted on to an aircraft carrier with a big banner behind him saying ‘Mission Accomplished’.

It is often said that the greater complexity and opacity of modern day finance is a key challenge for financial stability. I think this point is overstated. More importantly, the solution to this challenge, greater transparency and more financial education, while worthy goals for the sake of greater inclusiveness, will not stop market runs. The hedge fund managers that have fallen victim to their hubris this time around were hardly financial illiterates, nor did they have insufficient incentives to discover what they were investing in. Moreover, there are occasions when it is possible to argue that more transparency is aggravating trading in markets (see Persaud 2000).

I believe there are two, more important challenges to our achievement of greater financial stability.

### 1.3 Procyclicality

The first challenge is that for regulators, the economic cycle is ‘the love that dare not speak its name’. Even though financial instability is driven in many ways by the economic cycle, regulators manage to write several hundred pages of financial regulation and rules without expressly dealing with it and central bankers are expected to focus on stabilising the price of a basket of goods under the shadow of giant bubbles and crashes in asset markets.

There are a number of reasons why the financial system is procyclical, relating in large part to the asymmetries of financial incentives and monetary policy. George Akerlof, Joe Stiglitz and others have long since given us the tools to analyse the implications of these asymmetries. We had a good discussion on the first day, led by Claudio Borio, on the issue of counter-cyclical policies (both monetary and regulatory). Claudio pointed out that this is an area that is fraught with difficulty. I think he is being too polite. This is an area where policy-makers lack ambition.

Whenever policy-makers set aside the very real issue of ‘who’ should worry about asset-market cycles, the most popular arguments against counter-cyclical measures are that policy-makers cannot second-guess the cycle better than market participants and that to start doing so exposes them to political manipulation. This argument held more water before the age of independent central banks and inflation targets. Today, central banks actively try and forecast the cycle.

Moreover, this argument over-complicates the problem. The ambition of counter-cyclical measures such as shifting reserve requirements or capital buffers, should not be to predict the cycle or to destroy it, but merely to ‘lean against the wind’ – to make policy less procyclical than otherwise. When William McChesney Martin, the longest-serving Chairman of the Federal Reserve, said that ‘the Federal Reserve, as one writer put it, ... is in the position of the chaperone who has ordered the punch

bowl removed just when the party was really warming up',<sup>2</sup> he was not talking about a finely calibrated attempt to end the party at the right time, merely an attempt to moderate its consequences.

One of the glaring mistakes of the Basel II Capital Accord is that counter-cyclical measures are effectively ignored. One of its redeeming qualities is that counter-cyclical measures are possible under the supervisory discretion permitted under Pillar 2 of the Accord. It is true, as was discussed on the first day, that greater discretion for regulators and central bankers to judge the economic cycle could provide scope for political manipulation to return to monetary policy via this back door. However, the degree of policy discretion must be sensitive to institutional capacity. What is possible in Australia may not yet be possible in Albania. But one way of reducing the risk of excessive discretion is to institute the capital equivalent of automatic stabilisers, with capital buffers and reserves rising in some proportion to a rise in loan growth or broad measures of liquidity. Many of us have argued this point over the past 10 years (see Persaud and Spratt 2005). Indeed this entire debate is not new, was well covered in our first two sessions and I believe will be touched on in Philip Lowe's comments. Consequently, I would now like to turn my attention to the other major challenge for financial stability, the dangers of the risk-transfer model.

#### **1.4 The risk-transfer model is based on three mistaken notions about financial risk**

At the heart of the idea that it is better to spread risk across the financial system than concentrate it on banks' balance sheets are three fundamentally mistaken views about risk. I am sure this sounds like a bold statement, so let me pause to say that one of the hats I wear is as a founding director of the 60 000 strong global association of risk professionals and consultants who have played their part in the ascendancy of this faulty model of risk transfer.

The first mistaken notion is that if risk is divided up and spread across many holders then it is reduced. It is several years now since I and others showed that if you take several investors with very different investment strategies, but give them the same dataset, have them adopt best-practice mean-variance analysis, a daily risk management system and apply prudential credit risk requirements, then they will end up buying similar instruments and selling the same instruments at the same time. Under these circumstances, far from being spread, the transfer of risks from banks to markets concentrates risk.

You can see this clearly today with the simultaneous collapses of a raft of highly secretive 'quant' equity funds that were supposedly using very different strategies.

The best-practice risk management and mean-variance models that these investors adopt do not take into account strategic behaviour and interdependence. The mathematics gets too complicated. These models assume that: the user is the

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2. Martin (1955, p 12).

only one to own the assets that the data reveal have a historically good risk-return trade-off; that the user is the only one using a daily risk management system; and that the user is the only one required by their risk management rules to respond to a rise in risk by reducing or selling down risk. These remarkable assumptions explain why these systems often claim that a very large adverse shock to the market might be a once in a thousand year event. Such a statistically extreme event (*sic*) is often given as grounds for a monetary bail-out of financial institutions.

The upshot of all this is that we may have reduced the frequency of bank runs by turning them into market runs (of course banks are not impervious to market runs and so market runs could in turn lead to banking problems further down the road).

The frustrating thing about model-homogeneity is that it is to some extent self-imposed. Many long-term investors who could use time as a diversifier instead discard this vital form of risk diversification and adopt a daily risk management system in the name of best practice. Regulators tend to be a little incredulous that well-paid market participants could so enslave themselves to such self-destructive models, but to be fair, regulators have encouraged the use of these models themselves. Indeed, they often impose models of their own that have similar effects.

During this conference we have heard about a traditional regulatory framework based on a grid where the probability of an asset becoming non-performing is on one axis of the grid and the size of the potential loss is on the other. At the bottom left-hand corner is a box of assets that correspond to a low probability of a small loss and at the top right-hand corner is a box of assets with a high probability of a large loss. The point of this framework is that the regulator is supposed to highlight those assets that fall into this last box and to encourage institutions to reduce exposure to these toxic assets.

This appears eminently sensible. But it is not. Its premise is that bankers know nothing about banking. Financial institutions do not go out of their way to put toxic assets on their books. Assets turn toxic, through some event or development. They fall into the box of assets with a high probability of a large loss most frequently in times of general market stress when liquidity has dried up. This is precisely not the time you want to force owners to sell these assets. This framework will only begin to bite in circumstances where it would be sensible not to follow it.

## 1.5 Risk absorption and risk pricing are not the same

The second mistaken notion, related to the first, is to consider that the more risk is traded and priced, the more risk is being actively managed.

Shifting credit risks from bank balance sheets to hedge funds and bank proprietary trading desks, where they are priced more continuously, has undoubted benefits. It improves what I would call search liquidity, the ability to sell or buy instruments in quiet times and one would assume that it should improve the pricing of risks.

But these risk-traders are not risk-absorbers. They do not have large capital buffers to hold on to risks and they have less incentive to research idiosyncratic risk because they only intend to hold on to these instruments for a short period of

time. Consequently, these risk-traders are not willing to take contrarian bets on instruments that are falling in value, becoming illiquid, and with which they are unfamiliar. Their risk management strategy is to sell the risk before others do.

This is fine when markets are calm and price declines bring out buyers. It is not when volatility rises and risk management systems force many to be sellers. In these circumstances price declines lead to more price declines and we have a market run. The emergence of credit hedge funds potentially improves the pricing of risk – though I am not sure you could say that with a straight face today. But more risk-trading does not mean more risk-absorption. Financial market liquidity requires contrarians, but as a result of capital constraints and risk management practices, traders of risk do not have the capacity to be contrarians in crisis environments.

## 1.6 Risk is a chameleon

The third mistaken notion in the risk-transfer model is that risk is independent of the owner and so the transfer of risk from one person to another is neutral from a systemic point of view. In fact, the same instrument could be risky for me to hold, but safe for someone else to hold. Although it is routinely done, risk cannot be treated as if it is a block that you can slice and dice. It is a chameleon.

An instrument of good credit quality, backed by a state agency for example, but where there is no exchange market and hence no near-term liquidity, is risky if I am a bank funded by daily deposits, but is not risky if I am running a 20-year pension fund. The implication of this is that there are different types of risk and different actors may have different capacities for these different risks. An objective of system stability should be to facilitate the right risks going to the right places or, at least for the less dirigiste amongst you, not inadvertently encouraging risks to be transferred to places without a capacity to hold them.

The point is that we need to consider where risk capacities lie to consider whether a risk transfer is reducing risk or concentrating risk. This needs to be done at a national and global level but it is currently done at neither.

Public and private equity risks can be diversified across time and so an investor that can offer time diversification, like a young pension fund, has a greater capacity for public and private equity instruments than someone who cannot use time as a diversifier. Time is not a diversifier for credit risks however. Credit risks are best diversified by constant access to many different short-term credit risks. Institutions with large access to diversified credits, like banks, have a greater capacity for holding credit risks than those that do not.

Consequently, it is not so clearly a good thing, that as a result of the current financial stability framework, credit risks are being sold from banks to pension funds, or for banks to own private equity funds.

## 1.7 Summary

Let me end with the following short summary.

Policy-makers get too caught up in the popular fascination with innovation in financial instruments and institutions. This is a space in constant flux. It is more important to focus on financial behaviour and how behaviour leads to the distribution of risk and capital.

My view is that despite all the financial innovation and the dramatic rise in financial regulation, the underlying behaviour, where the availability of capital follows the cycle of feast and famine, has not appreciably changed. We have merely replaced bank runs with market runs. Today's credit crunch follows a long period during which market participants built up excessive risks. The indiscriminate volatility of capital availability is undesirable. It causes harm and does not provide financial institutions with the incentive to adopt prudential attitudes.

The instability of the availability of capital is related to two things: first, the procyclicality of market incentives and of monetary and regulatory policy; and second, a faulty risk-transfer model. From where we are today, with the advent of inflation targeting and independent central banks, a greater degree of counter-cyclical monetary and regulatory policy is not as ambitious as it would have sounded 20 years ago. The risk-transfer model does not work because risk is not independent of behaviour and the capacity to gauge and bear risk. Policy-makers need to stand back, survey and take a top-down approach to assessing where risk capacity lies and how we should ensure that we have not blocked the path of risk moving to those places at a global level. Thank you.

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## 2. Philip Lowe

As has been noted a number of times over the past day and a half, the timing of this conference has turned out to be impeccable. I say this for two reasons.

First, the events of recent weeks have served as a reminder that the issues we have been talking about are very important. Indeed, these issues have been on the front page of almost every major newspaper around the world on a daily basis. While financial stability is something that most people think about rarely in good economic times, when financial turmoil occurs, everybody takes notice!

Second, these events have also reminded us that the issues that some of the people in this room have been writing about for many years are more than of theoretical interest. In the good times, it can be hard to write about the threat to financial stability posed by a build-up of risk in the financial system. Most people do not want to hear about what ‘could go wrong’. Recent events, however, show us that those who have been thinking and writing about these issues have not been wasting their time.

In my remarks, I would like to pick up on five themes that I see as having run through the discussions at the conference. These are:

1. the tremendous change in the financial system;
2. the tendency for risk to be periodically mispriced;
3. the increasing complementarity between markets and institutions, and in particular, the important role that disruptions to liquidity can play in amplifying financial disturbances;
4. the difficulties associated with cross-border crisis management; and
5. the change in household balance sheets.

Given the time constraints, I am not able to do justice to all of these themes. Instead, I will focus my comments on some of the relevant policy issues.

### 2.1 Change in the financial system

There have been ten papers discussed at this conference. When I read these papers I was struck by the fact that four of them started with essentially exactly the same sentence – that is, ‘there has been tremendous change in the financial system’. And the other six papers contained this same idea on the first page. I think it is fair to say that there is little disagreement that we have witnessed a financial revolution over the past decade or so!

During the conference we discussed why this revolution has occurred and whether it has been a good thing.

The papers by Claudio Borio and Nigel Jenkinson *et al* presented very nice summaries of both the extent of the changes and the various factors that have caused these changes. My sense is that there was little disagreement about the driving forces: financial liberalisation, both domestically and globally; advances in information technology; improvements in communications; and low and stable inflation.

Perhaps the more interesting issue is whether these changes have been for the better. My assessment of the discussion is that there is a strong consensus that the answer is yes – few people really want to wind the clock back. And I think it is reasonably clear why this is so. Compared to decades past, the financial system is allocating credit risk more effectively, there are fewer liquidity constraints, and the process of financial intermediation is both more efficient and competitive. Giuseppe Bertola's paper also reminds us that in a world in which trade in goods and services has been liberalised, financial liberalisation helps people deal more effectively with risks to their income, and helps promote better public policies in a range of areas.

Notwithstanding this generally positive assessment, there are a number of aspects of this financial revolution that raise concerns. Reflecting the discussion at the conference, the three that I am going to focus on are: the possibility that markets and institutions periodically misprice risk; the importance of liquidity to the smooth functioning of the financial system; and the difficulties of cross-border crisis management.

## 2.2 Mispricing of risk

The possibility that risk is periodically mispriced has permeated many of the discussions at the conference, and has also been raised in almost every financial stability review issued by a central bank over recent years. This idea, however, seems to collide with another idea that we discussed at the conference: that is, risk is better measured and managed by financial institutions than was the case a decade ago. On the one hand risk is being mispriced, but on the other hand it is being better measured and managed!

These apparently conflicting views can be reconciled – and the paper by Claudio Borio suggests how. Few people would disagree with the idea that the cross-section dimension of risk is better measured and understood than it was a decade ago. Financial institutions have put in place effective tools for measuring the relative riskiness of different entities, and the sophistication of risk management frameworks has increased significantly. However, much less progress has been made in measuring the time dimension of risk: as a result it remains more difficult to assess whether overall risk is higher today than it was yesterday, as opposed to whether, at a particular point, one borrower is more risky than another.

This difficulty in assessing the time dimension of risk opens up the possibility that risk is periodically mispriced. As we heard a number of times throughout the conference, there is a natural tendency for many people to believe that the world has changed – 'that this time things will be different'. Why this is so is a difficult question, but it perhaps partly reflects the underlying natural optimism of most people. Whatever the reason, the result is that there is an apparent tendency for risk to be underpriced in good times, and perhaps overpriced in downturns.

A second explanation for the mispricing of risk is that it is the result of the incentive structures within the financial system, rather than the difficulties of assessing risk. According to this line of argument, in good times many people are concerned that

risk is being mispriced, but they still end up buying assets with too much debt, at prices that are too high.

During our discussions on this issue I was reminded of a recent conversation I had with my young daughter. When I asked her why she had been misbehaving, her answer was that her brothers were also misbehaving. The logic seemed to be that if they were all making poor choices then it was somehow okay. In a way, the same logic sometimes appears to hold in the financial system – if we are all buying assets at inflated prices, it is not as bad as if I am the only one doing so. In part this reflects the nature of remuneration arrangements, which are often short term, and the large penalties that sometimes apply for deviating from the mean. Also, if a financial institution wants to protect its franchise value, it may feel that it has to go with the flow, even if it feels that it should not be doing so.

Whatever the reasons for the mispricing of risk, an issue that we discussed is how policy-makers should respond when they are concerned that risk is being mispriced. Some see this as one of the critically important questions facing both central banks and supervisors, particularly given the potential for the mispricing of risk to sow the seeds of future instability. Arguably, this potential has increased over recent decades as the size of the financial sector has increased relative to economic activity.

The paper by Claudio Borio provides an excellent summary of the various policy options. At the supervisory level, the paper talks about developing automatic stabilisers. It also talks about supervisors using their instruments in a discretionary fashion in order to contain the build-up of financial imbalances in a boom. In our discussions, no consensus was reached about either the feasibility or the desirability of either approach. Some participants thought that prudential instruments could be used in a discretionary fashion, while others pointed to a number of practical challenges, as well as the possibility of political interference. Another possibility was for monetary policy to be used to contain the build-up of imbalances, but again there was no consensus as to whether this is a sensible thing to do.

My sense of the discussion was that no institution is actively seeking the daunting task of trying to contain the build-up of financial imbalances. There are a number of good reasons why this is so, but I will focus on just two.

The first is that it is technically challenging. If policy is to respond to the mispricing of risk and the build-up of imbalances, an assessment needs to be made about the scale of any imbalances and their potential effect on the economy. In addition, the movement in the relevant policy instrument needs to be calibrated. These are very difficult tasks. But they are not insurmountable. Both central banks and supervisors are constantly making decisions under uncertainty. Both are used to making probabilistic assessments about the future and the impact of their policies. What is required here is no different, although the degree of uncertainty is most likely higher than in cases in which policy instruments are used in a more traditional fashion.

The second reason has more to do with political economy. In particular, neither central banks nor supervisors want to be blamed for bringing a boom to an end. Taking action to curtail a boom on the grounds that doing so might avoid bigger problems later on is unlikely to be popular, particularly when the timing and severity of any

future problems are difficult to pin down. This means that both central banks and supervisors are reluctant to respond to perceived financial imbalances unless any response is seen to be consistent with the pursuit of their standard policy objectives. If this reluctance is to be overcome, there needs to be a degree of acceptance by the public that containing the build-up of risk in the financial system is indeed appropriate, at least under some circumstances.

This still leaves open the question of whether this task is best assigned to supervisory authorities or central banks. There is no universally correct answer here. However, in a deregulated financial system, with strong capital markets, it is likely to be more difficult to use prudential policy to contain the build-up of imbalances than is the case in more heavily regulated systems. In a financial system with strong capital markets, a tightening of prudential requirements on regulated entities is likely to lead to a shift in financing to the capital markets. This means that in such systems, the case for using monetary policy (as opposed to prudential policy) to contain financial imbalances is stronger than in more regulated systems. Furthermore, using monetary policy in this way is not necessarily inconsistent with inflation targeting, particularly if inflation targeting is viewed as a way of delivering low average inflation, rather than always keeping inflation in a narrow band.

### **2.3 Liquidity**

A second issue raised by the financial revolution of the past decade is that of liquidity. This is discussed in four of the papers presented at the conference: those by Claudio Borio, Chris Ryan and Chris Thompson, John Laker, and Franklin Allen and Elena Carletti. This focus is very timely, given that recent events have illustrated all too clearly how the effect of financial shocks can be amplified by a tightening of funding liquidity and the evaporation of transactional liquidity in financial markets.

There is a fairly wide consensus that liquidity management has not received the attention that it has deserved over recent years. Considerable comfort had been taken from the fact that credit risk transfer markets had widely dispersed credit risk, reducing the likelihood that adverse credit events would seriously impair financial institutions. But it turns out that the markets that have dispersed this credit risk have also increased liquidity risk, and arguably made it more concentrated, with banks being the providers of liquidity to the capital markets. Somewhat ironically, the growth of financial markets has actually increased the importance of banks to the smooth functioning of the financial system, partly due to their role as liquidity providers.

The discussions at the conference highlighted the fact that the recent liquidity problems stem partly from a large and sudden increase in uncertainty. When uncertainty increases, institutions become reluctant to commit their funds for other than short terms – when they are unsure about what will happen tomorrow, they want to maintain maximum flexibility and do not want to tie up their assets today. This is exactly what happened during August. Financial institutions: were uncertain as to when and where the losses from the sub-prime problems would show up; were uncertain about the extent to which credit lines would be called upon; and were

uncertain about the value of some of their investments. In this environment, it is hardly surprising that institutions did not want to commit their funds for other than very short periods – hence, the large increase in interbank term funding costs and the strains in many financial markets.

What then are the possible lessons for public policy? Our discussions focused on four possibilities.

First, the paper by Franklin Allen and Elena Carletti set an aspirational goal: that is the creation of a complete set of markets that would overcome the asset-price instability that is often associated with liquidity strains. It is difficult to disagree with this idea. But we are a long way from achieving this, and there must be a reasonable chance that we will never get there!

Second, the regulatory community needs to spend more resources understanding the role of the provision of liquidity in maintaining the smooth functioning of financial markets and the management of liquidity by financial institutions. The Basel Committee has already started work here, but much more needs to be done.

Third, ways need to be found to improve the flow of information, so that spikes in uncertainty do not derail the normal functioning of the financial system. In the current episode, the problems were heightened by investors not knowing where the losses would show up and by investors having purchased securities that they did not understand very well. Greater transparency regarding the current state of balance sheets would be useful, as would an increase in the effort that investors make in understanding complex investments and a reduction in their reliance on credit ratings.

And the fourth possible lesson concerns the provision of liquidity by the central bank. If the central bank is prepared to deal in a wide range of instruments, liquidity premia are likely to be smaller than otherwise and institutions can have greater confidence that they will be able to obtain funding if needed. In turn, if sound institutions have confidence that they can access liquidity when needed, they are more likely to be prepared to commit their funds for other than very short terms, and thus help the process of financial intermediation.

No doubt these possibilities will be discussed at many meetings and conferences in the months ahead!

## **2.4 Cross-border issues**

A third aspect of the financial revolution that raises concerns is that of cross-border crisis management. This issue was raised by Claudio Borio and Kevin Davis, and most pointedly by Stefan Ingves.

There is a general sense of frustration at the lack of progress in coming to some agreement about how problems in a cross-border bank would be handled. While banking is becoming global, crisis management largely remains local, and many people feel uncomfortable about this. While central banks and regulators have spent considerable effort developing arrangements for cross-border information sharing,

progress on how problems would be resolved has been much slower. One reason for this is that the resolution of problems in a bank that operates across borders is likely to involve a number of governments. And in some cases, it is likely to involve public funds. But whose funds, and how precisely are those funds to be used? These are big questions, and understandably, governments are reluctant to commit to a particular course of action in advance of a problem. This makes agreeing on likely resolution strategies difficult.

One issue that is always just lurking beneath the surface in these discussions is that of trust. It is not unreasonable to assume that each country will act in its own self interest – which may not be in line with the common interest. In the Australian-New Zealand context, the two governments took a significant step to addressing this issue when last year the banking acts in both countries were changed to require the prudential supervisors in each country to take into account financial stability in the other country. This change sends a clear message that the politicians recognise that there is a common interest, and creates a more productive climate in which to have trans-Tasman discussions.

More generally, as Stefan Ingves suggests, the questions of burden sharing and control are probably only ever going to be answered in a crisis. In a sense that seems unsatisfactory. Ideally, one would have agreed beforehand what was going to happen. But reaching such an agreement is difficult indeed!

## 2.5 Household balance sheets

The final theme that I would like to touch on is the significant changes in household balance sheets over the past decade or so. These changes are covered extensively in the papers by Christopher Kent *et al*, Chris Ryan and Chris Thompson, and Karen Dynan and Don Kohn. Our discussions focused on two broad issues: why have these changes occurred and what implications do they have for overall risk.

On the first of these issues there is broad agreement. Demographic factors and financial innovation are both very important, as are a large decline in unemployment rates and greater macroeconomic stability. The one area where opinions appear to differ a little is the role of interest rates. In Australia, lower nominal interest rates are seen to have been a major factor in the increase in household debt. The same is true in a number of other English-speaking countries. In contrast, in the United States, the fall in nominal interest rates is assigned a less influential role. This reflects the fact that the big increase in household debt took place somewhat after the decline in interest rates.

On what these changes mean for risk, I sensed less confidence that we knew the answers. One view was that the process of balance sheet adjustment by the household sector seen over the past decade still had some way to run, and did not pose increased risks to the stability of economy. An alternative view was that, in at least some countries, house prices are overvalued and that households have borrowed too much, with the result that the macroeconomic risks had increased.

Notwithstanding these different views, there does appear to be a consensus around at least four issues:

- that financial liberalisation has increased the ability of households to smooth consumption, and that this was a positive development;
- that the increased macroeconomic stability of the past decade or so meant that a given level of debt (relative to income) is less risky than it was previously;
- that the increased size and complexity of balance sheets means that a given change in asset prices and interest rates is likely to have a larger effect on household consumption than was the case previously; and
- that if the political consensus that has allowed the changes of the past decade to occur is to be sustained, more needs to be done to educate households on how to manage their larger and more complex balance sheets. Consideration should also be given to whether more tools can be developed to allow households to manage the risks inherent in these balance sheets.

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### 3. General Discussion

The discussion in the final session centred on financial crises, the mispricing of risk and the policy responses available to prudential regulators and central banks. On the topic of financial crises, one participant suggested that it is impossible to have a liquidity crisis without there also being some concerns about the solvency of some institutions. Similarly, panics rarely take place unless there are fundamental problems within a market. Stepping back from the current episode, the participant argued that financial crises have always been around and it is not clear that they have become more frequent over time; consequently, introducing speed limits to the financial system may be counterproductive, especially if their main effect is to dampen financial innovation. Another participant responded that as long as speed limits lean only against cyclical imbalances, innovation should be unaffected. Avinash agreed, saying that speed limits should be aimed at reducing the procyclicality of risk-taking, not bursting bubbles. Also, he was somewhat surprised that financial systems were not more stable given substantial efforts to improve risk management frameworks and the considerable costs associated with regulation.

This led to a discussion of the reasons for the periodic mispricing of risk. One view was that the owners and managers of banks had not identified the right time to pare back their risk-taking because they were unable to see systemic risks increasing or turning points in the business cycle. This in turn meant that they often took on greater risks and/or were tempted to reduce expenditures in their risk control areas.

Some participants warned against policy-makers over-reacting to periods of financial volatility. They were particularly worried that large injections of liquidity by central banks could exacerbate procyclical risk-taking and make it more likely that a large financial crisis occurs in the future. In contrast, others argued that as long as central banks were careful not to be seen to be bailing out insolvent financial

institutions, providing liquidity support was one of their most important functions. Indeed, the failure to provide liquidity can itself lead to solvency problems if institutions are forced to sell their assets at heavily discounted prices.

There was some discussion of how policy-makers could help households to manage the greater financial risks that they had taken onto their balance sheets in recent years. One participant thought that regulators needed to provide more information to unsophisticated households. One example of this would be mandating the inclusion of projections of retirement income at age 65 with every defined contribution retirement plan statement. While most participants thought that such information, as well as improved financial education, could be beneficial to households, few thought that it would have a major effect on excessive risk-taking.

Securitisation also got an airing with one participant wondering whether central banks in Asia should encourage the originate-and-distribute model given concerns that securitisation has grown rapidly in some countries mainly because of regulatory arbitrage. Although Avinash suggested that securitisation was a prime example of an innovation that improved efficiency but undermined stability, other participants thought that, on balance, securitisation had enhanced welfare.

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Franklin Allen is the Nippon Life Professor of Finance and Professor of Economics at the Wharton School, University of Pennsylvania, a position he has held since January 1994. He is also co-director at the Wharton Financial Institutions Center. Professor Allen has published extensively in leading journals such as *The Review of Economic Studies*, *Econometrica* and the *American Economic Review*, on topics spanning, among other things, corporate finance, asset pricing and the economics of information. His current research involves comparing financial systems and examining financial crises of various countries. He has also held editorial positions for numerous academic journals. He is a past President of the American Finance Association. Professor Allen holds an MPhil and DPhil in Economics from Nuffield College, Oxford University.

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Giuseppe Bertola is Professor of Economics at the University of Torino, a position he has held since November 1996, and is a senior consultant to the European Central Bank. Between 1997 and 2003 he was on leave as a Professor at the European University Institute and has previously been Assistant Professor and Assistant Director of the International Finance Section at Princeton University. Professor Bertola has served as Special Adviser to the Commissioner for Economic and Financial Affairs at the European Commission. His research focuses on the labour market and other institutions with an international perspective, with a particular focus on the European process of economic and monetary unification. His research has been published in *The Review of Economic Studies*, the *American Economic Review*, the *European Economic Review* and other academic journals and books. Professor Bertola holds a PhD in Economics from the Massachusetts Institute of Technology.

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Claudio Borio is Head of Research and Policy Analysis at the Bank for International Settlements (BIS). Dr Borio has been at the BIS since 1987, holding a number of senior positions including Head of the Secretariats for the Committee on the Global Financial System and for the Gold and Foreign Exchange Committee. He previously worked as an economist at the OECD in the country studies area of the Economics and Statistics Department and as a Lecturer and Research Fellow at Brasenose College, Oxford University. Dr Borio has published extensively on numerous issues, including the relationship between asset prices and financial and monetary stability, monetary policy, and financial supervision and regulation. Dr Borio holds a MPhil and a DPhil in Economics from Oxford University.

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Jan Brockmeijer is Director of the Financial Stability Division of De Nederlandsche Bank (DNB). The main task of the Division is to prepare accurate and timely assessments of the financial stability risks relevant to the Netherlands and to formulate clear policy advice aimed at safeguarding financial stability. Between 1997 and 2004 Mr Brockmeijer was in charge of strategy, policy and general support in the Banking Supervision Directorate of DNB. Prior to 1997, he was Head of the Financial Markets Department, responsible for DNB's foreign exchange and open market operations, as well as the management of the gold and foreign exchange reserves. Mr Brockmeijer is a member of the Banking Supervision Committee of the European Central Bank, the Basel Committee on Banking Supervision and the Committee on the Global Financial System at the Bank for International Settlements. At present, he chairs the Working Group on Macro-Prudential Analysis of the Banking Supervision Committee.

## Chris Carroll

Chris Carroll is Professor of Economics at the Johns Hopkins University and an NBER Research Associate in the programs on Monetary Economics and Economic Fluctuations and Growth. He has also worked at the Federal Reserve Board in Washington DC and at the Council of Economic Advisers in Washington, where his responsibilities included analysis of social security reform proposals, tax and pension policy, and bankruptcy reform. Professor Carroll has published extensively and his research has looked at consumption and saving behaviour, with an emphasis on reconciling the empirical evidence from both microeconomic and macroeconomic sources with theoretical models. He holds a PhD from the Massachusetts Institute of Technology.

## Jenny Corbett

Jenny Corbett is Professor of Economics at the Australian National University in Canberra and executive director of the Australia-Japan Research Centre at the Crawford School of Economics and Government. Her research interests include the Japanese economy, particularly banking, macroeconomic policy and corporate governance and east Asian financial systems. Professor Corbett is a Research Fellow at the Centre for Economic Policy Research (London), Research Associate with the Center on Japanese Economy and Business (Columbia University, New York), and a member of the Editorial Board of the *Journal of the Japanese and International Economies*. Professor Corbett holds a PhD and a MA from the University of Michigan and a MA from the University of Oxford.

## Kevin Davis

Kevin Davis is the Commonwealth Bank Group Professor of Finance at the University of Melbourne and has been Director of the Melbourne Centre for Financial Studies since 2005. Prior to his appointment at the University of Melbourne in 1987, he was a Senior Lecturer in Economics at the University of Adelaide. His primary research interests are financial institutions and markets, financial engineering and corporate financial policy and treasury management. He is co-author/editor of 16 books in the areas of finance, banking, monetary economics and macroeconomics and has published numerous journal articles and chapters in books. He is on the Board of the Melbourne University Credit Union, and has undertaken an extensive range of consulting assignments for financial institutions, business and government. Professor Davis holds a Masters in Economics from the Australian National University and is a Senior Fellow of the Financial Services Institute of Australasia.

## Guy Debelle

Guy Debelle is Assistant Governor (Financial Markets) at the Reserve Bank of Australia, a position he has held since March 2007. He joined the Reserve Bank in 1994, and prior to his current position, worked in the Economic Research and Economic Analysis Departments, including as Head of that Department, and as Head of International Department. He has also worked at the International Monetary Fund, Bank for International Settlements, Australian Treasury and as a visiting professor in economics at the Massachusetts Institute of Technology. He graduated from the University of Adelaide with an honours degree in economics, and gained his PhD in Economics at MIT. He is an associate editor of the *International Journal of Central Banking* and has published on a range of topics in the fields of labour and monetary economics.

## Mathias Drehmann

Mathias Drehmann is currently a Senior Economist at the European Central Bank. Previously he has worked as a Research Manager at the Bank of England in charge of developing a framework to measure and stress test the financial stability of the UK banking system. His research interests lie in financial stability, risk measurement, and liquidity. Mathias Drehmann holds a PhD in Economics from the University of Bonn and the London School of Economics as part of the European Doctoral Programme. He has published in leading academic journals such as the *American Economic Review*.

## **Saul Eslake**

Saul Eslake is the Chief Economist at the Australian and New Zealand Banking Group (ANZ) and is a member of ANZ's Group Asset and Liability Committee. Mr Eslake is also a Director of the University of Tasmania Foundation and Chair of the Tasmanian Arts Advisory Board. He serves on three Federal Government advisory panels – the Trade Policy Advisory Council, the Foreign Affairs Council and the Tourism Forecasting Committee. Prior to joining ANZ in 1995, Mr Eslake was the Chief Economist (International) at National Mutual Funds Management (now part of the AXA Insurance group) and, before that, he was the Chief Economist of the stockbroking firm McIntosh Securities (now part of the Merrill Lynch group). He began his career as an economist in the Commonwealth Public Service, including two years at the Treasury in Canberra. Mr Eslake holds a first-class honours degree in Economics from the University of Tasmania and has completed the Senior Executive Program at Columbia University's Graduate School of Business.

## **Jonathan Fiechter**

Jonathan Fiechter is Deputy Director of the Monetary and Capital Markets Department at the International Monetary Fund (IMF), responsible for the development of IMF policies relating to financial supervision and regulation, deposit insurance, and crises management. Prior to joining the IMF in 2003, Mr Fiechter held various senior policy positions including Senior Deputy Comptroller at the Office of the Comptroller of the Currency, Director of the Financial Sector Development Department at the World Bank, Acting Director of the Office of Thrift Supervision, Director of the Federal Deposit Insurance Corporation and Director of the Resolution Trust Corporation. Mr Fiechter began his professional career at the US Treasury Department in 1971 as an international economist and is a graduate of Rockford College in Rockford, Illinois.

## **Ian Harper**

Ian Harper is the Sidney Myer Professor and Executive Director, Centre for Business and Public Policy at the Melbourne Business School, University of Melbourne. In 2005, he was appointed as inaugural Chairman of the Australian Fair Pay Commission. Professor Harper is also Director and Principal of his own consulting company, Harper Associates Australia, and a Senior Consultant with CRA International. Prior to joining the Melbourne Business School in 1993, he was Professor of Monetary and Financial Economics in the Faculty of Economics and Commerce at the University of Melbourne. He has also held positions at the Australian National University, Princeton University and the Reserve Bank of Australia. Professor Harper's primary research interests include domestic and international aspects of money, banking and financial economics, with a particular emphasis on the effects of regulation, deregulation and innovation on the evolution of financial institutions and policy. Professor Harper holds a PhD in Economics and a Masters in Economics from the Australian National University.

## **Stefan Ingves**

Stefan Ingves is the Chairman of the Executive Board and Governor of Sveriges Riksbank, a position he has held since 2005. He is a member of the European Central Bank General Council, a member of the Board of Directors of the Bank for International Settlements and also Sweden's Governor at the International Monetary Fund (IMF). Previous positions held by Dr Ingves include Director of the Monetary and Financial Systems Department at the IMF and General Director of the Swedish Bank Support Authority. Dr Ingves holds a PhD in Economics from Stockholm School of Economics.

## **Nigel Jenkinson**

Nigel Jenkinson is the Executive Director, Financial Stability at the Bank of England, a position he has held since 2003. He is also a member of the Financial Stability Board at the Bank of England, a member of the Basel Committee of Banking Supervision (and co-chair of the working group on liquidity) and a member of the Committee on the Global Financial System. He was Deputy Director of the Monetary Analysis and Statistics area at the Bank of England from 1999 to 2003. Previous roles he has served in include Head of Structural Economic Analysis Division in the Monetary Analysis area at the Bank of England, Senior Manager of Reserves Management in the Foreign Exchange Division, and a three-year secondment in Basel working for the forerunner of the European Monetary Institution (itself the forerunner of the European Central Bank). Mr Jenkinson holds a MSc in Econometrics and Mathematical Economics from the London School of Economics.

## **Christopher Kent**

Christopher Kent is the Head of Economic Research Department at the Reserve Bank of Australia, a position he has held since November 2004. Prior to rejoining the Bank as Deputy Head of Economic Analysis in September 2003, Dr Kent spent three years working in the European Department of the International Monetary Fund. His earlier career was spent at the Bank, where he worked in Economic Group and Financial Stability Department. His research interests include the links between asset prices and monetary policy, inflation targeting for small open economies, and the relationship between the current account and the terms of trade. Dr Kent is also a member of the Advisory Board of the Melbourne Institute of Applied Economic and Social Research at the University of Melbourne. He holds a PhD from the Massachusetts Institute of Technology.

## **Donald L Kohn**

Donald Kohn is the Vice Chairman of the Board of Governors of the Federal Reserve System. Prior to becoming a member of the Board, he served on its staff as Adviser to the Board for Monetary Policy and before that was Secretary of the Federal Open Market Committee, Director of the Division of Monetary Affairs and

Deputy Staff Director for Monetary and Financial Policy. He has also held several positions on the Board's Division of Research and Statistics, including Associate Director and Chief of Capital Markets. Dr Kohn is also the Chairman of the Committee on the Global Financial System, a central bank panel that monitors and examines broad issues related to financial markets and systems. He has written extensively on issues related to monetary policy and its implementation by the Federal Reserve. Dr Kohn holds a PhD in economics from the University of Michigan.

## **John Laker**

John Laker is the Chairman of the Australian Prudential Regulation Authority (APRA) and is APRA's representative on the Payments System Board of the RBA and the Council of Financial Regulators. He is also a member of the Trans-Tasman Council on Banking Supervision, which has been established to facilitate the integration of the Australian and New Zealand banking markets. Prior to joining APRA, Dr Laker had a 21-year career at the Reserve Bank of Australia. He was the Reserve Bank's Chief Representative in Europe, based in London, from 1991 to 1993, Assistant Governor (Corporate Services) from 1994 to 1998, and Assistant Governor (Financial System) from 1998 to 2003. In this latter role he was a member of the Council of Financial Regulators and Deputy Chairman of the Payments System Board of the Reserve Bank, where he was closely involved in major reforms to the credit card market in Australia. Dr Laker has also worked at the Australian Treasury and at the International Monetary Fund, where he helped to negotiate economic reform programs in Zambia and other countries in eastern and southern Africa. Dr Laker holds a MSc in Economics and a PhD from the London School of Economics.

## **Jeremy Lawson**

Jeremy Lawson is a Senior Economist in the Research Department of the Reserve Bank of Australia's Economic Group. Mr Lawson has also worked in the Economic Group's Financial Conditions section and in its Economic Activity and Forecasting section. He holds a Bachelor of Economics with Honours from the University of Adelaide and a Master of Economics from the London School of Economics and Political Science. His research interests include labour economics and monetary economics, and he is currently investigating the sectoral effects of monetary policy.

## **Philip Lowe**

Philip Lowe was appointed Assistant Governor (Financial System) of the Reserve Bank of Australia in December 2003. He is responsible for overseeing the Bank's work on issues related to financial stability and payments system policy. He is also Deputy Chairman of the Payments System Board. Dr Lowe joined the Bank in 1980 and has worked in the economic, financial markets, and financial system areas. He also spent two years with the Bank for International Settlements, where he worked extensively on financial system issues in an international context. He

is the author of numerous articles, including influential work on monetary policy and financial stability. Dr Lowe holds a PhD from the Massachusetts Institute of Technology and a Bachelor of Commerce (Honours) in Economics/Econometrics from the University of New South Wales.

## **Crystal Ossolinski**

Crystal Ossolinski is currently an Economist in the Research Department of the Reserve Bank of Australia's Economic Group. Ms Ossolinski has also worked in the Economic Group's Prices, Wages and Labour Market Analysis section and in its Financial Conditions section. Her recent research has focused on household sector issues; in particular, the measurement of net wealth, rising participation rates and explaining trends in household debt and interest rate sensitivity using the Household, Income and Labour Dynamics in Australia (HILDA) Survey. She holds a Bachelor of Economics with Honours from the University of Western Australia.

## **Avinash D Persaud**

Avinash D Persaud is currently Chairman of Intelligence Capital Limited, an advisory firm specialising in the management of financial assets, risks and liquidity. Previously, Professor Persaud was Investment Director at Global Asset Management (GAM), Managing Director at State Street Corporation and Global Head of Currency and Commodity Research at JP Morgan. Professor Persaud's career has also spanned areas of public policy and academia. He is Co-chair of the OECD Emerging Markets Network and was a Visiting Scholar at the International Monetary Fund and the European Central Bank. He is a Trustee of the Royal Economics Society, the London School of Economics and Political Science, the Overseas Development Institute and the Global Association of Risk Professionals. Professor Persaud held the Mercer Memorial Chair in Commerce at Gresham College and won the Jacques de Larosiere Awards in Global Finance from the Institute of International Finance. He is an Economics graduate from the London School of Economics.

## **Chris Ryan**

Chris Ryan is Head of Financial Stability Department at the Reserve Bank of Australia. Immediately prior to this, he was Head of the RBA's Domestic Markets Department and before that Deputy Head of its Economic Analysis Department. He worked at the International Monetary Fund from 1992 to 1994 and from 1995 to 1998. Chris holds a Masters degree in Public Affairs from the Woodrow Wilson School, Princeton University and a Bachelors degree in Economics with Honours from the Australian National University.

## **Jack Selody**

Jack Selody is Adviser to the Governor of the Bank of Canada, a position he has held since 2003. Previous positions held by Dr Selody at the Bank of Canada include Deputy Chief and then Chief of the Department of Monetary and Financial

Analysis, Assistant Chief and then Deputy Chief of the Forecasting and Special Studies Division, and Assistant Chief of the Special Studies Division of the Research Department. Dr Selody has worked on a variety of topics related to monetary stability and is particularly interested in models of the financial channels of the transmission mechanism. Dr Selody holds a PhD in Economics and a Masters in Economics from the University of Western Ontario.

## **Grant Spencer**

Grant Spencer is Deputy Governor of the Reserve Bank of New Zealand (RBNZ) and Head of the RBNZ's Financial Stability Department. Previous positions held by Mr Spencer at the RBNZ include Assistant Governor and Head of Economics Department (2004 to 2007) and also Chief Manager of both Financial Markets and Economics Departments. Between 1995 and 2004 Mr Spencer worked for the Australia and New Zealand Banking Group (ANZ) in multiple roles: Head of Strategy and Business Development (NZ); Executive Manager for Group Strategy; and New Zealand Treasurer for ANZ Investment Bank. He has also worked at the International Monetary Fund between 1990 and 1993. Mr Spencer has spent time as a Non-Executive Director of the New Zealand Institute of Economic Research, a Council member and Vice President of the New Zealand Association of Economists, and a Council member of the New Zealand Corporate Treasurers Association. Mr Spencer holds a MSc in Econometrics and Mathematical Economics from the London School of Economics.

## **Chris Thompson**

Chris Thompson is a Senior Manager in the Financial Stability Department at the Reserve Bank of Australia, focusing on macro-prudential analysis of the household and non-financial business sectors. Prior to this, he worked for three years in the Bank's Domestic Markets Department and before that, in the Economic Analysis and Economic Research Departments. He holds a Masters degree in Public Financial Policy from the London School of Economics and a Bachelors degree in Economics with Honours from the University of Western Australia.

## **Luke Willard**

Luke Willard joined the Reserve Bank of Australia in 1997 and has worked in Financial Stability, Economic Analysis and Economic Research Departments. He has also worked at the International Monetary Fund. He has done research on international business cycles and macroeconomics. Dr Willard holds a PhD in Economics from Princeton University and also studied economics at the University of Sydney and the Australian National University.

# Glossary

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## Alphabetical List of Selected ISO Country Codes<sup>(a)</sup>

| ISO Code | Country            | ISO Code | Country            |
|----------|--------------------|----------|--------------------|
| AR       | Argentina          | KR       | Korea, Republic of |
| AT       | Austria            | LK       | Sri Lanka          |
| AU       | Australia          | LU       | Luxembourg         |
| BD       | Bangladesh         | MO       | Macau              |
| BE       | Belgium            | MX       | Mexico             |
| BR       | Brazil             | MY       | Malaysia           |
| CA       | Canada             | NI       | Nicaragua          |
| CH       | Switzerland        | NL       | Netherlands        |
| CL       | Chile              | NO       | Norway             |
| CN       | China              | NP       | Nepal              |
| CO       | Colombia           | NZ       | New Zealand        |
| CZ       | Czech Republic     | PA       | Panama             |
| DE       | Germany            | PE       | Peru               |
| DK       | Denmark            | PH       | Philippines        |
| DO       | Dominican Republic | PK       | Pakistan           |
| ES       | Spain              | PL       | Poland             |
| FI       | Finland            | PT       | Portugal           |
| FR       | France             | PY       | Paraguay           |
| GB       | United Kingdom     | SE       | Sweden             |
| GR       | Greece             | SG       | Singapore          |
| GT       | Guatemala          | SK       | Slovakia           |
| HK       | Hong Kong          | SV       | El Salvador        |
| HU       | Hungary            | TH       | Thailand           |
| ID       | Indonesia          | TW       | Taiwan             |
| IE       | Ireland            | US       | United States      |
| IN       | India              | UY       | Uruguay            |
| IT       | Italy              | VE       | Venezuela          |
| JP       | Japan              | VN       | Vietnam            |

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(a) ISO is the International Organization for Standardization.

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# List of Conference Participants

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|--------------------|--|
| Franklin Allen     | <i>Wharton School, University of Pennsylvania</i>                                |
| Chris Aylmer       | <i>Reserve Bank of Australia</i>   |
| Ric Battellino     | <i>Reserve Bank of Australia</i>   |
| Giuseppe Bertola   | <i>University of Torino</i>  |
| Claudio Borio      | <i>Bank for International Settlements</i>  |
| Jan Brockmeijer    | <i>De Nederlandsche Bank</i>   |
| Chris Carroll      | <i>Johns Hopkins University</i>  |
| Der Jiun Chia      | <i>Monetary Authority of Singapore</i>   |
| Jenny Corbett      | <i>Australian National University</i>  |
| Kevin Davis        | <i>University of Melbourne</i>   |
| Guy Debelle        | <i>Reserve Bank of Australia</i>   |
| Mathias Drehmann   | <i>European Central Bank</i>   |
| Malcolm Edey       | <i>Reserve Bank of Australia</i>   |
| Saul Eslake        | <i>Australia and New Zealand Banking Group</i>                                   |
| Jonathan Fiechter  | <i>International Monetary Fund</i>   |
| Chay Fisher        | <i>Reserve Bank of Australia</i>   |
| Ian Harper         | <i>Melbourne Business School, University of Melbourne</i>                        |
| Stefan Ingves      | <i>Sveriges Riksbank</i>   |
| Nigel Jenkinson    | <i>Bank of England</i>   |
| Mark Johnson       | <i>Macquarie Bank</i>  |
| Christopher Kent   | <i>Reserve Bank of Australia</i>   |
| Donald Kohn        | <i>Board of Governors of the Federal Reserve System</i>                          |
| John Laker         | <i>Australian Prudential Regulation Authority</i>                                |
| Jeremy Lawson      | <i>Reserve Bank of Australia</i>   |
| Charles Littrell   | <i>Australian Prudential Regulation Authority</i>                                |
| Philip Lowe        | <i>Reserve Bank of Australia</i>   |
| Warwick McKibbin   | <i>Australian National University and Reserve Bank of Australia Board Member</i> |
| Jim Murphy         | <i>Australian Treasury</i>   |
| David Orsmond      | <i>Reserve Bank of Australia</i>   |
| Crystal Ossolinski | <i>Reserve Bank of Australia</i>   |

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|------------------|---|
| Tsuyoshi Oyama   | <i>Bank of Japan</i>                                    |
| Avinash Persaud  | <i>Intelligence Capital Limited</i>                     |
| Anthony Richards | <i>Reserve Bank of Australia</i>                        |
| Heidi Richards   | <i>Australian Prudential Regulation Authority</i>       |
| Malcolm Rodgers  | <i>Australian Securities and Investments Commission</i> |
| Chris Ryan       | <i>Reserve Bank of Australia</i>                        |
| Jack Selody      | <i>Bank of Canada</i>                                   |
| Grant Spencer    | <i>Reserve Bank of New Zealand</i>                      |
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| Chris Thompson   | <i>Reserve Bank of Australia</i>                        |
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## **Disclaimer**

The Household, Income and Labour Dynamics in Australia (HILDA) Survey was initiated and is funded by the Australian Government Department of Families, Community Services and Indigenous Affairs (FaCSIA), and is managed by the Melbourne Institute of Applied Economic and Social Research (MIAESR). Findings and views based on these data should not be attributed to either FaCSIA or the MIAESR.