

Bulletin

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Indicators of Labour Demand

Kim Edwards and Linus Gustafsson*

There are several indicators of labour demand that can be used to assess labour market conditions and as inputs into forecasts of employment growth. These include measures of job vacancies, job advertisements and business surveys of employment intentions. Over the past year, there have been pronounced declines in a number of these indicators and employment growth has been somewhat subdued. This article suggests that as well as being a source of information on current labour market conditions, these indicators provide some leading information on employment growth, although the forecasting performance of models including these indicators is only slightly better than that of a simple benchmark model.

Introduction

Employers looking to hire new staff generally engage in various activities to find suitable employees. Jobs vary according to the skills employers require and the location of the business, while prospective employees vary in their qualifications, experience and ability, which may be hard for employers to assess. Moreover, hiring a new employee entails costs such as training (or, if the wrong choice is made, the costs associated with termination). To find a suitable candidate for a job, employers conduct recruitment activities to attract and screen potential candidates.

Indicators of firms' demand for new employees provide a valuable gauge of the state of the labour market. There are several such indicators, including:

- the Australian Bureau of Statistics (ABS) survey of *job vacancies*
- *job advertisements* in print media and on the internet
- business surveys of *employment intentions* of firms.

One advantage of such indicators is that they may point to a change in conditions before it becomes apparent in the employment data. For example, when a firm's demand for labour increases, it may engage in recruitment activities (e.g. by advertising new vacancies) for several months or more before

the vacant positions are filled. Similarly, a fall in the demand for labour may be observed in a slowing in search activity before the effect on employment growth becomes apparent. For this reason, these measures are often called 'leading' indicators of employment.

This article explores the relationship between these indicators and employment growth. First, the theoretical role of job vacancies as an indicator of labour demand is reviewed. A range of other indicators is also assessed, noting the strengths and limitations of each. A number of empirical techniques are used to evaluate the strength of the relationship between employment growth and these indicators, as well as the extent to which they might be useful in forecasting future employment outcomes.

Job Vacancies, Employment and the Beveridge Curve

The ABS defines a job vacancy as a position that is available to be filled immediately, is open to external applicants and for which recruitment action has been undertaken.¹ The number of job vacancies is a key indicator of unmet demand for labour in the economy. Under some simplifying assumptions,

¹ Recruitment action includes efforts to fill vacancies by advertising, by notices in the workplace, by notifying public or private employment agencies or trade unions and by contacting, interviewing or selecting applicants already registered with the business or organisation.

* The authors are from Economic Group.

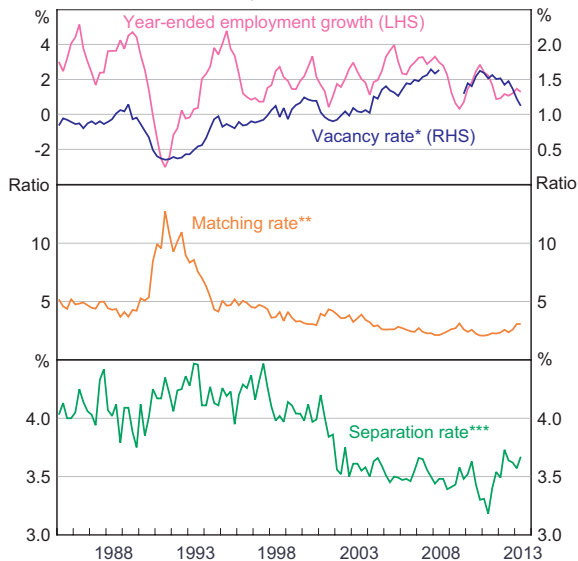
INDICATORS OF LABOUR DEMAND

the increase in employment in a given period will equal the number of job vacancies that are filled in the period ('matches') less the number of people that leave a job for any reason ('separations').² When demand for labour is strong, the level of vacancies will generally rise, which in turn tends to lead to higher employment growth as these vacancies are filled. Not surprisingly, employment growth has been positively related to the vacancy rate (i.e. the number of vacancies scaled by the labour force) over time, although this relationship is not especially close as employment growth has also been influenced by a range of other factors (Graph 1). In particular, in any given period employment growth will also be affected by:

- the likelihood that a vacancy is filled, which is also known as the matching rate
- the likelihood that an employed person leaves his or her job, either due to retirement, resignation or retrenchment, which is also known as the separation rate.

The matching rate is the rate at which vacancies, which reflect unmet labour demand, are matched to the stock of available workers, which will be influenced by determinants of labour supply such as the labour force participation rate and/or population growth.³ The negative relationship between the number of vacancies and the number of unemployed persons (both as a proportion of the labour force) is illustrated by the Beveridge curve (Graph 2). As well as providing information on factors affecting the matching rate, the economy's position on and movements along the Beveridge curve can also provide an indication of broader labour market

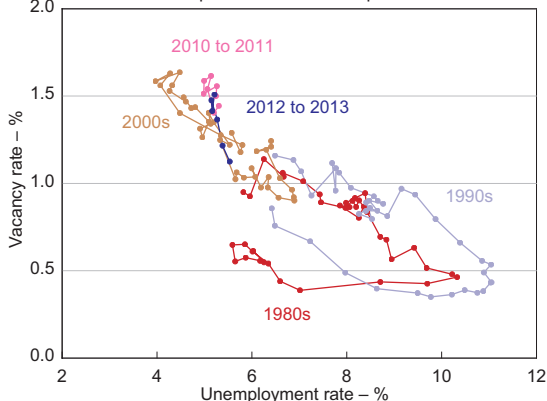
**Graph 1
Employment Growth**



* Ratio of vacancies to the labour force; this survey was suspended between May 2008 and November 2009
 ** Gross flows into employment over vacancies in the previous quarter
 *** Gross flows out of employment over employment in previous quarter
 Sources: ABS; RBA

**Graph 2
Beveridge Curve***

March quarter 1980 to June quarter 2013



* Vacancy rates between May 2008 and November 2009 are estimates
 Sources: ABS; RBA

2 This relationship will not hold if a person who fills a vacancy or leaves a job continues to be employed in another job at the same time. ABS estimates suggest that there are approximately 106 jobs per 100 employed persons, although this number has decreased slightly since 2004. The relationship also assumes that every newly employed person fills a job vacancy, which may not be the case.

3 The estimates of the matching rate and separation rate derived from the ABS data on gross labour flows do not include workers who change jobs from quarter to quarter. For this and other reasons (discussed below) they are imperfect estimates of the actual matching and separation rates.

conditions. For example, when labour market conditions tighten, the unemployment rate will fall while the number of vacancies will rise as firms search for more labour. This will result in a movement up and to the left on the Beveridge curve. In these circumstances, it will be harder for employers to find suitable labour and hence the matching rate

may fall.⁴ The reduction in the unemployment rate and increase in the vacancy rate over the past two decades is consistent with the matching rate having declined over the same period (the available data provide an imperfect proxy for the matching rate, for reasons discussed below). Shorter-term movements along the Beveridge curve have also been observed during this time, in line with cyclical changes in labour market conditions.

The matching rate will also be affected by structural developments in the matching efficiency of the labour market; that is, the rate at which vacancies are filled for a given number of unemployed. Matching efficiency is reflected in the position of the Beveridge curve relative to the origin. Changes in labour force mobility are an important influence on matching efficiency: if the labour force is more mobile, with workers better able and more willing to move across different occupations, industries or geographical locations, then (for a given level of unemployment) vacancies should be easier to fill. Matching efficiency may also be affected by developments in recruitment technology. For instance, the increased use of online job advertisements may have made it easier for firms to find and screen potential candidates and made it easier for jobseekers to find opportunities of interest.

Changes in the separation rate may also affect the relationship between job vacancies and employment growth. Job separations fall into two broad categories, depending on whether it is the firm's or the employee's decision to separate. Involuntary separations, which are initiated by firms and account for about one-third of all separations, tend to be countercyclical – rising during economic downturns as firms downsize their workforce or even close entirely. On the other hand, voluntary separations, which are initiated by employees, tend to be procyclical. Employees will tend to be more willing to bear the costs and risks of changing jobs when economic conditions are strong, and the

gains from leaving a job will generally be higher in a tighter labour market in which firms are competing more intensely for labour.⁵

The resources boom in Australia over the past decade is likely to have affected rates of both matching and separation. In particular, the shift in activity toward mining and mining-related industries and geographical regions may have led to a mismatch between vacant positions and the supply of labour, thereby reducing the matching rate. Graph 2 suggests that the level of vacancies in 2010 and 2011 was slightly higher than that implied by the historical relationship between vacancies and unemployment, indicating that the matching efficiency of the labour market may have declined somewhat during this period.⁶ At the same time, structural change in the economy may result in a higher separation rate, as firms in some industries reduce their number of employees and as labour moves towards industries and regions where demand is higher. Together, these factors suggest that a given rate of employment growth will tend to be associated with a higher vacancy rate in periods of structural change.

The Job Vacancies Survey

Each quarter, the ABS publishes a measure of job vacancies estimated from a survey of approximately 4 800 employers.⁷ Importantly, the ABS measure of vacancies records the stock of vacancies on a particular *day* in the quarter (the survey date), which is smaller than the total number of vacancies

4 This may be at least partly offset by employers being more inclined to draw on available workers when the labour market is tight (or expand the pool of available workers by offering higher wages), even if their skills or experience are not completely suited to the vacant positions.

5 A substantial proportion of voluntary separations will reflect individuals' personal circumstances (e.g. related to their family, age or health) and career paths rather than macroeconomic developments. The distinction between voluntary and involuntary separations in the context of labour market turnover and mobility is covered in D'Arcy *et al* (2012).

6 Borland (2011), on the other hand, finds no evidence that there was a statistically significant outward shift in the Beveridge curve during the 2000s.

7 Other than the December quarter release, which is published during the first half of January, the survey is published toward the end of the last month of each quarter. The job vacancies series was suspended between May 2008 and November 2009. In the analysis presented in this article, estimates of the number of job vacancies from the Treasury Model of the Australian Economy (TRYM) have been used for this period.

available to be filled *during* the quarter. This is one reason why deriving a reliable estimate of the matching rate from the data is difficult: the number of people becoming employed in any given quarter (derived from the ABS data on gross labour flows) is typically much greater than the recorded stock of vacancies on a particular day within that quarter.⁸

There are a number of other measurement issues associated with the vacancies data. In particular, the costs associated with recruitment action may mean that some firms have vacant positions that do not meet the ABS criteria and hence are not recorded as vacancies. To the extent that these costs have fallen over time (e.g. owing to the developments in recruitment technology outlined below), this will tend to complicate any comparison of the level of vacancies in the recent period with the level of vacancies in previous years. Relatedly, a hire may result from a candidate approaching a firm that at the time had no vacant positions, in which case the number of recorded vacancies would again tend to understate the number of positions available to be filled. Although it is difficult to estimate how common this is, the 2012 ABS survey of job search experiences suggests that a significant share of new employees look for work by contacting friends or directly contacting an employer. Finally, increases in the number of employers and people who work on their own account will generally not be associated with the filling of vacant positions.

Job Advertisements

Job advertisements are an alternative measure of the level of recruitment activity. Data on job advertisements are published by three main sources: ANZ, SEEK and the Department of Education, Employment and Workplace Relations (DEEWR). Of these, the ANZ series are the longest running, with the newspaper component extending back to 1975 and the internet component to 1999. These

series measure the stock of job advertisements on a specific weekday in each of the weeks of the month (and then take an average). On the other hand, DEEWR and SEEK provide measures of flows – that is, the number of new job advertisements posted in the month.⁹

These series are published every month and are timelier than the quarterly vacancies data. Unlike the vacancies data, which are collected from a representative survey of firms, measures of job advertisements attempt to capture the ‘population’ of advertisements, and so are not subject to sample noise. On the other hand, job advertisements have several drawbacks, in particular they:

- are affected by changes in recruitment methods and costs due to new technologies
- may not be representative of labour demand in the aggregate labour market
- can be affected by double counting.

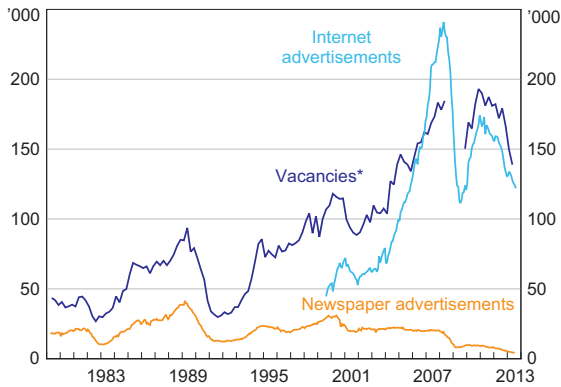
Advertising technology

In the 1980s and 1990s, the number of job advertisements – at the time predominantly in newspapers – was significantly lower than the number of vacancies recorded by the ABS (Graph 3). With the growth of internet advertising from the late 1990s, the total number of advertisements increased substantially relative to vacancies, while the number of newspaper advertisements declined. In 2008, the stock of internet advertisements (as measured by ANZ) was around 30 per cent above the number of recorded vacancies. The slowdown in economic activity during the financial crisis was associated with a sharp fall in job advertisements, and since then the levels of vacancies and job advertisements have been broadly similar.

Some of the growth in online job advertisements may be attributable to the relative costs of the various recruitment methods. Online advertising

⁸ Also, a significant share of all vacancies is filled by people who left a previous position to take up the new job, and these hires will not be recorded as a gross flow into employment.

⁹ SEEK also produces the ‘SEEK Employment Index’, which measures the ratio of new job advertisements to the number of applications received for those advertisements.

Graph 3**Job Advertisements and Vacancies**

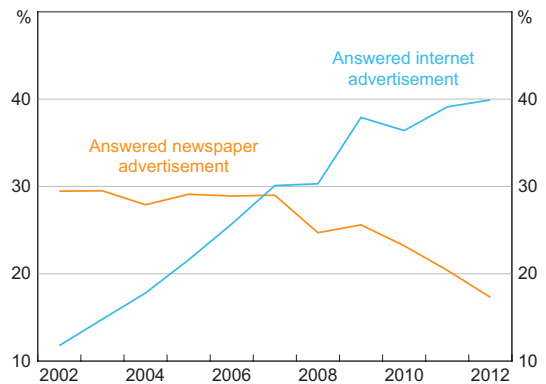
* This survey was suspended between May 2008 and November 2009
Sources: ABS, ANZ

has generally been a more affordable option for employers than advertising in newspapers. Online advertisements might have also replaced, or been used as a complement to, other recruitment channels such as job noticeboards. While online job advertisements now dominate the newspaper market in terms of volumes, in the 2012 ABS survey of job search experiences close to 20 per cent of recent employees stated that they had answered a print advertisement, indicating that the print market remains an important part of the recruitment process (Graph 4). Moreover, a substantial proportion of recent employees did not indicate that they had answered a job advertisement, suggesting that other means of searching, including directly contacting potential employers or talking to friends and relatives, also play an important role.

A more recent development has been recruitment through social media sites, such as LinkedIn, which reportedly had around four million registered users in Australia in early 2013 (Fitzsimmons 2013). While the number of job advertisements posted on the site is relatively low, LinkedIn allows recruiters to directly approach potential candidates with specific characteristics, including those not actively searching for new employment opportunities,

Graph 4**Job Search Experience of Recent Employees**

Share of persons who started current job in past 12 months



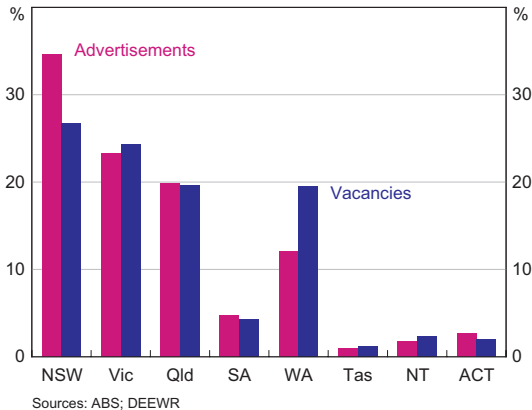
Source: ABS

without the need to advertise a position. In this way, the increased use of alternative recruitment channels such as LinkedIn may account for some of the recent decline in measures of job advertisements. It may also have had an effect on the broader relationship between job advertisements and job vacancies, to the extent that some vacancies are now being filled via such channels without being advertised first.

Industry and job composition

While the job vacancies data are constructed to be representative of the broader labour market in terms of states, industries and firm size, there is no assurance that job advertisements measures will be similarly representative, as some types of vacancies may be more likely to be advertised than others. Over time, there appear to have been some differences between the distribution of vacancies and advertisements across the states, which may in turn reflect differences in industry and/or occupational composition. For instance, the share of job advertisements in Western Australia has been substantially smaller than the share of vacancies in recent years, while the opposite is true for New South Wales (Graph 5).

Graph 5
Distribution of Vacancies and Advertisements
 Share of total, as at May 2013



Double counting

Apart from SEEK, the available job advertisements series cover more than one source website and/or newspaper (Table 1). Accordingly, there is the potential for the same advertisement to be counted multiple times if it is posted across multiple sources, either in print or online media. There is also the possibility that an advertisement for the same vacancy will be posted multiple times on the same source. While some of the published series attempt to control for ‘double counting’, in practice it may be difficult to do this with precision.

If adjustments are not made for double counting (or if the adjustments do not account for double counting in full), a change in the number of advertisements may not be the result of a change in the number of vacancies, but instead reflect a change in the efforts of firms to identify and recruit applicants or a change in the cost of advertising. For instance, tighter labour market conditions may cause employers to increase their search activity by advertising their positions with more than one source, or by posting their advertisements multiple times within a month. This may help to explain why the cycles in the job advertisements measures tend to be more exaggerated than the corresponding cycles in the number of job vacancies (Graph 6).

Graph 6
Job Advertisements and Vacancies
 Share of the labour force

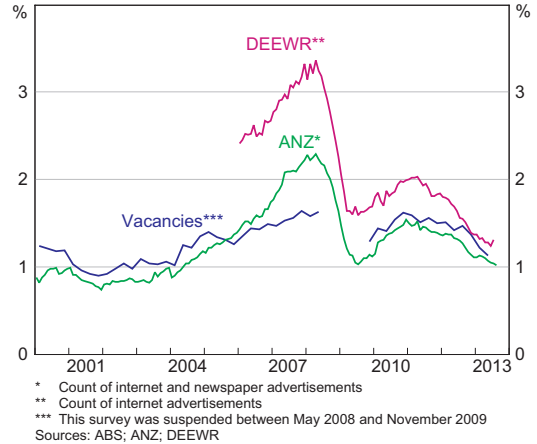


Table 1: Coverage of Job Advertisements Series

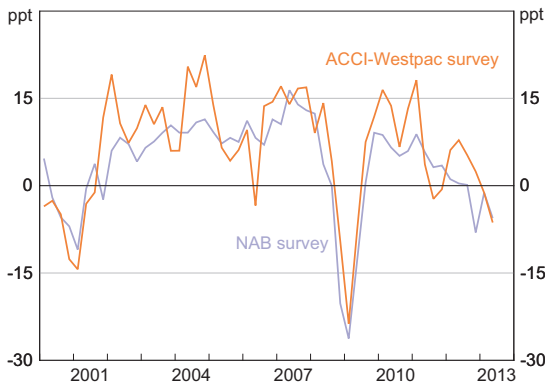
	Advertisement series		
	ANZ	SEEK	DEEWR
Source websites			
SEEK	✓	✓	✓
CareerOne	X	X	✓
MyCareer	X	X	✓
JobNet	X	X	✓
JobSearch	✓	X	✓
Print ads	✓	X	X

Sources: ANZ; DEEWR; SEEK

Business Survey Measures

Business surveys of employment intentions report the net balance of firms expecting to increase employment in the coming quarter (Graph 7). Two frequently cited surveys are the quarterly National Australia Bank (NAB) and ACCI-Westpac measures of employment intentions. The NAB survey includes responses from around 900 firms in the non-farm business sector each quarter, while ACCI-Westpac surveys around 300 firms in the manufacturing industry. The NAB survey sample is designed to be broadly representative of the aggregate economy in terms of state, industry and firm sizes, although

Graph 7
Employment Intentions*
 Deviation from average since 1989



* Net balance of surveyed employment intentions for the following quarter
 Sources: ACCI; NAB; RBA; Westpac

firms with less than 35 employees are excluded. The Reserve Bank also discusses hiring intentions with businesses that participate in the Bank's liaison program.

In theory, these measures may be more closely related to employment growth than job vacancies and advertisements inasmuch as they also take account of firms expecting to reduce headcount. However, there are a range of issues associated with the interpretation of business survey measures, including: they are subject to sampling error and other potential biases associated with survey design; they provide limited quantitative information as they often only ask firms if employment is expected to be higher or lower in the next quarter; and there may be variation in the way that firms report their individual experiences.¹⁰

The Relationship with Employment Growth

Changes in labour demand, as measured by these indicators, can flow through to employment growth in a number of ways. For example, an improvement in business confidence may initially translate into a re-evaluation of employment intentions, and then

an increase in the number of job vacancies and advertisements. It may also prompt an increase in search intensity in those firms where vacancies already exist. Increases in employment, on the other hand, will be recorded at the point at which the associated recruitment processes result in new hires, which may be a number of months ahead. Consistent with this, quarterly changes in job vacancies and advertisements are positively correlated with employment growth one and two quarters ahead, as well as contemporaneously, as is the net balance of employment intentions from business surveys (Table 2). Over the past decade or so, the correlations with employment growth one and two quarters ahead have been higher than the correlations with employment growth one quarter earlier, suggesting that these indicators have tended to lead changes in employment.

Although employment growth in any period will be a function of the number of vacancies at the start of the period (and the rate at which they are matched to jobseekers), employment growth was found to be more highly correlated with the change in vacancies than the level of the vacancy rate. The change in vacancies is also found to be more useful than the vacancy rate in the simple modelling exercises discussed below. There are a number of possible reasons for this: as discussed earlier, instability in the matching and separation rates over time, due for example to structural changes in the economy and/or developments in recruitment technology, can act to complicate the relationship between employment growth and the level of job vacancies. Various measurement issues associated with the vacancies data may also make it more difficult to interpret the recorded level of vacancies in any given quarter. On the other hand, changes in the number of vacancies from quarter to quarter can provide an initial signal of changes in labour demand, while potentially being less affected by structural changes.

The correlations for different sample periods suggest that the strength of the relationship between these indicators and employment growth has

¹⁰ For more on business survey measures, see Aylmer and Gill (2003) and Park (2011).

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varied over time, although there are relatively few observations in the more recent periods. At certain times, for instance during the global financial crisis, changes in employment growth may be primarily attributable to shifts in labour demand, which would act to increase the correlations relative to other periods in which developments in labour demand and labour supply (such as changes in the

participation rate) both play a role. Changes in the job advertisements market may have also affected some of these correlations over time. The leading relationship appears to have weakened across most of the indicators in the past few years, although the contemporaneous relationship between the internet job advertisements measures and employment growth has been relatively strong.

Table 2: Correlation between Employment Growth and Indicators of Labour Demand

Correlation coefficients^(a)

Lead	ABS Job Vacancies	NAB survey	ACCI-Westpac survey	ANZ Print	ANZ Internet	SEEK	DEEWR
2000:Q1–2013:Q2							
–1	0.17	0.35	0.30	0.08	0.30		
0	0.46	0.50	0.48	0.32	0.57		
1	0.24	0.49	0.40	0.55	0.47		
2	0.48	0.49	0.42	0.40	0.31		
2000:Q1–2008:Q2							
–1	0.11	0.23	0.15	–0.13	0.04		
0	0.35	0.34	0.36	0.07	0.38		
1	0.09	0.39	0.31	0.49	0.27		
2	0.53	0.55	0.44	0.27	0.11		
2008:Q3–2010:Q2 ^(b)							
–1	0.14	0.29	0.39	–0.03	0.56	0.29	0.28
0	0.81	0.84	0.84	0.62	0.87	0.78	0.79
1	0.74	0.83	0.76	0.94	0.72	0.88	0.83
2	0.30	0.30	0.29	0.66	0.18	0.45	0.51
2010:Q3–2013:Q2							
–1	0.26	0.42	0.59	0.49	0.51	0.47	0.63
0	0.47	0.26	0.36	0.34	0.81	0.61	0.70
1	0.33	–0.20	–0.02	0.21	0.19	0.31	0.31
2	0.27	–0.14	–0.24	–0.25	–0.34	–0.31	–0.40

(a) A correlation at lead x refers to the correlation between the quarterly change in the indicator (except for the NAB and ACCI-Westpac surveys for which the level is used) and employment growth x quarters ahead; for each indicator, the highest correlations among leads –1 to 2 are shown in bold

(b) Estimates for the job vacancies series are used between May 2008 and November 2009 (see footnote 7)

Sources: ABS; ACCI; ANZ; DEEWR; NAB; RBA; SEEK; Westpac

Forecasting performance

Indicators of labour demand are commonly used as an input into near-term forecasts of employment growth. Econometric estimates suggest that the addition of lagged values of these indicators to simple autoregressive models of employment growth improves their explanatory power. For instance, a model which includes the change in job vacancies as an independent variable explains around half of the variance of employment growth in the next quarter, compared with a simple benchmark autoregressive model, which explains around one-third of the variance (Table 3).

The results also suggest that changes in the number of job advertisements perform at least as well as changes in vacancies in explaining employment growth, as does a model based on the NAB survey measure of employment intentions.¹¹ Models of two-quarters-ahead employment growth display a particularly marked improvement in fit relative to an autoregressive benchmark, although the performance of such models deteriorates sharply when they are used to model employment growth further ahead.

While the above exercise shows that the in-sample performance of these models improves on that of the simple benchmark, it is also useful to examine the extent to which these indicators can provide superior information about future employment growth in real time (i.e. without estimating over the entire sample). To address this question, we generate out-of-sample recursive forecasts of next-quarter and two-quarters-ahead employment growth using these models. For each recursive forecast, the model coefficients are estimated using a data sample beginning in 1985 (apart from the survey model where the sample begins in 1990), with the first out-of-sample forecast of employment growth generated for the March quarter of 2000.¹² The out-of-sample forecasting performance of each model can then be evaluated on the basis of root mean squared errors (RMSEs), which describe how close the forecast outcomes are to the actual outcomes.

The results suggest that since 2000, the vacancies model and the business survey model have provided slightly more accurate forecasts of employment growth one and two quarters ahead than the benchmark autoregressive model (Table 4). The job

Table 3: Fit of Employment Growth Models
R-squared; models estimated from 1990:Q2 to 2013:Q2

Dependent variable	Benchmark model	Vacancies model	Job advertisements model	Business survey model
One-quarter-ahead ^(a)	0.31	0.49	0.49	0.52
Two-quarters-ahead ^(b)	0.16	0.38	0.42	0.50

(a) The benchmark specification is an AR(1) model. That is, quarterly employment growth is modelled as a function of employment growth in the previous quarter. The vacancies and job advertisements models of employment growth also include the first and second lags of the quarterly change of job vacancies and ANZ job advertisements, respectively. Changes in the sum of newspaper and online advertisements are used in the job advertisements model, except for prior to the December quarter 1999, when changes in the number of newspaper advertisements are used (dummy variables are used to control for the break). The business survey model includes the lag of employment growth and the first and second lag of the NAB survey measure of hiring intentions. Apart from the business survey measure, all variables are in logs.

(b) In the benchmark specification, quarterly employment growth is modelled as a function of employment growth two quarters prior. The vacancies and job advertisements models include the same lagged dependent variable as well as the second lag of the quarterly change in job vacancies and ANZ job advertisements, respectively. The business survey leading indicator model includes the lagged dependent variable and the second lag of the NAB survey measure of hiring intentions.

Sources: ABS; ANZ; NAB; RBA

11 The ACCI-Westpac measure of employment intentions does not explain aggregate employment growth as well in-sample (or out-of-sample), which is likely to reflect the fact that only firms in the manufacturing industry are surveyed.

12 Technically, these are pseudo real-time forecasts, in the sense that the current vintage of data (rather than historical data vintages) has been used to generate each recursive forecast.

advertisements model, on the other hand, does not improve on the benchmark overall, suggesting that the forecasts from this model may have been affected by some of the cyclical and structural shifts in the job advertisements market described earlier, which have potentially caused the relationship between job advertisements and vacancies to change over time. In recent years, however, the job advertisements model has performed relatively well compared with the other leading indicator models. A simple average of the forecasts from the three leading indicator models improves on the benchmark by around 10 to 15 per cent over the evaluation period, which is a statistically significant (though modest) improvement in forecasting performance.

Since 2008, the forecasts produced by the autoregressive model have improved, while the forecasting performance of the leading indicator models has been similar or slightly inferior to that of the benchmark. This may, in part, reflect the relatively pronounced movements in the separation rate observed over the past few years, which contrasts with its relative stability over most of the preceding decade, and which is an important omitted variable in the simple forecasting models of employment growth estimated here.¹³

Although the results suggest that changes in these indicators of labour demand do provide some useful real-time information about near-term employment growth, the magnitude of the typical forecast error

Table 4: Recursive Model Forecasts of Employment Growth
Root mean squared errors^(a)

	Benchmark model ^(b)	Vacancies model	Job advertisements model	Business survey model	Model average ^(c)
2000:Q1–2013:Q1					
One-quarter-ahead	0.34	0.31	0.35	0.32	0.30**
Two-quarters-ahead	0.38	0.33*	0.40	0.33	0.33**
2000:Q1–2008:Q2					
One-quarter-ahead	0.38	0.33**	0.40	0.33	0.32***
Two-quarters-ahead	0.41	0.35**	0.44	0.33**	0.34***
2008:Q3–2010:Q2 ^(d)					
One-quarter-ahead	0.28	0.29	0.25	0.31	0.27
Two-quarters-ahead	0.34	0.32	0.34	0.39	0.33
2010:Q3–2013:Q1					
One-quarter-ahead	0.24	0.25	0.24	0.30	0.25
Two-quarters-ahead	0.26	0.27	0.25	0.30	0.26

(a) Diebold-Mariano tests are used to determine whether there is a statistically significant difference between the forecasting errors of each of the leading indicator models and the forecasting errors of the benchmark autoregressive model; *, **, *** denote significance at the 10, 5 and 1 per cent levels, respectively

(b) An AR(1) model is used to generate the one- and two-quarters-ahead benchmark forecasts

(c) The model average refers to the simple average of forecasts from the vacancies, job advertisements, and business survey models

(d) Estimates for the job vacancies series are used between May 2008 and November 2009 (see footnote 7)

Sources: ABS; ANZ; NAB; RBA

¹³ However, incorporating lagged values of the separation rate (obtained from the ABS gross flows data as in Graph 1) did not improve the forecasting performance of these models.

(as implied by the RMSEs) is substantial even in the best case. For instance, a quarterly forecast error of 0.3 percentage points currently translates to employment of around 35 000 persons, and is also large relative to average quarterly employment growth since 2000 of around 0.5 per cent. As with all forecasts, therefore, some care needs to be taken in interpreting the forecasts of employment growth generated by these models.

Conclusion

Measures of job vacancies, job advertisements and employment intentions of firms each have strengths and limitations as contemporaneous indicators of labour market conditions, and as leading indicators of employment growth. In particular, structural changes in matching and separation rates, in recruitment technology and in the market for job advertisements are all likely to affect the interpretation of these indicators. While the simple models estimated in this article can explain around half the variance of next-quarter employment growth in-sample, their forecasting performance over the past decade or so has been only slightly better than that of a simple autoregressive model, and the forecast errors are relatively large. This implies that these indicators generally should be used in conjunction with other sources of information when assessing labour market conditions. ✎

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The Relationship between Bulk Commodity and Chinese Steel Prices

Mark Caputo, Tim Robinson and Hao Wang*

Iron ore and coking coal are complementary inputs for steelmaking and therefore their prices are closely related to steel prices. Historically, trade in iron ore and coking coal was based on long-term contracts, but in recent years there has been a shift towards shorter-term pricing, including on the spot market, and consequently prices reflect market developments more quickly. This article analyses the relationship between the spot prices for iron ore, coking coal and Chinese steel products, and finds that in the short run the spot price for iron ore has tended to overshoot its long-run equilibrium following an unexpected change in Chinese steel prices.

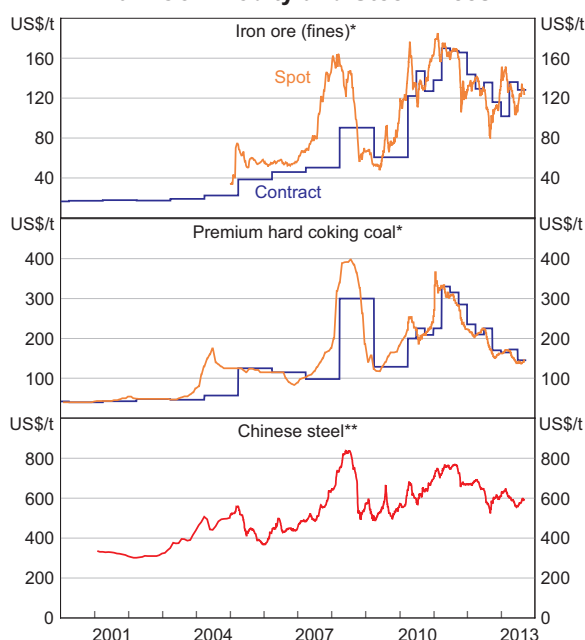
Introduction

Bulk commodity prices have risen over the past decade as China has industrialised and urbanised. The prices of iron ore and coking coal – which currently account for one-quarter of the value of Australia’s exports – are around four times higher than they were in the early 2000s (Graph 1). These increases have resulted in a considerable rise in Australia’s terms of trade. Over this period, iron ore and coking coal have been increasingly traded either on the basis of short-term contracts or at spot prices, both of which are influenced by developments in the Chinese steel market.

The expansion in China’s consumption and production of steel has been a key driver of the increase in demand for iron ore and coking coal, both of which are used predominantly as inputs for steelmaking (Graph 2).¹ The commonly used blast furnace/basic oxygen converter method of producing crude steel requires on average around

1.4 tonnes of iron ore and 0.8 tonnes of coking coal to produce a tonne of steel (World Steel Association 2011). This implies a close relationship between fluctuations in the prices of domestic Chinese steel

Graph 1
Bulk Commodity and Steel Prices

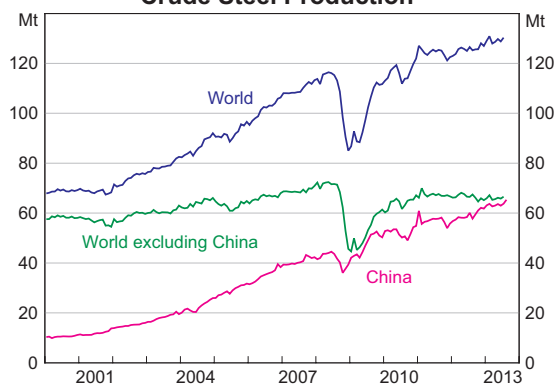


* The authors are from Economic Analysis Department. They thank James Hansen for helpful comments on an earlier version of this paper.

1 Although crude steel can be produced from scrap steel (and other inputs) using electric arc furnaces, a relatively small proportion of steelmaking in China is currently fed from recycled scrap reflecting the low availability domestically of ferrous scrap and difficulties with the supply of electricity in some regions (Holloway, Roberts and Rush 2010).

* Free on board basis
 ** Average of hot rolled sheet steel and steel rebar prices from 2005; prior to this, rebar is replaced with whorl steel prices
 Sources: ABARES; Bloomberg; Citigroup; IHS Energy Publishing; Macquarie Bank; RBA

Graph 2
Crude Steel Production*



* Seasonally adjusted
Sources: CEIC; RBA; World Steel Association (worldsteel)

and the prices of iron ore and coking coal. Indeed, these prices have experienced similar cycles in recent years. In 2007/08, there was a run-up in prices, underpinned by strong growth in China, which was followed by a sharp decline, reflecting the downturn in global economic activity associated with the onset of the global financial crisis. Demand for steel increased over 2009/10, due to the policy stimulus and associated rise in infrastructure spending in China, resulting in significant increases in prices of steel, iron ore and coking coal. Prices peaked in 2011 as severe flooding in Queensland temporarily disrupted the supply of Australian coking coal. In recent years, prices have trended lower as additional supply of iron ore and coking coal has become available and growth in Chinese crude steel production has moderated.

This article examines the relationship between the prices for iron ore, coking coal and Chinese steel. It seeks to estimate, and hence disentangle, the temporary from more persistent components of these price movements.

Data

Bulk commodity prices

Iron ore and coking coal are sold internationally in over-the-counter (OTC) markets where individual transaction details are not readily observable and

individual characteristics of different sources of coal and iron ore (such as purity and moisture content) can require specifically tailored contracts. Until the mid 2000s, trade in iron ore and coking coal was largely based on longer-term contract prices. In recent years, however, trade of these commodities has shifted to shorter-term pricing mechanisms and this has coincided with Chinese imports growing strongly. The initial move was from annual to quarterly contracts in the first half of 2010, and over recent years to monthly contracts and spot sales. Arguably, spot transactions are now the most informative signal about the current state of demand and supply for iron ore and coking coal. Nevertheless, there is no single measure of the spot price for these commodities. Spot prices for iron ore and coking coal are published by various private sector data providers, including Platts, The Steel Index (TSI), Metal Bulletin and IHS Energy Publishing. Prices are based on transaction, bid and/or offer data submitted from market participants such as mining companies, steel producers and brokers. Although there can be small differences in the methods employed and the data sources collected, most comparable benchmark spot prices appear to move closely with each other.

The importance of shorter-term pricing is most evident in the iron ore market. Monthly contract prices and spot transactions account for a large share of global trade (RBA 2012). For example, Australia and Brazil are by far the two largest exporters of iron ore, and more than half of their exports of iron ore are estimated to be sold using short-term index-based approaches (equivalent to more than 450 million tonnes per year, or close to 40 per cent of global iron ore trade). Chinese buyers are large participants in this market. The remainder of iron ore trade tends to be based on longer-term contracts, typically of quarterly duration, where the price is linked to previous spot price outcomes. A number of Japanese steel mills reportedly prefer this pricing arrangement. In contrast, the shift toward shorter-term pricing has been less marked for coking coal, in part reflecting its more varied

physical characteristics and China's proportionally smaller share of world imports. Important physical characteristics include the amount of fixed carbon, volatile matter, ash, sulphur and moisture. These properties affect the performance of coal in steelmaking and energy generation and its ability to be transported. Sales based on quarterly contract prices are presently estimated to account for around two-thirds of the global trade in coking coal. Nevertheless, the use of shorter-term pricing for coking coal has gained prevalence since late 2011, with market reports suggesting that the remainder is sold using monthly contracts or spot transactions.

The spot price for iron ore imported into China by sea is the most commonly used reference price for the physical sale and purchase of iron ore, although multiple variants are published. Typically, the benchmark spot price is quoted in US dollars per dry metric tonne, for 62 per cent iron content (which is comparable to the average quality of iron ore exported from Australia) and stipulates whether it includes the cost of freight and/or insurance. Published spot prices usually also control for other physical characteristics, such as the level of impurities and moisture, and extreme or unusual price movements are reportedly removed.² The cost of shipping is also standardised to delivery to one of China's major north-eastern trading ports.

Although there are a range of spot prices for different types of coking coal, the spot price for premium low-volatile hard coking coal from Queensland is typically regarded as a benchmark spot price, with around 60 per cent of Australia's coking coal exports having somewhat similar physical characteristics. Based on Energy Publishing's methodology, the spot price index is measured on a free on board basis and

includes only once-off deals that are not explicitly or implicitly associated with any past or future contracts (Energy Publishing 2010).

Chinese steel prices

China is presently the world's largest producer and consumer of steel, accounting for close to half of global production. Around one-half of China's steel consumption is used for construction and building infrastructure while the other half is used for manufacturing that is both exported and used domestically (Wu 2009). The prices of steel products sold in China tend to move together quite closely, although they can diverge periodically due to idiosyncratic factors. One indicator of domestic steel prices in China that is being used in this paper is the average price of steel reinforcing bar (rebar) and hot rolled sheet steel sourced from Bloomberg; these products are used extensively in the construction and manufacturing industries, respectively. The relatively competitive Chinese steel industry should aid the price discovery process for steel.

Modelling the Relationship

To examine the relationship between the spot prices for iron ore, coking coal and Chinese steel, a structural vector error correction model (SVECM) is estimated, covering the period between April 2010 and August 2013 using weekly data.³ This approach allows us to jointly model all three prices while integrating both their long- and short-term determinants. While relatively short, the sample starts in 2010 and covers only the period when spot prices have become indicative of the marginal tonne sold and therefore the relationship between steel, iron ore and coking coal prices is more likely to be stable.

Steel, as discussed above, is produced using relatively fixed proportions of iron ore and coking coal. Consequently, its marginal cost of production

2 There are fallback procedures used by some data providers when there is insufficient information to compile a spot price. For instance, if this occurs, TSI reports that the new submitted transactions will first be complemented by the 'rolling forward' of transactions made during the previous period by data providers that have not submitted data in the current period. If the sample is still insufficient, bid and offer data may be used. In both cases, though, these fallback data will carry a reduced volume weighting relative to transaction data that has been submitted in the current period (TSI 2008).

3 The spot price for iron ore used in this model is for 62 per cent iron content published by TSI and adjusted for freight between Dampier and Tianjin sourced from Bloomberg. Coking coal prices are sourced from IHS Energy Publishing.

should be a linear combination of the prices of iron ore and coking coal. The price of steel can be thought of as being a mark-up on these costs. Statistical tests suggest that none of the three prices display mean reversion, but that the mark-up of the price of steel on costs does. More formally, the prices appear to be non-stationary, but there is one cointegrating relationship between them. The SVECM approach allows such a relationship to be incorporated into a model:

$$B\Delta y_t = c + \alpha \beta' y_{t-1} + T\Delta y_{t-1} + \epsilon_t \quad (1)$$

where y denotes the vector for the endogenous variables, namely Chinese steel prices and the spot prices for coking coal and iron ore; Δ denotes the first difference, and B , c , α , β and T are all parameter matrices and vectors. ϵ are the structural shocks.⁴

There are several aspects to note about this model. First, it is comprised of three equations, one for each price. However, the model also allows for contemporaneous relationships between all of these prices, which are captured by the B matrix. The structure of this B matrix is important and is discussed in more detail below. Second, the determinants in the change of these prices are lagged changes in the prices (captured by the $T\Delta y_{t-1}$ terms; note that T is a matrix of coefficients; longer lags yield qualitatively similar results), and the long-run relationship. The latter is also known as an error correction term, which is a linear combination of the three prices denoted by $\beta' y_{t-1}$, where the vector β contains the parameters. α is a vector comprised of the parameters on the error correction term in each of the equations. Finally, unexplained fluctuations in the prices are summarised in ϵ , the structural shocks.

Identification

In order to interpret the effects of a given type of shock, for example a demand or supply shock and whether transitory or permanent, some model

parameters need to be restricted. These restrictions are also referred to as identifying assumptions and are guided by the expected behaviour of the variables.

The first restriction we place is to normalise a coefficient on one of the contemporaneous variables in each equation, which allows us to refer to a 'Chinese steel price' equation, a 'coking coal price' equation, and an 'iron ore price' equation (in other words, the diagonal of the B matrix is normalised to be 1). Second, based on cointegration tests, only one cointegrating relationship is assumed to exist and is included in the model. This assumption implies that two of the shocks (elements of ϵ) have permanent effects, that is, these shocks change the level of at least one of the prices in the long run. Pagan and Pesaran (2008) demonstrate that equations which have a permanent shock do not contain the error correction term, that is, its element of α is zero. Consequently, an approach to identification of the model is to select which of the shocks are permanent, and to place further restrictions upon the contemporaneous relationships between the prices.

A common approach might be to assume that shocks to Chinese steel prices reflect unanticipated changes to steel demand and therefore are transitory, whereas shocks to the spot prices for coking coal and iron ore reflect changes in supply, and therefore are long lasting. However, as China is industrialising rapidly, which has underpinned the growth in demand for these products, this approach seems less applicable. Instead, we assume that shocks to steel prices can have a permanent effect. The second permanent shock could be supply related in either the iron ore and coking coal sectors; it is assumed to appear only in the coking coal price equation, with shocks to the equation for the relatively volatile spot price for iron ore transitory in nature.

In the short run, coking coal prices are assumed to not respond to Chinese steel prices contemporaneously, motivated by the relatively low share of coking coal traded on the spot market.⁵ The model yields

4 The variables are included in levels, not natural logs, reflecting the lack of substitutability present in steel production. The results are similar if alternatively natural logs are used.

5 Effectively, the coefficient on Chinese steel prices in the coking coal price equation is set to zero in the B matrix.

qualitatively similar results for a range of alternative identifying assumptions.

The estimation is done in two steps. The long-run relationship is first estimated using ordinary least squares (OLS), and then given this each of the equations is estimated individually using instrumental variables, following the approach of Pagan and Pesaran (2008).⁶

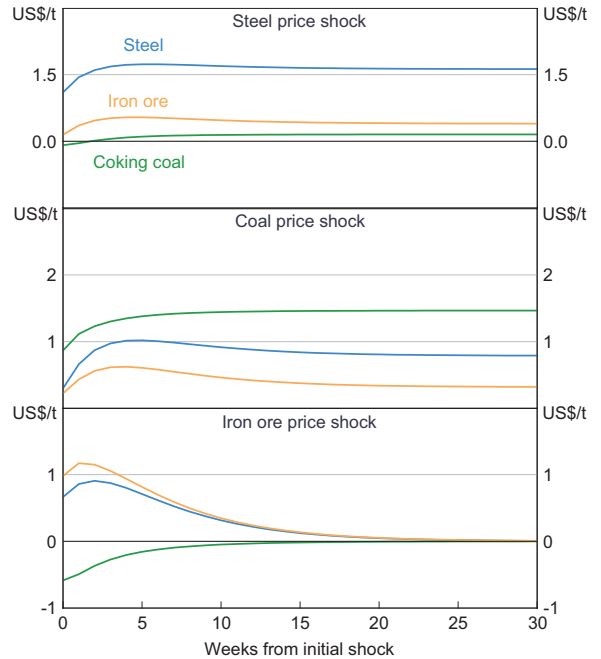
Results

Graph 3 shows the responses of the endogenous variables to shocks. Overall, the prices tend to react quickly to the shocks, although there appears to be some overshooting for the spot price for iron ore, and to some extent for Chinese steel prices, as these prices increase by more than their eventual level immediately after the shock. In comparison, coking coal prices converge gradually to their long-run level, though the coking coal price equation has limited ability to fit the data.

Considering the specific shocks in Graph 3 in turn, the top panel shows the response to an unanticipated US\$1 increase in the price of Chinese steel. This shock results in higher prices of coking coal and iron ore, which subsequently increase steel prices further in the long run. At the sample mean, an unexpected 1 per cent increase in the spot price for Chinese steel is estimated to increase the spot prices of iron ore and coking coal in the long run by 1¼ and ¼ per cent, respectively (in the short run, the spot price for iron ore is estimated to increase by up to 1½ per cent). Turning to other shocks, an unanticipated US\$1 increase in the spot price for coking coal results in higher prices for iron ore and steel (Graph 3, middle panel). By assumption, iron ore price shocks do not have a long-run impact; however, a positive iron ore price shock results temporarily in higher Chinese steel prices, whereas coking coal prices decline for a

time (Graph 3, bottom panel).⁷ One interpretation of this shock is that it corresponds to a reduction in the supply of iron ore, and the resulting fall in the spot price for coking coal could therefore be due to a fall in its demand reflecting its complementary role with iron ore in steel production.

Graph 3
Responses to Price Shocks*



* Shocks are US\$1 per tonne increase in the SVECM
Source: RBA

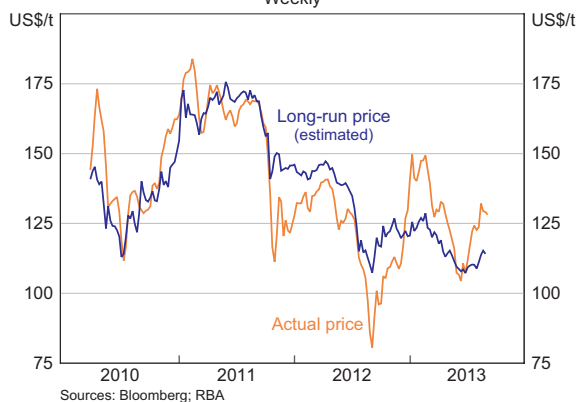
To disentangle more persistent shifts in the spot price for iron ore from temporary movements, the estimated value of the historical shocks can be used to construct a measure of the long-run price for iron ore.⁸ For instance, the spot price for iron ore appeared to deviate significantly from its estimated long-run price when it moved sharply lower in late 2012 and higher in early 2013 (Graph 4).

6 The lagged residual from the long-run relationship is used as an instrument in the equations that do not contain the error correction term. The residual from the coking coal price equation is used as an instrument in the steel price equation, and the residuals from both equations are used for the iron ore price equation.

7 If shocks to iron ore prices are instead assumed to have permanent effects and coking coal price shocks are transitory, qualitatively similar impulse responses to those in Graph 3 are obtained from a range of identifying assumptions.

8 The permanent component is normalised to have the same mean as the actual price.

Graph 4
Iron Ore Spot Prices*
Weekly



Conclusions

Prices for iron ore and coking coal have risen significantly over the past decade owing to a large increase in steel production in China. In recent years, short-term pricing mechanisms – including spot transactions – have become increasingly important for global trade of these commodities. Using a model which allows prices to respond to each other endogenously, this article finds that the spot price for iron ore tends to react quickly and overshoot its long-run equilibrium value in response to an unanticipated increase in Chinese steel prices, whereas the price of coking coal responds more gradually. ✎

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The Performance of Resource-exporting Economies

Ellis Connolly, Jarkko Jääskelä and Michelle van der Merwe*

The surge in demand for resources over the past decade led to sharp increases in the terms of trade not just for Australia, but also for other economies with comparable resource exports such as Brazil, Canada, Chile, Russia and South Africa. Each of these economies experienced an increase in investment, although the surge in resources investment in Australia has been particularly large. The real exchange rates in these economies appreciated, weighing on other trade-exposed industries, while parts of the non-traded sector benefited from the boost to income and activity from the resources boom. In general, the resource-exporting economies experienced relatively strong growth in economic activity and inflation remained well contained, particularly compared with previous booms in resource prices.

Introduction

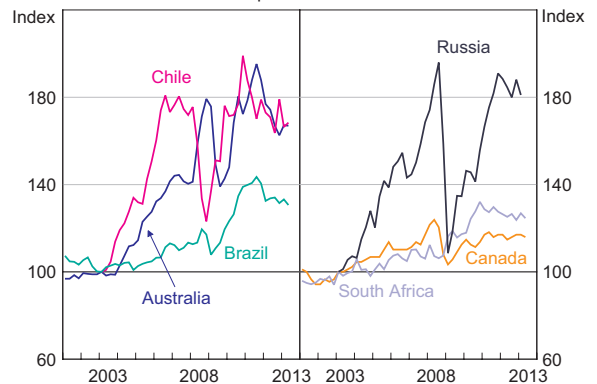
As a major exporter of resource commodities, Australia has been a beneficiary of the significant pick-up in the pace of urbanisation and industrialisation in emerging Asian economies over the past decade. The sharp increase in demand for commodities, coupled with their relatively inelastic supply, saw global commodity prices increase substantially, boosting the terms of trade (Graph 1). The value of Australia's resource exports increased more than fivefold over the 10 years to 2012 and now accounts for over 10 per cent of nominal GDP. The terms of trade boom has led to a surge in resources investment and a significant appreciation of the exchange rate, forces which have been driving structural changes in the Australian economy. This article compares Australia with five other economies with broadly comparable resource exports: Brazil, Canada, Chile, Russia and South Africa.

Along with Australia, these economies account for almost two-thirds of the world's proven reserves of iron ore, around half of copper and gold reserves and a third of coal reserves (Table 1). These resource

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Graph 1
Terms of Trade

March quarter 2003 = 100



Sources: OECD; Thomson Reuters

economies represent an even larger share of global iron ore and coal export markets, reflecting the fact that their resource production significantly exceeds domestic consumption requirements. However, apart from Russia and Canada, the resource-exporting economies represent a small share of global oil and gas reserves, which are dominated by economies in the Middle East; only Australia and Russia are significant exporters of liquefied natural gas (LNG).

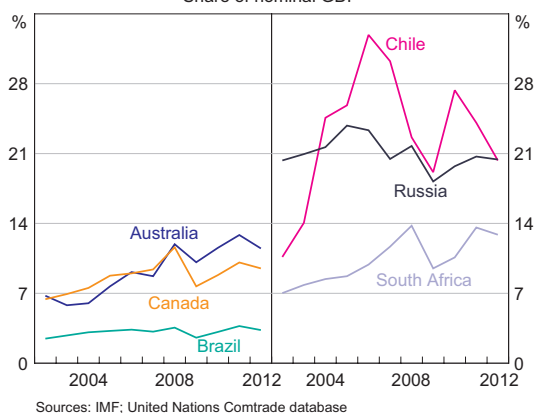
Table 1: Shares of Global Proven Reserves and Exports
2012, per cent

	Australia	Brazil	Canada	Chile	Russia	South Africa
Iron ore						
– Reserves	21	20	3	0	18	1
– Exports	46	25	3	1	2	6
Coal						
– Reserves	9	1	1	0	18	4
– Exports	30	0	5	0	10	5
Copper						
– Reserves	13	0	1	28	4	0
– Exports	5	0	3	23	3	0
Gold						
– Reserves	14	5	2	8	10	12
– Exports	6	1	6	1	na	3
Natural gas						
– Reserves	2	0	1	0	18	0
– Pipeline exports	0	0	12	0	26	0
– LNG exports	9	0	0	0	5	0
Oil						
– Reserves	0	1	10	na	5	0
– Exports	1	1	3	0	10	0

Sources: BP (2013); Bureau of Resources and Energy Economics; United Nations Comtrade database; UNCTADstat; U.S. Geological Survey

These economies vary in terms of the contribution of resources to production, their level of development and their macroeconomic frameworks. For Chile and Russia, resource exports account for around one-fifth of economic output, compared to around one-tenth for Australia, Canada and South Africa, while Brazil's resource exports are relatively small compared with its economy (Graph 2). The economic importance of resource exports has tended to increase over the past 10 years, except in Russia, where the broader economy expanded rapidly from a low base following the financial crisis it experienced in 1998. Australia, Canada, Chile and Russia are classified by the World Bank as high-income economies, while South Africa and Brazil are classified as upper-middle-income economies. There are some similarities in the macroeconomic frameworks, with all the economies – apart from Russia – having floating exchange rates and inflation-targeting central banks.

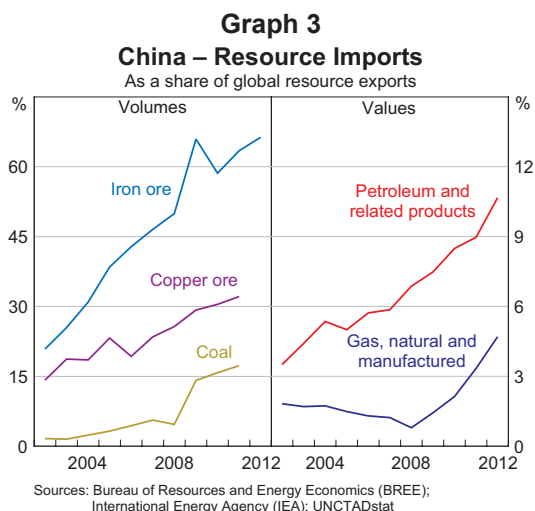
Graph 2
Resource Exports
Share of nominal GDP



The Surge in Demand for Resources

China's rapid economic growth over the 2000s underpinned a significant increase in global demand for resources; investment in Chinese infrastructure, building construction and heavy industry has been particularly steel intensive, boosting demand for iron ore and coking coal (Roberts and Rush 2010; Coates and Luu 2012). At the same time, rising household incomes have translated into higher demand for electricity and consumer goods. Despite China being a major producer of resources, domestic production has been unable to keep up with the growth in consumption, so China has increasingly turned to global markets to meet its demand.

Within a relatively short time, China's imports have risen significantly as a share of global trade in the key commodities produced by the six resource-exporting economies (Graph 3). This rise in demand from China drove substantial price increases for a wide range of resources (Table 2). Despite the sharp slowdown in the pace of growth in the advanced economies over the past five years, Chinese demand for commodities continued to increase during this period, only dipping briefly in 2009. Nevertheless, the pace of growth in Chinese resource imports has slowed over the past three years while global supply has expanded. These factors have contributed to commodity prices declining from their peaks, although they remain well above the levels that prevailed in the early 2000s.



The surge in Chinese demand for resources clearly shifted the direction of trade for the six economies (Graph 4). The share of Australian, Chilean and Brazilian resource exports bound for China increased from around 10 per cent in 2002 to around 30 per cent in 2012. While the proportion of Russian, South African and Canadian resource exports destined for China also increased, this change was not as significant, as they were less directly exposed to shifts in Chinese demand. In aggregate, these six economies met more than one-quarter of China's resource import demand in 2012, up from around 18 per cent in 2002. Of the six economies, Australia meets the largest share of China's resource import demand, reflecting Australia's dominance in both the iron ore and coal export markets and also its

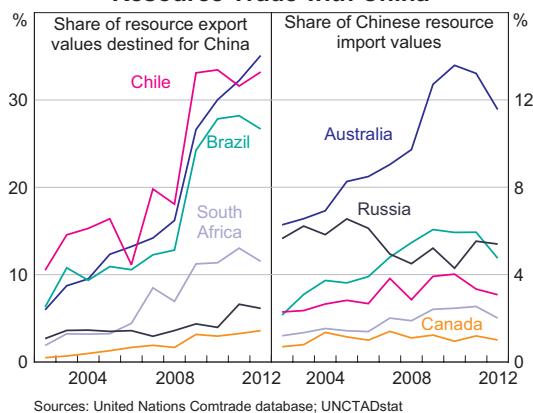
Table 2: Growth in Resource Prices^(a)
Percentage change

	Month of peak price	From Jan 2002 to peak	From peak to Aug 2013	From Jan 2002 to Aug 2013
Iron ore	May 2011	667	-24	482
Coking coal	Nov 2008	469	-53	165
Thermal coal	Jan 2012	213	-29	123
Copper	Feb 2011	427	-25	294
Gold	Sep 2012	406	-22	297
Oil	Jul 2008	444	-13	376

(a) Resource prices are in SDR terms; iron ore, coking coal and thermal coal prices are average Australian export prices
Sources: Bloomberg; RBA

geographical proximity to China. The recent decline in the share of Chinese imports sourced from the six resource-exporting economies reflects declines in the prices of bulk commodities and relatively strong growth in the value of imports of petroleum and related products, predominantly sourced from the Middle East and Africa.

Graph 4
Resource Trade with China

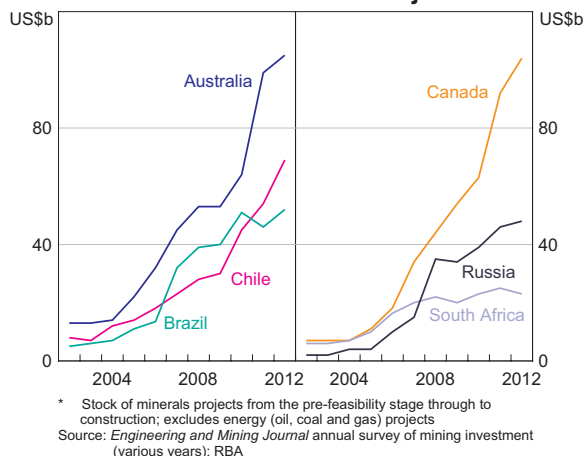


Resources Investment and Exports

The surge in demand for resources led to significant investment in the resources sector in all six economies over the past decade. Nevertheless, the magnitude of the pickup varied considerably, depending on each economy’s resource endowment, the availability of relevant extraction technology and the economy’s investment environment. Overall, a range of indicators suggest that Australia’s resources investment boom was particularly large, especially in LNG and iron ore.

Chinese demand for iron ore increased substantially, supporting resource investment projects in the economies with large iron ore reserves. The share of iron ore projects in global minerals projects rose from under 5 per cent in 2002 to around one-third in 2012, driving minerals investment in Australia and Brazil (Graph 5; Ericsson 2003; Ericsson and Larsson 2013). Similarly, investment in Chile was supported by Chinese demand for copper. Canada experienced a boom in minerals investment projects, although the composition was relatively broad based, including

Graph 5
Minerals Investment Projects*



gold, base metals and iron ore projects (Canada also experienced a boom in energy projects, particularly in unconventional oil extraction).

Improvements in resource extraction technology have also influenced the timing and location of resources investment, particularly for oil and gas projects (Alquist and Guénette 2013). In Canada, investment in unconventional oil extraction, primarily from the Alberta oil sands, more than doubled as a share of the Canadian economy over the past 10 years. In the United States, the shale gas boom over recent years has shifted the economy from being an importer of natural gas, to potentially becoming a significant exporter of LNG in the future. The LNG investment boom in Australia has also been partly driven by technological improvements in the extraction of both onshore coal seam gas and offshore gas, with the development of floating LNG technology.¹

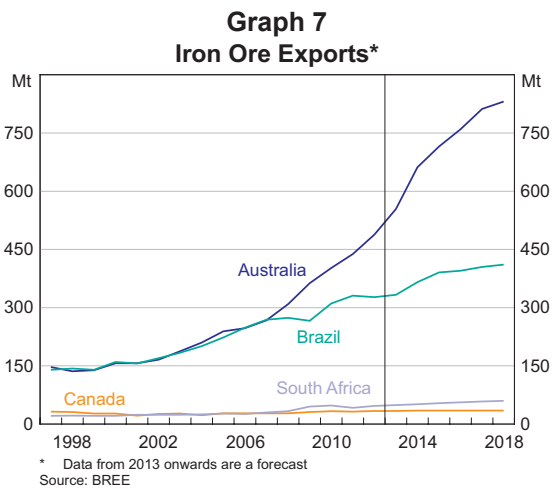
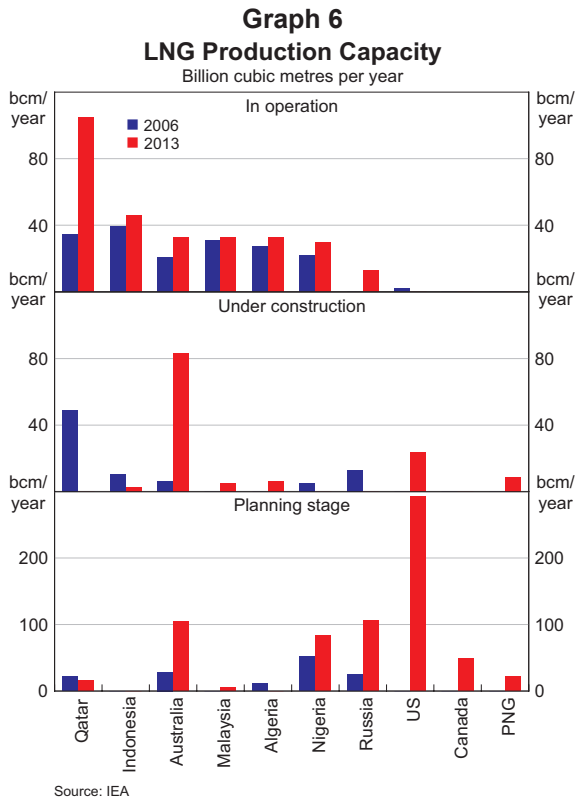
Given the highly capital-intensive and long-term nature of resource projects, the local investment climate is an important consideration for global resources companies when they make investment decisions. To measure this, the Fraser Institute surveys executives from mineral and petroleum

1 Shell’s Prelude project, currently under construction, is the world’s first floating LNG project, and when complete will be moored off the north-west coast of Australia. Woodside is considering using Shell’s floating LNG technology to develop the Browse gas basin, also located off the north-west coast of Australia.

companies on a range of factors influencing investment decisions, including political stability, the cost of compliance, the tax burden, the quality of infrastructure and the availability of skilled labour. According to these surveys, Australia, Canada and Chile have relatively low barriers to investment, underpinning the resources investment booms that have taken place in those economies over the past decade (Wilson, McMahon and Cervantes 2013; Angevine, Cervantes and Oviedo 2012).

These factors affecting the location of resources investment also help to explain developments in LNG capacity over the past decade (Jacobs 2011). The first wave of expansion was in Qatar, another economy considered to have a favourable investment climate, with LNG production capacity more than doubling over the second half of the 2000s (Graph 6). A second wave of expansion is underway in Australia, and the International Energy Agency (IEA) forecasts that Australian LNG exports will increase rapidly from 2015, making Australia the world's largest exporter of LNG. Looking ahead, LNG projects currently in the planning stage are mostly in the United States, and the IEA is forecasting US LNG exports to increase substantially later this decade. The IEA has noted that many of the other projects in the planning stage could be restrained by political instability and regulatory uncertainty, particularly those located in parts of Asia, the Middle East and Africa (IEA 2013).

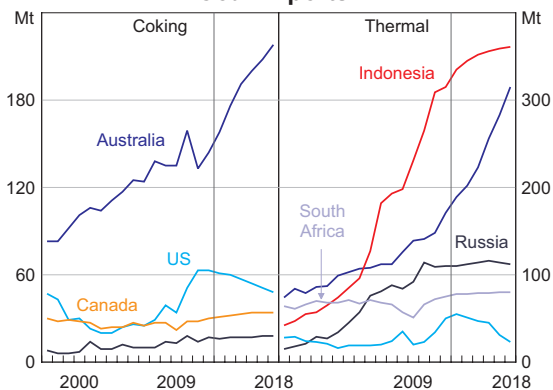
For the bulk commodities, trends in supply have also differed considerably across countries over the past decade. Australian iron ore exports increased more rapidly than for Brazil, Canada or South Africa, owing to the efficient coordination of supply expansions across mine, rail and port facilities, with Australia's share of global exports rising to around 45 per cent over the period (Graph 7). In contrast, while Australian exports continued to represent over half of the global trade in coking coal and a little under 20 per cent of thermal coal, the rate of growth of coal exports was much slower than for iron ore, reflecting challenges in coordinating expansion along the chain of infrastructure (that is, mines, rail



and port facilities; Connolly and Orsmond 2011). In comparison, the most rapid capacity expansions occurred in Indonesia, where thermal coal producers were able to use river barges to transport coal, avoiding the need to invest in rail networks (Graph 8; IEA 2011). Exports of coal from the United

States have also grown rapidly since 2009, owing to reduced domestic demand for coal following the global financial crisis and the boom in shale gas production. Forecasts from the Bureau of Resources and Energy Economics (BREE) suggest that Australia’s share in these bulk commodity export markets will increase over coming years, as the relatively large investments in Australia flow through to increased production, while growing domestic demand is expected to gradually reabsorb production capacity in the United States.

Graph 8
Coal Exports*



* Data from 2013 onwards are a forecast
Source: BREE

The Broader Economic Implications

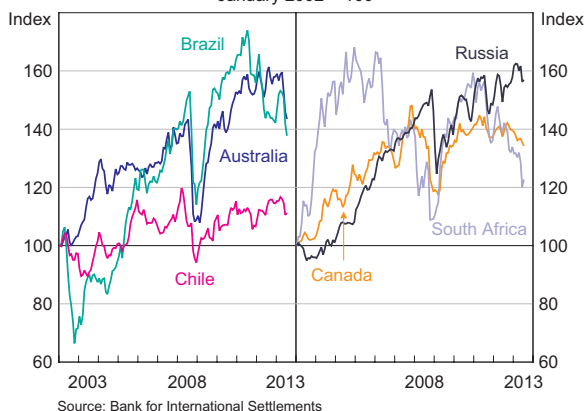
Over the past decade, the resource-exporting economies experienced the largest resources boom since at least the 1970s, and in the case of Australia, the largest in its history. Such booms are inevitably challenging for an economy as it adjusts to the dramatic shift in relative prices. To analyse this process, it is useful to consider the economy as being composed of three sectors: the resources sector, the other trade-exposed sector and the non-traded sector.²

2 In this article, the output of the resources sector is measured as the gross value added from mining; the other traded sector is measured as the gross value added from the manufacturing and agriculture, forestry & fishing industries, while the non-traded sector is measured as the value added from all remaining industries including services, utilities and construction. For a more detailed three-sector analysis for Australia, see Plumb, Kent and Bishop (2013).

Real exchange rate adjustment

One of the main ways that resource-exporting economies adjust to a surge in demand for resources is through appreciation of the real exchange rate. The real exchange rate measures the relative price of goods and services across countries, and the international competitiveness of the trade-exposed sector. The appreciation of the real exchange rate over the past 10 years has assisted all the resource-exporting economies with the reallocation of the factors of production towards the resources sector and away from the other trade-exposed sector (Graph 9). Real exchange rate adjustment can occur through an appreciation of the nominal exchange rate or through higher inflation of prices and wages as experienced in many countries in the 1970s. In Australia, Canada and Chile, the real appreciation over the past 10 years occurred predominately through the adjustment of the nominal exchange rate, with inflation remaining relatively well contained (Table 3, Graph 10). In contrast, in Russia – which has a managed exchange rate – and South Africa, the adjustment occurred through high inflation, while Brazil experienced a mix of nominal exchange rate appreciation and elevated inflation.³

Graph 9
Real Effective Exchange Rate
January 2002 = 100



Source: Bank for International Settlements

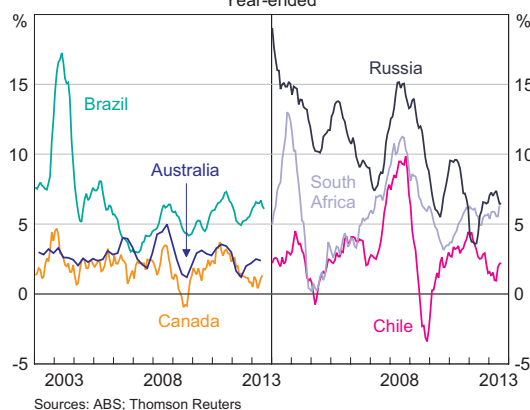
3 Other factors have also affected the real exchange rate in these economies over this period, including episodes of global financial market stress and unconventional monetary policies in many advanced economies.

Table 3: Exchange Rate Adjustment
January 2002–July 2013; percentage change

	Australia	Brazil	Canada	Chile	Russia	South Africa
Nominal exchange rate	38	5	40	18	-31	-9
Relative prices ^(a)	5	38	-5	-3	132	39
Real exchange rate	46	45	33	14	60	27
– Peak month	Aug 2012	Jul 2011	Nov 2007	Mar 2008	Feb 2013	Dec 2004
– January 2002 to peak	64	82	47	23	66	73
– Peak to July 2013	-11	-21	-9	-7	-3	-27

(a) Measured by the ratio of the real and nominal exchange rates
Sources: Bank for International Settlements; RBA

Graph 10
Consumer Price Inflation
Year-ended



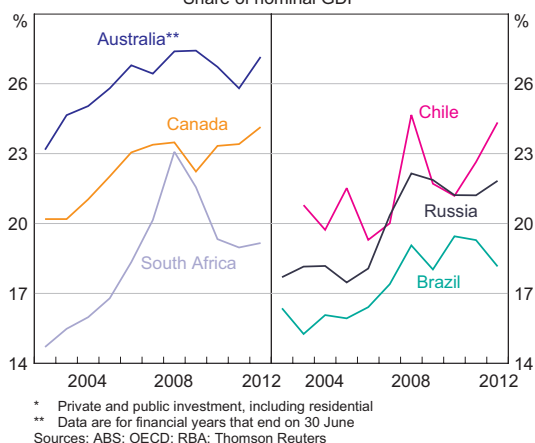
Over the past couple of years, most of the economies, but particularly Brazil and South Africa, have experienced a depreciation of their real exchange rates, consistent with their terms of trade having passed their peaks (Graph 1, Table 3). In Australia and Chile, the real exchange rate remained close to its peak level for some time after the terms of trade had begun to decline, although it depreciated more noticeably in mid 2013.

Investment and employment reallocation

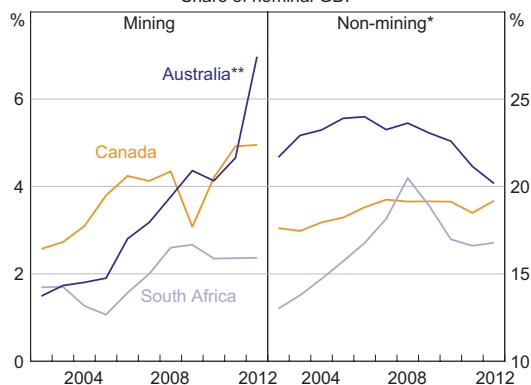
While investment in the resources sector should unambiguously increase in response to higher resource prices, the effect on investment and activity in other sectors is less clear. Although the non-resource sectors benefit from the boost to national income flowing from the higher terms of trade, these sectors have to compete against the

resources sector for labour and capital, while the other trade-exposed sector also faces reduced international competitiveness as a result of the higher real exchange rate. In aggregate, all of the resource-exporting economies experienced an increase in the investment share of the economy over the past 10 years, implying that the boom in resources investment more than outweighed any reduction in investment in other sectors (Graph 11). For Australia, Canada and South Africa (where data on mining and non-mining investment are available), mining investment increased strongly over the decade, but the experience of other sectors was mixed, with non-mining investment declining as a share of the economy in Australia (although it still increased in volume terms), while it increased in Canada and South Africa (Graph 12).

Graph 11
Total Investment*
Share of nominal GDP

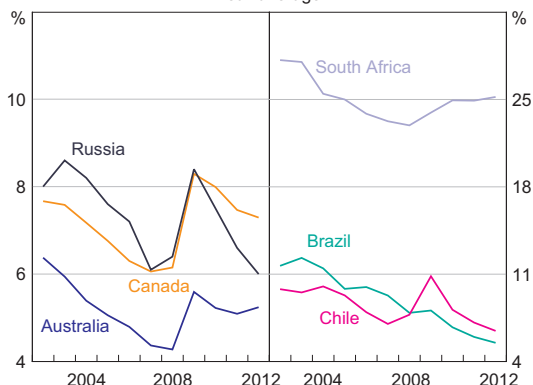


Graph 12
Mining and Non-mining Investment
 Share of nominal GDP



* Private and public investment, including residential
 ** Data are for financial years that end on 30 June
 Sources: ABS; OECD; RBA; Thomson Reuters

Graph 13
Unemployment Rate
 Year-average



Source: IMF

The boom in the resources sector also affects the allocation of employment across sectors, with employment shifting away from the other trade-exposed sector in particular towards resource-related activities. Plumb *et al* (2013) highlight the fact that in Australia, the composition of employment changed significantly during the course of the terms of trade boom. While the share of labour employed in the other trade-exposed sector declined, the share of total employment accounted for by the resource and resource-related sectors doubled between the mid 2000s and 2012. Francis (2008) makes a similar observation for Canada, but notes that the decline in manufacturing employment in Australia was less pronounced than in Canada, at least between 2002 and 2007. Also, since the mid 2000s, wages in the other trade-exposed sector grew slower than aggregate wages in both economies as the pace of growth in the resources sector accelerated and employment in that sector grew faster than in the broader economy.

While the resources boom led to some shifts in the structure of employment across industries, the resource-exporting economies experienced a substantial increase in aggregate labour demand associated with the boom. Consistent with this, unemployment rates declined over most of the period (although unemployment rose in most economies following the global financial crisis; Graph 13).

Trends in production

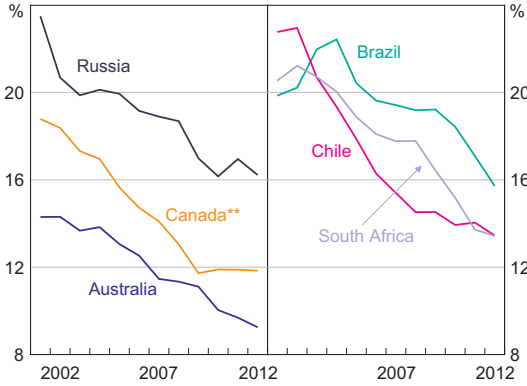
In each of the resource-exporting economies, the other trade-exposed sector steadily declined as a share of output over the period (Graph 14).⁴ This is consistent with the factors of production moving away from the other trade-exposed sector towards the resources sector in response to the higher returns that could be earned there, aided by the signal provided by the appreciation of the exchange rate.

In contrast to the weakness in the other trade-exposed sector, the share of output accounted for by the non-traded sector in these resource-exporting economies was steady or increased over the past 10 years (Graph 15). The income and activity generated by the resources boom stimulated the business services and construction sectors in particular (Francis 2008; Plumb *et al* 2013).⁵

4 The decline in the share of the traded sector is also affected by relative price movements; while strong demand pushed resource prices up, prices in the other trade-exposed sector, and manufacturing in particular, have tended to increase less rapidly than the overall price level, partly owing to ongoing productivity improvements. These relative price changes contributed to decreases in the share of nominal GDP accounted for by the other trade-exposed sector.

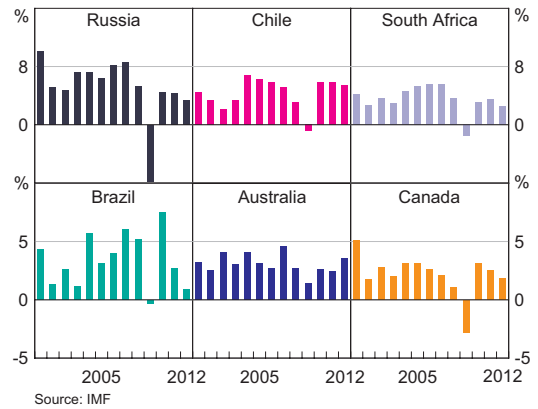
5 Although positive spillover effects from the higher terms of trade have contributed to the increasing share of the non-traded sector of the economy, it is worth bearing in mind that the shift in demand away from agriculture and manufacturing towards services has been going on for a much longer time. This same broad trend is apparent in other advanced economies, not just in the Australian and commodity-exporting economies (Connolly and Lewis 2010; Lowe 2012).

Graph 14
Other Trade-exposed Sector Value Added*
 Per cent of nominal GDP



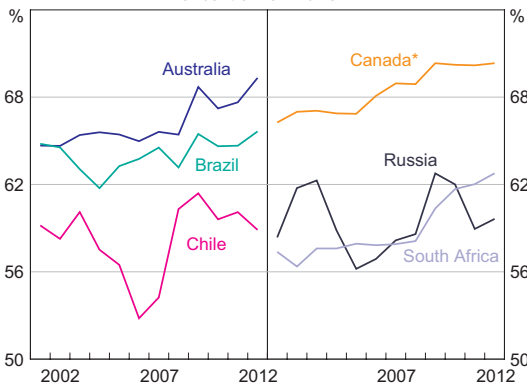
* Gross value-added output of the agriculture, forestry & fishing and manufacturing sectors
 ** Data for 2012 are based on chain-linked industry data
 Sources: RBA; Thomson Reuters; United Nations

Graph 16
Real GDP Growth
 Annual



Source: IMF

Graph 15
Non-traded Sector Value Added
 Per cent of nominal GDP



* Data for 2012 are based on chain-linked industry data
 Sources: RBA; Thomson Reuters; United Nations

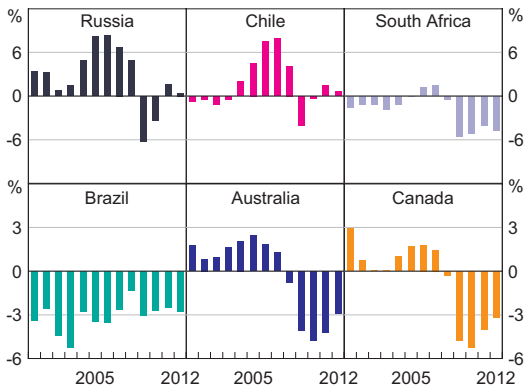
In summary, the resource-exporting economies experienced strong growth in economic activity from 2002 to 2008, with most subsequently experiencing a fall in output in 2009 following the global financial crisis (Graph 16). The key exception was Australia, which benefited especially from the rapid, steel-intensive rebound in the Chinese economy in 2009; in comparison, Canada – which has very similar institutional structures to Australia – experienced a sharp decline in activity owing to its close economic relationship with the United States (Kearns 2013). Since 2010, most of the resource-

exporting economies have experienced a slowing in output growth, partly in response to the moderation in Chinese growth and the associated declines in global resource prices. Since 2011, there has been a slowdown in the global mining investment boom, with projects being deferred in a number of economies, including Australia, Russia and Brazil (Ericsson and Larsson 2013).

Macroeconomic stabilisation policy

The resources boom posed significant challenges for policymakers, including the potential for the surge in resource-related activity to generate inflationary pressures, and structural change resulting from the appreciation of the real exchange rate. To maintain macroeconomic stability, most of the resource-exporting economies relied on the combination of an inflation targeting framework for monetary policy with a flexible exchange rate, and fiscal policy with the aim of balancing the budget over the medium term. Many resource-exporting economies also had explicit fiscal rules or set up sovereign wealth funds to address some of these challenges (Kearns and Lowe 2011; Garton 2012; Garton and Gruen 2012). Governments in Australia, Russia, Chile and Canada generated relatively large budget surpluses through the mid 2000s until the global financial crisis (Graph 17). In addition, monetary policy was tightened in many economies during this period. However, as

Graph 17
General Government Balance
Per cent of GDP



Source: IMF

commodity prices have begun to ease from their recent peaks, growth in government revenue has slowed, contributing to a downward shift in the budget balance in the resource-exporting economies (apart from Brazil for which the budget position has remained little changed over recent years).

Notwithstanding the magnitude of the resources boom, macroeconomic outcomes have been relatively benign across most of the resource-exporting economies. In Australia, Canada and Chile, inflation was relatively well contained over the past 10 years, especially when compared with the periods of high and volatile inflation experienced during the previous resources boom in the 1970s (Table 4). In addition, output growth was moderate to strong and unemployment typically declined over the decade as a whole, notwithstanding the disruption to growth from the global financial crisis. Such outcomes perhaps partly reflected the benefits of having better anchored inflation expectations, assisted in many of the resource-exporting economies by an inflation-targeting monetary policy framework, a flexible exchange rate and a balanced budget over the medium term. For Australia, the floating exchange rate has been an important part of the economic adjustment by allowing the real exchange rate to rise through an appreciation of the nominal exchange rate rather than through higher inflation.⁶

Table 4: Output Growth and Inflation
Per cent

	Australia	Brazil	Canada	Chile	Russia ^(a)	South Africa
Average inflation						
1971–1980	10.5	38.1	8.6	131.0	na	11.2
2003–2012	2.8	6.0	1.8	3.0	10.0	5.2
Inflation volatility ^{(b),(c)}						
1971–1980	5.3	na	3.0	463.5	na	4.4
2003–2012	1.8	3.8	2.5	3.5	3.7	3.1
Average output growth						
1971–1980	3.0	8.1	4.1	2.5	2.4	3.3
2003–2012	3.0	3.5	1.8	4.8	4.6	3.4
Output growth volatility ^(b)						
1971–1980	5.8	na	3.9	na	na	4.6
2003–2012	2.0	5.0	2.7	5.3	7.2	2.7

(a) Data for 1971–1980 are for the USSR

(b) The standard deviation of annualised quarterly output growth and inflation, respectively

(c) Data are seasonally adjusted by the RBA; ABS seasonally adjusted data have been used for Australia from December 1986 onwards

Sources: ABS; Baer (1987); RBA; Thomson Reuters; The Conference Board, Total Economy Database™

⁶ Jääskelä and Smith (2013) show that in Australia the flexible exchange rate has reduced economic volatility by absorbing external shocks, including changes in commodity prices; see also Battellino (2010).

Conclusion

The resource-exporting economies all experienced substantial resources booms over the past 10 years, associated with the surge in demand from emerging Asia and the rise in global commodity prices. Australia experienced a particularly large boost to demand and investment owing to the composition of its resource endowment. Overall, the economic outcomes for the resource-exporting economies were generally positive, supported by macroeconomic stabilisation frameworks. ✕

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Partial Mortgage Prepayments and Housing Credit Growth

Marc-Oliver Thurner and Alexandra Dwyer*

Changes in lending rates have an important influence on the pace at which households prepay their mortgages. This has implications for housing credit growth. The effect of the fall in lending rates since October 2011 on prepayments is by itself estimated to have led to a $\frac{1}{2}$ to $\frac{3}{4}$ percentage point reduction in year-ended housing credit growth as of June 2013.

Introduction

One of the channels by which monetary policy affects the economy is through its effect on the price of credit. Other things equal, when lending rates fall, demand for credit increases and, as long as supply is not a constraint, credit growth can be expected to rise. During the most recent monetary policy easing phase, the value of housing loan approvals as a share of outstanding housing credit has risen, yet the pick-up in housing credit growth has been modest by comparison. One of the possible factors contributing to this divergence is an increase in the rate at which households are repaying their mortgages.

When lending rates fall, borrowers with variable-rate mortgages have three options: they can choose to reduce their payments to the lower minimum scheduled payment; maintain their existing payments; or even pay some higher amount. The extent to which borrowers adjust their payments depends on a number of factors, including the different processes lenders have for adjusting these payments, the level of lending rates at the start of an easing phase, and the perceived permanency of any reduction in lending rates.

A partial mortgage prepayment occurs when a borrower repays some, but not all, of a housing loan ahead of schedule. Such payments can be made on a

regular basis, or as a one-off excess repayment. Most prepayments of loan principal are paid by borrowers with variable-rate loans. These loans account for about 85 per cent of outstanding housing credit. There is generally a limit to how much Australian borrowers are able to prepay on fixed-rate mortgages before they incur some penalty, although it is worth noting that fixed-rate terms are typically one to three years, after which these loans are usually rolled over into variable-rate loans. For this reason, the effect of prepayments on housing credit growth is likely to be larger in those economies that have a high proportion of variable-rate mortgages, such as Australia, Canada and the United Kingdom.

Investors do not have the same incentives as owner-occupiers to make prepayments owing to factors related to taxation. For investors, the tax benefits accruing from negative gearing diminish as the loan balance declines because of the lower interest deductions that can be used as an offset to rental income. Nonetheless, information from banks suggests that investors do make some prepayments.

This article discusses the influence of banks' mortgage payment options and policies on prepayments before examining the empirical evidence. These findings are then compared with the results from two simulations, which estimate the effect of prepayments on housing credit growth. The analysis

* The authors are from Domestic Markets Department.

focuses on isolating the effect of prepayments on housing credit, rather than the effect of the reduction in lending rates on the demand for new loans.

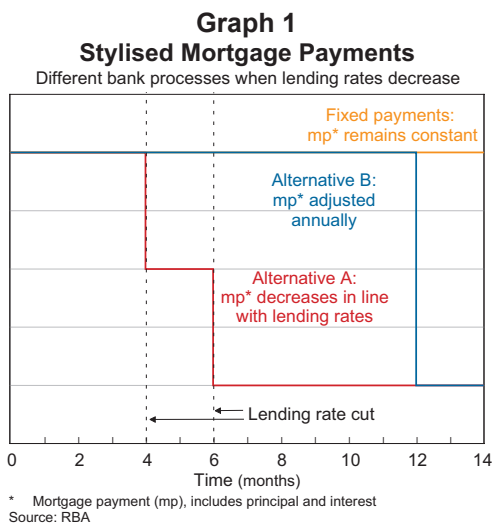
Prepayments: Bank Processes and Customer Behaviour

Borrowers' prepayment behaviour can be affected by the processes and policies of their lenders, and in particular how lenders change scheduled mortgage payments following a change in lending rates. Australian lenders offer two main mortgage payment options to their customers. The first links payments to the minimum required to amortise the loan over its remaining term. These payments vary with lending rates. The second and more prevalent option is for borrowers to fix the level of payments on the mortgage until either the bank or the borrower decides to change the level of payments. These payments are set at origination, at a level at or above the minimum, so that the loan principal is repaid fully by the time the loan is scheduled to mature (assuming no change in interest rates). If interest rates increase, the bank may choose to increase the level of payments to ensure that the loan is fully paid off by its scheduled maturity date. If lending rates decline, borrowers can elect to take two courses of action. They can either continue to make the same payment, in which case their prepayments increase by an amount equal to the reduction in lending rates accruing on the outstanding balance. Alternatively, they can choose to nominate a lower payment level (within the limits stipulated by their lender). Anecdotal evidence suggests that about half of these borrowers have reduced the level of their scheduled payments since October 2011.

Policies regarding the timing of changes to borrowers' scheduled mortgage payments following changes in lending rates vary considerably between lenders. These policies can also depend on whether lending rates increase or decrease. For those borrowers who

make payments linked to the minimum payment level, they will make:

- no additional prepayments if their bank immediately decreases scheduled mortgage payments following a reduction in lending rates (illustrated as 'Alternative A' in Graph 1); or
- temporary additional prepayments if their bank decreases scheduled mortgage payments infrequently (e.g. after a few changes in lending rates or annually; 'Alternative B' in Graph 1);



A borrower's decision to deviate from their bank's default arrangements or to change their payment amount is also influenced by the frequency with which the lender notifies its customers of a change in lending rates, as well as the ease with which borrowers can change their mortgage payments (e.g. in a branch, online, by telephone or by post).

Measures of Partial Prepayments

There are two main ways of estimating partial prepayments in Australia: the partial prepayment rate calculated from data reported by banks to APRA on a quarterly basis; and implied net principal payments based on the difference between housing loan approvals (net of refinanced owner-occupier loans) and housing credit growth.

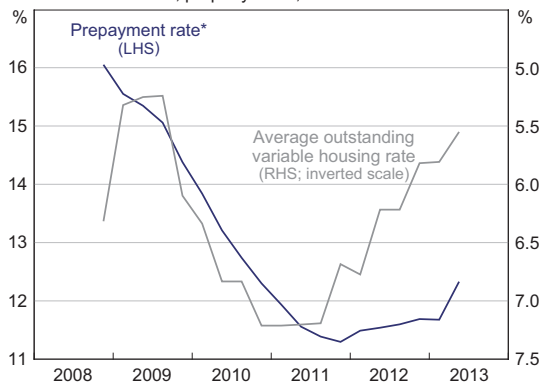
The partial prepayment rate of each of the banks (based on APRA data) varies considerably.¹ This is partly due to the fact that following a change in lending rates, some banks do not immediately change the level of mortgage payments that borrowers are expected to make. Consequently, even though borrowers may be repaying their loan faster after a reduction in lending rates, some lenders may not report higher partial prepayments because there is no difference between the level of payments the lender has set for the borrower and what the borrower actually pays (which is a consequence of some of the bank processes outlined above). Therefore, as lending rates decline, the rate of partial prepayment reported by some banks may be understated.

The partial mortgage prepayment rate based on these data (on a four-quarter rolling average basis) increased by 0.9 percentage points between the September quarter 2011 and June quarter 2013 (Graph 2).²

Graph 2

Partial Mortgage Prepayment Rate

Excludes refinances, property sales, redraws and offset balances



* Rolling four-quarter average (annualised); variable-rate loans only; assumes half of borrowers with interest-only loans prepay
Sources: ABS; APRA; Perpetual; RBA

1 The quarterly partial prepayment rate is calculated as the quarterly flow of partial prepayments, relative to the stock of housing credit outstanding at the start of the quarter, which is reduced by any scheduled principal repayments made during the quarter.

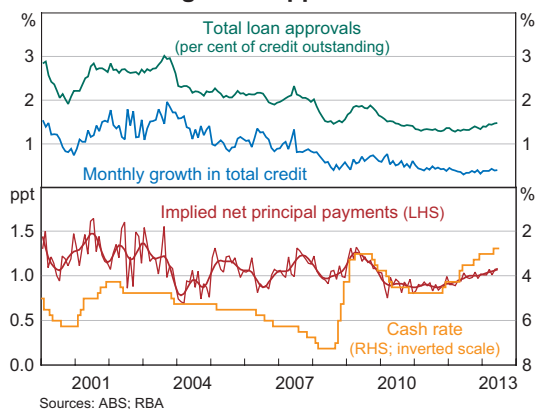
2 Prepayment data are only available for a short time period, so cannot be fully adjusted for seasonal effects. A four-quarter average is used to partly address this issue.

Prepayments can also be gauged by looking at changes in implied net principal payments. This measure is only a rough proxy for prepayments since it is also affected by factors other than partial prepayments, such as variations in redraws and scheduled principal repayments (see Table A1 in Appendix A). Another problem with the implied net principal payments measure is that some loan approvals can be cancelled and the timing between an approval and a drawdown of a loan can vary significantly.

The implied net principal payments measure indicates that prepayments increased by 0.2 percentage points between the September quarter 2011 and June quarter 2013 (Graph 3). This is considerably less than the 0.9 percentage point increase indicated by the partial prepayment rate discussed above.

Graph 3

Total Housing Loan Approvals and Credit



Sources: ABS; RBA

Partial Mortgage Prepayment Simulations

Simulations can also be used to obtain estimates of the impact of decreases in lending rates on partial mortgage prepayments and housing credit growth. This article looks at two simulations: the first uses a hypothetical loan portfolio; while the second uses historical housing credit and loan approvals data. Both simulations focus on borrowers with variable-rate loans and assume that loan payments

are kept constant when lending rates fall. For this reason, both simulations estimate the upper bound of the effect of prepayments on housing credit growth.

1. Loan portfolio simulation

The loan portfolio simulation examines the effect of a decrease in lending rates on the repayment profile of a single credit-foncier loan, the most common type of mortgage in Australia, with a contractual term of 25 years. This profile is then used to construct a portfolio of loans, differentiated by age, to assess the impact of prepayments on aggregate housing credit growth in Australia.

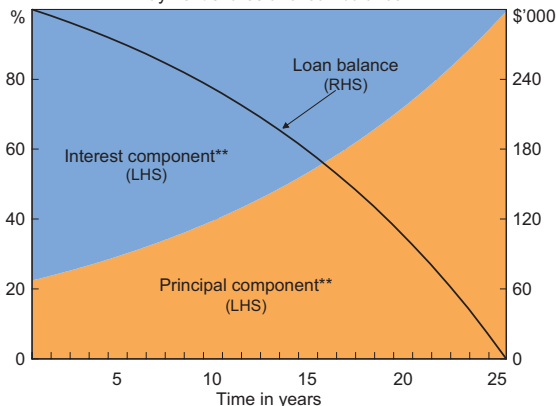
Single loan view

Under a credit-foncier loan contract, the borrower must repay the original principal and pay applicable interest on the outstanding balance over an agreed maximum term by making regular payments. This payment schedule leads to a non-linear principal repayment profile, with principal repayments being a lower portion of total payments at the start of the loan and a higher portion towards the end of the loan (Graph 4).

If lending rates fall, borrowers with variable-rate loans might reduce their scheduled payments, such that the loan still matures at the same time, but with borrowers incurring lower interest costs over the remaining life of the loan (the blue line in Graph 5). Alternatively, if borrowers keep their payments constant, the loan is fully repaid earlier than originally scheduled (the green line in Graph 5). For example, if lending rates decrease from 6 per cent to 5 per cent for a \$300 000 loan in the third year of a 25-year contract and the borrower keeps their monthly payments constant, the loan will be fully repaid by year 22.³

3 In this case, if there was already a significant level of partial prepayment (in addition to prepayments as a consequence of a change in lending rates), a reduction in interest rates would lead to a lower level of additional prepayments relative to other loans of the same age that have not been partially prepaid. While most Australian borrowers repay their mortgage ahead of schedule, for simplicity, it is assumed that prior to the reduction in lending rates, borrowers had been repaying their loan as scheduled – that is, no mortgage buffers had been accumulated.

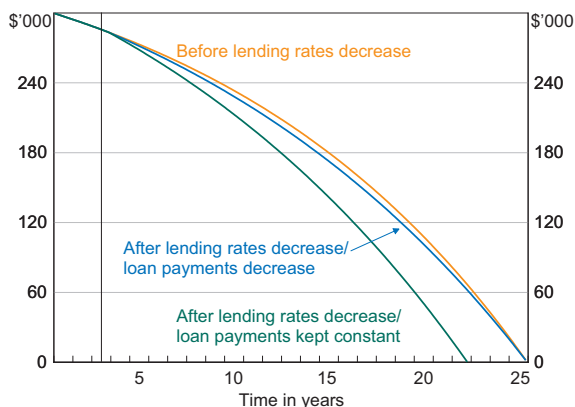
Graph 4
Credit-foncier Loans*
Payment shares and loan balance



* \$300 000 loan with a contractual term of 25 years, monthly payments and a lending rate of 6 per cent
** Share of total scheduled payment
Source: RBA

Graph 5
Loan Balance

Effect of a decrease in lending rates and repayment behaviour*



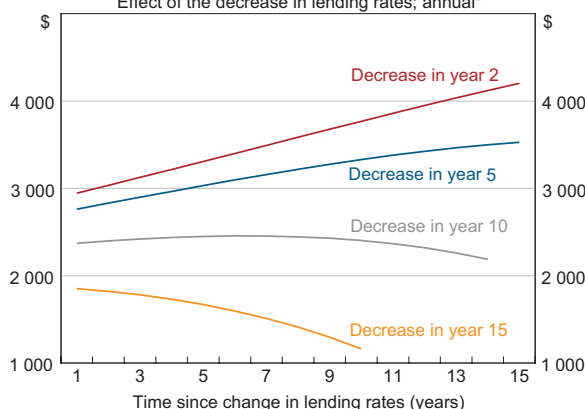
* \$300 000 loan with a contractual term of 25 years and monthly payments; lending rates decrease from 6 per cent to 5 per cent in year 3
Source: RBA

To measure the effect of prepayments, two scenarios are compared. In the first scenario, principal repayments are calculated in each period if lending rates are unchanged and borrowers made their scheduled loan payments for the remaining term of the loan (the counterfactual scenario). In the second scenario, principal repayments are calculated in each period assuming that borrowers do not change their loan payments after lending rates are reduced, thereby accelerating the repayment of the outstanding loan balance.

It is assumed that mortgage payments are made annually (to simplify the analysis) and that lending rates decrease from 6 per cent to 5 per cent. In the year immediately following the decrease in lending rates, the rate of prepayments relative to the outstanding loan balance is equivalent to the change in lending rates (i.e. 100 basis points), regardless of the age of the loan. In subsequent periods, however, the age of the loan affects the magnitude of prepayments (Graph 6). Prepayments on younger loans continue to increase due to the larger loan balance on which the interest savings apply; these interest savings are compounded over time. In contrast, for older loans, there is a point after which prepayments tend to diminish. This is due to the increasingly rapid decline in the loan balance as the loan ages. As a consequence, any interest savings apply to a much smaller loan balance, and principal repayments tend to have a larger effect than the compounding of the interest savings.

loans (Graph 7).⁴ The portfolio view also requires an assumption about the rate of housing credit growth in the absence of any partial prepayments. This approach ensures that after a reduction in lending rates, the analysis takes into account any new loans entering the credit pool (it also helps to calibrate the prepayment profile of individual loan age cohorts relative to the growth of credit). Since new loans are entering the pool in each period, it is assumed that prepayments are made only on the outstanding stock of loans at the time of the decrease in lending rates. Therefore, new loans diminish the prepayment effect on the portfolio.

Graph 6
Prepayments on Individual Loans
Effect of the decrease in lending rates; annual*

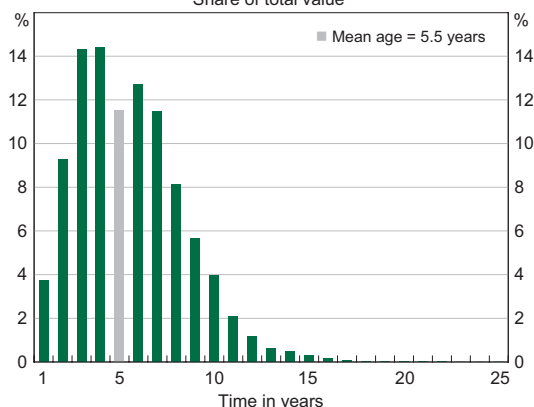


* Change in principal repayments on a single \$300 000 loan if lending rates decrease from 6 per cent to 5 per cent and total payments are held constant at the original lending rate; contractual loan term of 25 years and annual payments
Source: RBA

Portfolio view

To estimate the aggregate effect of prepayments on a portfolio of loans, the prepayment profiles of single loans with terms of 1 to 25 years are weighted by an empirical age distribution of variable-rate

Graph 7
Age Distribution of Securitised Housing Loans
Share of total value*



* Variable-rate loans only; as at December 2012
Sources: Perpetual; RBA

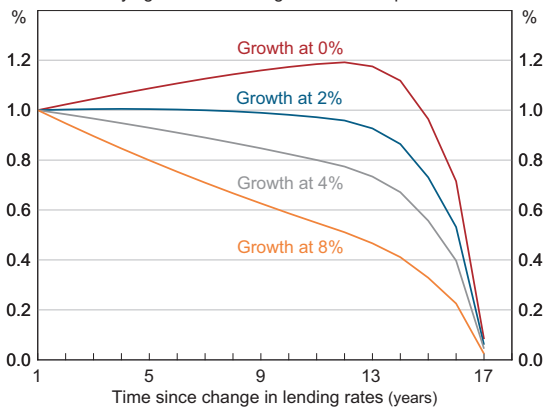
The portfolio simulation results suggest that in the first year following a 100 basis point decrease in lending rates, prepayments reduce growth in variable-rate housing credit by 1 percentage point, as all loans experience the same effect. Under the assumption that fixed-rate housing loans and some interest-only loans are less susceptible to prepayments, this is equivalent to a 0.5 to 0.7 percentage point reduction

⁴ The age distribution is obtained from securitisation trust data. This distribution may be skewed because loans that are securitised, particularly by banks, are often older. The distribution also reflects varying issuance activity of residential mortgage-backed securities, particularly during recent years. However, the average age is broadly consistent with information from liaison with lenders.

in the year-ended growth rate of total housing credit.⁵

In subsequent years, however, the assumed growth of housing credit substantially affects the extent to which prepayments have an effect on housing credit (Graph 8). When the flow of new loans is large, the effect of prepayments on housing credit growth tapers off more quickly than in lower growth environments. This is because the loans that experience prepayments diminish rapidly as a share of outstanding loans. In contrast, when there is a lower flow of new loans into the credit pool, the effect of prepayments is much higher relative to the outstanding stock of housing credit. In fact, the effect can be higher than the decrease in lending rates for a number of years after a reduction in lending rates because of the compounding of interest savings.

Graph 8
Prepayment Effect on Housing Credit Growth*
 Varying counterfactual growth rates in portfolio



* Change in principal repayments on a portfolio of loans if lending rates decrease from 6 per cent to 5 per cent and loan payments are held constant, as a share of housing credit; \$300 000 loans, contractual loan terms of 25 years and annual payments
 Source: RBA

5 Variable-rate mortgages – adjusted for the share of interest-only loans where borrowers are assumed to prepay – account for about 70 per cent of housing credit outstanding. Due to the way that loans and deposits are reported, housing credit is not reduced by deposits in offset accounts. There are no data available to help determine the effect on credit from direct prepayments and those prepayments that occur because of the interest savings resulting from deposits in offset accounts. Therefore, a range is given based on two assumptions: the lower end is equivalent to all borrowers with offset accounts (around 30 per cent of loans outstanding) using prepayments to increase deposits in these accounts (which reduce the interest burden on the mortgage but do not reduce credit outstanding); while the upper end is equivalent to all borrowers using prepayments to reduce the balance of the loan (and hence credit).

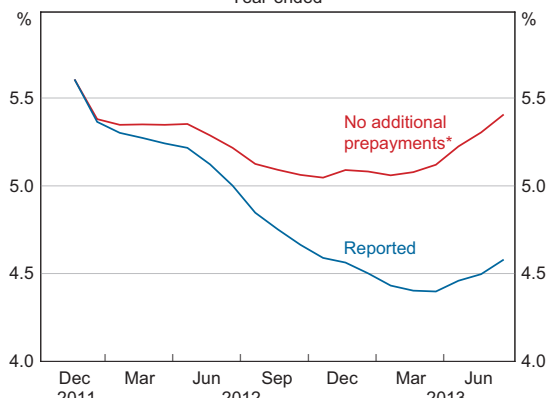
2. System-level simulation

In the system-level simulation, a model is used to estimate the effect of the reductions in lending rates on monthly prepayments and ultimately on housing credit growth since late 2011. The simulation then projects these effects from July 2013 to March 2014 assuming no further changes in lending rates and a constant growth rate for housing credit.

The central principle of this simulation is that only those loans outstanding prior to a reduction in lending rates experience an increase in prepayments as a result of the interest savings. For each reduction in lending rates, we calculate a projection of interest savings on loans outstanding at the time of the reduction in lending rates. To do this, however, the flow of new loans after a reduction in lending rates has to be taken into account as the interest savings do not apply to new loans written after lending rates decline. Therefore, in each period the balances of new loans written are subtracted from the total stock of housing credit. We assume that the new loans amortise according to the credit-foncier schedule over a 25-year term and follow a profile for partial prepayment behaviour in line with past patterns. The change in lending rates is applied in each period to the resulting balances on loans that existed at the time that lending rates were reduced. These calculations produce eight projections of interest savings (for the eight reductions in lending rates since late 2011). For each period, the interest savings across each projection are added to produce an estimate of the effect of interest savings on housing credit growth.

Overall, the simulation suggests that the cumulative effect of the 165 basis point decrease in the average outstanding variable rate between October 2011 and June 2013 on prepayments would result in about a 1 percentage point reduction in housing credit growth over the period. Over the year to June 2013, the effect on housing credit growth is around 0.8 percentage points (Graph 9). Assuming that the flow of new loans relative to housing credit is constant in each period, that there are no further

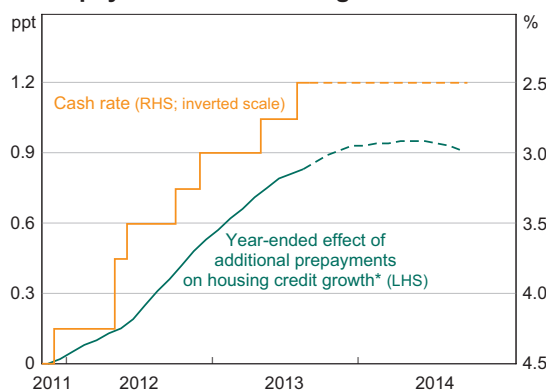
Graph 9
Total Housing Credit Growth
 Year-ended



* Reversing the effect of borrowers with variable-rate housing loans using the entire amount of interest savings from lower lending rates to partially prepay their loans
 Sources: ABS; APRA; RBA

changes in lending rates, and all interest savings are used to partially prepay mortgages, the effect of prepayments on year-ended housing credit growth is estimated to peak in mid 2014 at around 1 percentage point (i.e. year-ended housing credit growth is forecast to be around 1 percentage point lower than it otherwise would have been; Graph 10).

Graph 10
Prepayments and Housing Credit Growth



* Forecast from July 2013 assumes that the monthly housing credit growth rate is constant from June 2013 and there are no other changes in lending rates
 Sources: ABS; APRA; RBA

Conclusion

In an environment where lending rates are falling, higher partial prepayments on mortgages reduce the rate of housing credit growth below what it otherwise would be. This article attempts to quantify this effect over the recent monetary policy easing phase.

Behavioural aspects play an important role, as borrowers can use interest savings to either spend (for consumption) or save (via accelerated prepayment of debt or via the accumulation of assets). This behaviour, in turn, is influenced by banks' payment options and policies.

When considering the effect of this behaviour, a range of estimates of the likely upper bound of the prepayment effect on housing credit growth have been calculated. The estimates suggest that housing credit growth over the year to June 2013 has been lower by as much as 0.8 percentage points as a consequence of the increase in prepayments. If there are no further changes in lending rates, the peak effect of prepayments on year-ended housing credit growth of around 1 percentage point will be likely to occur in mid 2014.

The difference between the estimates of prepayments based on data reported by the banks and the loan portfolio simulation, which assumes that all borrowers make partial prepayments, suggests that about 90 per cent of the interest savings have been used for prepayments between October 2011 and June 2013. On the other hand, liaison with lenders suggests that this ratio could be as low as 50 per cent. Using this range implies that prepayments have reduced housing credit growth by between ½ and ¾ percentage points over the year to June 2013. ↕

Appendix A

Table A1: Determinants of Housing Credit

Change in housing credit =	+ new loan drawdowns
	+ accrued interest
	– interest payments
	– net principal repayments
	+ shortfalls in payments
<i>where</i>	
net principal repayments =	+ scheduled principal repayments
	+ partial principal prepayments
	+ full principal prepayments
	– redraws
	– increases in borrowing through refinancing and lines of credit

Source: RBA

The Use of Trade Credit by Businesses

Amy Fitzpatrick and Bobby Lien*

Trade credit is an important source of funding for some businesses, particularly those in the unlisted business sector. Nonetheless, little is known about the use of trade credit owing to the paucity of data. This article explores the use of trade credit, as well as the terms and conditions of trade credit contracts. It also examines the relationship between trade and bank credit. Understanding the nature of this relationship provides useful insights into how changes in financial conditions will affect the overall funding of businesses.

Introduction

Trade credit is an agreement in which a supplier allows a business to delay payment for goods and services already delivered. Allowing payment to occur after the receipt of the goods and services helps the business to better manage their short-term cash flows. Trade credit is an alternative source of funding to credit provided by financial institutions, hereafter referred to as bank credit.¹

Trade credit is used as a form of business funding for a number of reasons. First, suppliers may have an advantage over banks in providing credit because they tend to have more information about their customers and their credit history. Second, because suppliers cannot provide certainty about the timing for delivery of their goods, they may extend trade credit to provide buyers with more certainty about the timing of their payments. Third, trade credit can be used as an instrument of price discrimination. Given that trade credit is usually extended to buyers on the same basis regardless of the buyer's underlying credit quality, financially weaker firms typically pay a lower effective price than financially

stronger borrowers. Finally, trade credit can be used by businesses to verify the quality of their purchases before having to pay for them.²

Given the funding that trade credit provides, its use has implications for understanding both the transmission of monetary policy to the business sector and the financial health of businesses over the credit cycle. For example, an increase in interest rates should make bank credit more expensive and result in businesses scaling back their borrowing. However, if businesses have ready access to funds outside of the financial system that do not incur the payment of interest, such as trade credit, the reduction in total funding may be less than it would be otherwise. However, an increase in the interest rate should also increase the opportunity cost of supplying trade credit to customers. As such, suppliers may choose to reduce the amount of trade credit offered or impose less favourable conditions on their customers.

The use of trade credit by businesses might also be an important mechanism for mitigating the effects of an adverse change in the availability of bank credit. A reduction in lending from the financial sector may cause financing problems for some businesses. If these businesses are able to use trade credit as an alternative to bank credit, this may temporarily assist with any cash flow problems and help to sustain the

* The authors completed this work in Financial Stability and Domestic Markets Departments. They would like to thank Kylie Smith and Adam Cagliarini for their valuable comments.

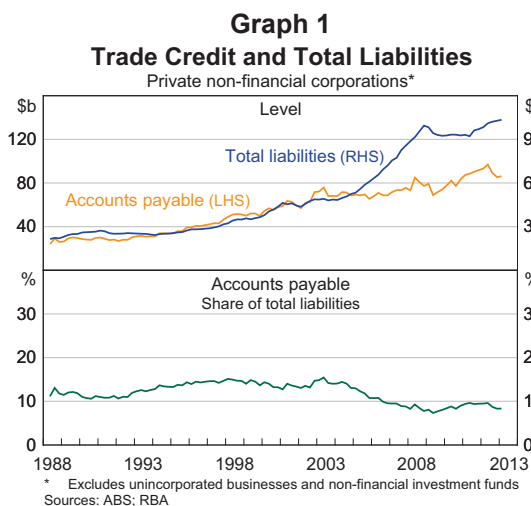
1 Bank credit has an explicit interest charge. For businesses, the majority of bank credit is provided by the banks. Credit unions and building societies do very little business lending. Registered financial corporations account for a small share of bank credit.

2 For further detail on the theories that explain the use and supply of trade credit, see Petersen and Rajan (1997).

financial health of the business sector. At the same time, trade credit increases the interconnectedness of businesses and potentially increases the risk that payment difficulties faced by one firm may spread more broadly throughout the business sector.

The Use and Supply of Trade Credit

In Australia, trade credit owed by Australian businesses (both listed and unlisted corporations) is estimated to have been over \$80 billion in March 2013, which accounted for around 8 per cent of their total liabilities (Graph 1; trade credit is proxied by accounts payable). According to the Dun & Bradstreet financial database, data for unlisted (typically smaller) businesses suggest that trade credit is a particularly important source of debt funding for this segment of the business sector and accounted for around 40 per cent of their total liabilities.³

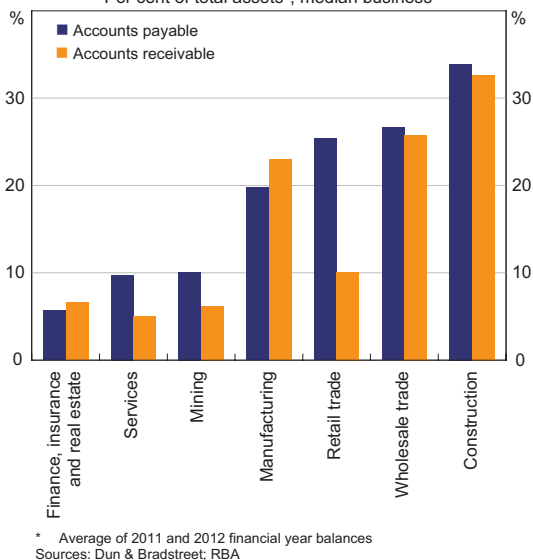


3 The Dun & Bradstreet financial database contains a sample of over 25 000 unlisted businesses of various sizes across a range of industries. Note that survivorship bias and the sample being mostly indebted companies may affect the results of the analysis. Due to data availability, trade credit is proxied by accounts payable; Love, Preve and Sarria-Allende (2007) suggest that accounts payable is a reliable indicator of trade credit.

Trade credit by industry

While trade credit is an important source of external financing for many unlisted businesses, its use differs markedly across industries (Graph 2). Industries that are involved in the production or distribution of goods tend to use trade credit more intensively. These industries include construction, retail trade and wholesale trade, where trade credit received generally exceeds 25 per cent of total assets.⁴ Businesses in these industries typically have to manage their inventories closely and deal with suppliers on a regular basis. By contrast, those industries that have reduced inventory requirements or are less likely to interact with suppliers of goods on a regular basis, such as service industries, are less likely to have their suppliers provide this source of finance.

Graph 2
Trade Credit – Unlisted Businesses
Per cent of total assets*; median business



Unlisted businesses that tend to extend more trade credit to their customers (as proxied by a greater share of accounts receivable) predominately operate in upstream goods industries, such as the wholesale

4 The measure of trade credit is standardised by total assets to facilitate comparison across different sized businesses.

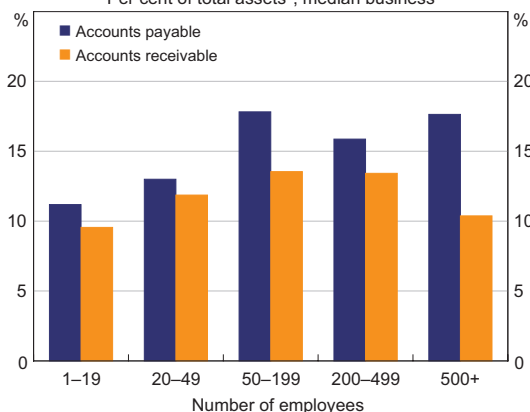
trade, manufacturing and construction industries. As a consequence, these industries are at greater risk of loss from the default of trade debtors. A late payment or default from a debtor potentially inhibits the ability of the creditor to service their own debts. In other words, a default by one business may quickly propagate to other businesses in that industry, or related industries. By contrast, industries such as finance and services are less likely to extend trade credit and therefore have lower exposure to the payment risk of their trading partners.

Trade credit by business size

The use of trade credit (as a proportion of total assets) within the unlisted sector increases with business size until the firm reaches a size of 50 to 199 employees (Graph 3). For unlisted businesses larger than this, there is typically little increase in the use of trade credit relative to assets. This may reflect the tendency for unlisted businesses to gain more access to other forms of funding once they reach a certain size. In addition, larger businesses are likely to have more long-term fixed assets such as property, plant and equipment, which are generally funded by long-term liabilities or equity rather than trade credit. These fixed assets may also be pledged as collateral for bank credit.

Graph 3
Trade Credit – Unlisted Businesses

Per cent of total assets*; median business



* Average of 2011 and 2012 financial year balances
Sources: Dun & Bradstreet; RBA

As noted, smaller unlisted businesses (those with 1 to 19 employees) typically use less trade credit than larger unlisted businesses. This possibly reflects the weaker bargaining power of these smaller businesses in comparison with their larger suppliers. Small businesses may also be perceived as being more risky than their larger counterparts. Furthermore, many small businesses, especially younger or unincorporated firms, may lack a sufficient financial history that is often required by trade creditors or credit agencies to assess their creditworthiness.

Similarly, according to these data, small unlisted businesses tend to extend the least amount of trade credit. This could be because small businesses have difficulty in accessing finance (such as bank credit) should their trade creditors default or because they have volatile and non-diversified cash flows, which can inhibit their ability to extend trade credit.

Terms and conditions of trade credit

The terms and conditions under which trade credit is extended play a key role in understanding its attractiveness relative to bank credit, and therefore the extent of its use and supply. The terms and conditions are usually specified by a trade credit contract. While the price of trade credit is typically not correlated with movements in interest rates, an implicit interest rate may be imputed from the terms of the contract. The imputed interest rate depends on whether the business offers either a 'one-part' or 'two-part' contract (Cuñat 2007).

A one-part contract is similar to an interest-free loan; the supplier allows its client to pay within a specified period and provides no incentive or discount for early payment.⁵ By contrast, a two-part contract provides the client with a discount for early payment. As noted by Cuñat (2007) for US businesses, a common two-part contract is one that offers the client a discount of 2 per cent if they pay within 10 days of delivery, otherwise they are expected to pay the full

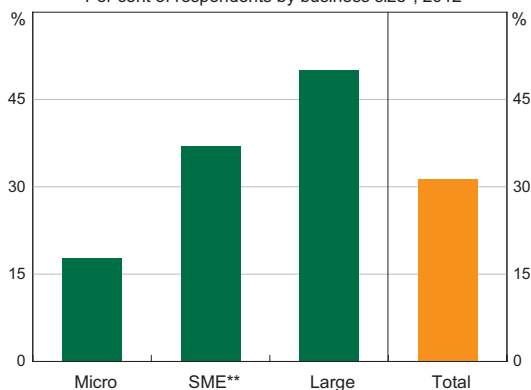
⁵ However, the client may implicitly be charged more for the goods and services they purchase because the supplier is foregoing interest that can be earned if the receipt of funds were not deferred.

THE USE OF TRADE CREDIT BY BUSINESSES

amount due by the 30th day (commonly referred to as '2–10 net 30'). Conceptually, payment made after the discount period ends is more expensive for the client – the customer effectively has to pay 2 per cent for 20 days. This is significantly higher than advertised interest rates on business loans and credit cards.

The Atradius Payment Practices Barometer Survey (Atradius 2012) estimates that around 30 per cent of Australian businesses offer two-part contracts (Graph 4). However, there are differences across business size; for example, larger businesses are more likely to offer two-part contracts than smaller businesses.

Graph 4
Two-part Trade Credit Offered
Per cent of respondents by business size*; 2012

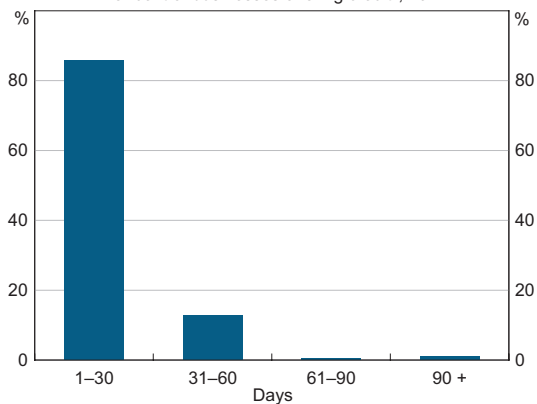


* The Atradius survey includes 197 Australian businesses
** Small and medium enterprises
Sources: Atradius (2012); RBA

The most common payment term offered by businesses is for payment within 30 days. This term is offered by over 80 per cent of businesses surveyed by Atradius (Graph 5). However, there is some evidence that the payment term offered is correlated with the size of the business providing trade credit; larger businesses tend to offer longer payment terms, which are typically around 40 days, while smaller businesses offer shorter payment terms of around 20 days. As previously discussed, this may reflect the fact that smaller businesses have more volatile cash flows and are therefore more financially constrained

Graph 5
Average Payment Terms

Per cent of businesses offering credit*; 2012



* The Atradius survey includes 197 Australian businesses
Sources: Atradius (2012); RBA

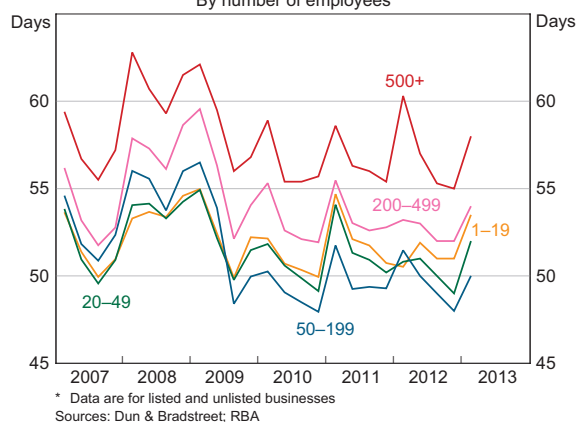
than larger businesses. The longer payment terms offered by larger businesses may also reflect their ability to apply active credit management policies, such as checking a buyer's creditworthiness prior to extending credit or using a collection agency to manage their debtors.

Although payment terms are specified in the trade credit contract, actual payment behaviour suggests that these terms are quite flexible in practice. The average collection period provides an indication of the number of days businesses take to collect payment from their trade debtors.⁶ Data suggest that businesses on average take slightly more than 50 days to receive payment (Graph 6). This is well beyond the payment term of 30 days that is typically offered. In general, larger businesses, particularly those with more than 500 employees, take substantially longer to collect payments than smaller businesses, which may reflect longer credit terms offered by these businesses to their trading partners and customers.

Late payment by businesses is consistent with Cuñat's (2007) suggestion that debtors tend not

⁶ A short collection period might indicate highly efficient credit collection. Alternatively, it may indicate that the company's credit conditions are restrictive.

Graph 6
Average Collection Period*
 By number of employees



to enforce late payment penalties against their trading partners. In the case of one-part contracts, and in the absence of late payment penalties, late payments suggest that businesses attempt to manage their cash flows efficiently by stretching their payments beyond the due date. In the case of two-part contracts, the cost of trade credit increases immediately once the discount period has ended, but businesses may be more willing to face the risk of an interest rate penalty rather than default on other debt obligations, such as bank credit, for which the consequences can be more severe.

The Relationship between Trade Credit and Bank Credit for Business Funding

The above descriptive analysis provides useful insights into the extent to which trade credit is used by different business sizes and industries, and the form that trade credit contracts typically take. To understand the potential financial stability and monetary policy implications of the use of trade credit requires an understanding of the relationship between trade and bank credit.

On the one hand, businesses may use trade and bank credit as substitutes. That is, an increase in the use of trade credit will be associated with a fall in

bank credit, as a share of total debt. This may be the case because businesses that are credit constrained may substitute from bank credit to more costly trade credit (Petersen and Rajan 1997).⁷ This could include businesses without an established relationship with a lender (such as small or new businesses). Alternatively, businesses that have ready access to bank credit may choose to substitute between trade and bank credit depending on the relative costs after taking into account any transaction costs. For example, businesses looking for longer-term funding may substitute towards bank credit, while some businesses will prefer the short-term nature of trade credit and the potential ease of obtaining credit directly from the supplier, particularly if the application process for the extension of bank credit is demanding (Pawlowska and Marzec 2013).

On the other hand, businesses may use trade and bank credit as complementary forms of funding. That is, movements in trade credit will tend to coincide with similar movements in bank credit. The complementarity arises when businesses use their ability to access trade credit to assist them in gaining access to bank credit (Biais and Gollier 1997). Specifically, trade credit suppliers are likely to have an informational advantage over banks in assessing the financial health of trade credit users and better knowledge of the markets in which their customers operate. Thus, a business' ability to access trade credit may send a positive signal to banks about the business' credit quality (Fisman and Love 2003). Burkart and Ellingsen (2004) find that the amount banks are willing to lend a business increases with the business' ability to access trade credit.

Estimating the relationship between trade credit and bank credit

To explore the relationship between trade and bank credit in Australia's unlisted business sector, a

⁷ Trade credit is more expensive than bank credit because it includes costs associated with having a late payment option, greater risk of default and the higher cost of acquiring funds (Cuñat 2007).

model of firm-level use of trade credit is estimated.⁸ The model is used to test whether trade and bank credit are substitutes, under the assumption that bank credit use affects trade credit, but trade credit use does not affect bank credit.⁹ The analysis also accounts for a range of factors related to each firm – such as age, size, liquidity and profitability. Variables for each financial year are included to control for time effects, and fixed effects are included to control for unobservable firm-level characteristics that do not vary with time. Further details on the regression are provided in Appendix A.

The results suggest that firms in the Australian unlisted business sector are likely to be treating trade and bank credit as partial substitutes as evidenced by the negative coefficient estimate on bank credit (Table 1). Specifically, 10 percentage points more

of bank credit (as a proportion of total assets) is associated with 3.7 percentage points less trade credit (as a proportion of total assets). Conversely, if there is a tightening in bank credit supply, then trade credit may act as a partial buffer for business funding. This result is consistent with several studies for other countries. Lundholm, Serafeim and Yu (2012), for example, find evidence of substitution between trade and bank credit across 69 countries.

In terms of the other specific firm-level factors that affect the use of trade credit, businesses with a higher share of short-term assets (asset structure) tend to use more trade credit; this is consistent with the notion that trade credit is itself a form of short-term financing. Although accounts receivable turnover and liquidity are both statistically significant in explaining changes in trade credit, their effect is negligible.

To estimate whether the relationship between trade and bank credit differs across sectors, interaction terms between industry variables and bank credit are used. The results suggest that trade and bank credit are likely to be substitutes across all sectors (Table 2). The degree of substitutability in the construction industry (one of the more intensive users of trade credit) was significantly (and statistically) different from the mining, and transport and utilities sectors (which are some of the less intensive users of trade

Table 1: Regression Results – Key Variables
Dependent variable: Trade credit/total assets

Variable	Estimated effect on trade credit/total assets ^(a) (ppts)
Bank credit/total assets	-0.365***
Accounts receivable turnover ^(b)	-0.000001**
Liquidity ^(c)	-0.00001***
Asset structure	0.121***
Observations	34 421

(a) ***, ** and * denote significance at 1, 5 and 10 per cent, respectively; sample period is 2004/05 to 2011/12

(b) Sales over accounts receivable

(c) Current assets minus inventories over current liabilities

Source: RBA

8 In this analysis, bank credit is estimated as total liabilities excluding accounts payable. This measure may overstate the true value of bank credit due to the inclusion of other liabilities, such as taxes payable. While these items are likely to be small for unlisted businesses, they are unable to be accounted for due to data limitations.

9 The validity of this assumption was tested using an instrumental variables approach, which controls for potential reverse causality between trade and bank credit. Preliminary estimates from this approach also suggest that Australian unlisted businesses tend to treat trade and bank credit as partial substitutes.

Table 2: Estimated Effect of Bank Credit on Trade Credit
Proportion of total assets

Industry	Estimated effect ^(a) (ppts)
Mining	-0.171*
Transport and utilities	-0.218***
Services	-0.370***
Wholesale trade	-0.367***
Manufacturing	-0.413***
Retail trade	-0.464***
Construction	-0.703***

(a) ***, ** and * denote significance at 1, 5 and 10 per cent, respectively; sample period is 2004/05 to 2011/12

Source: RBA

credit). Carbó-Valverde, Rodríguez-Fernández and Udell (2012) suggest that the level of substitution will be greater for firms that are more credit constrained. The RBA's liaison with businesses suggests that this was particularly the case for construction businesses during the period used for the estimation.

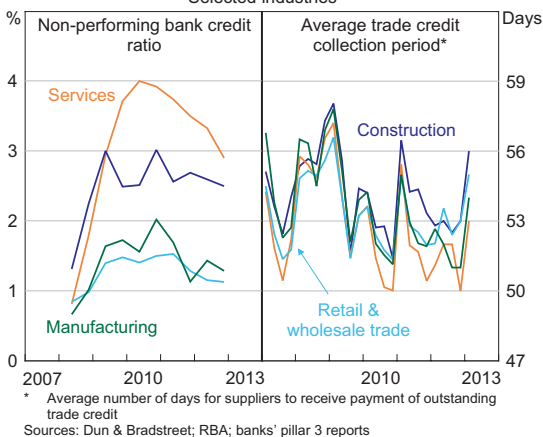
As noted above, the evidence that trade and bank credit are substitutes means that trade credit has the potential to mitigate difficulties that might otherwise arise if businesses cannot access alternative sources of funding. However, should there be a prolonged financial or economic shock, the use of trade credit may also provide a mechanism for the propagation of shocks within the business sector; trade debtors defaulting on their payments may lead to trade creditors having problems repaying their own debt. The data suggest that there was not a substantial increase in the use of trade credit in Australia following the global financial crisis. However, it does appear that firms had more difficulty repaying their bank credit, and to a lesser extent their trade credit, as reflected by the higher non-performance rate on bank credit and the increased number of days it took for businesses to receive payment of trade credit in 2008 and 2009 (Graph 7).

Conclusion

Trade credit is an important source of funding for businesses in Australia, particularly in the unlisted sector. Although most unlisted businesses use trade credit to some degree, the extent of its use is influenced by both the nature and size of businesses. Industries that carry extensive inventories and are providers of intermediate goods tend to use and supply more trade credit. Likewise, large unlisted businesses typically have a higher proportion of trade credit to total assets than smaller unlisted businesses, possibly because the latter tend to have weaker bargaining power and are perceived to be riskier than larger businesses. Businesses generally appear to be consistently repaying trade credit well beyond the due date, suggesting that trade creditors tend not to enforce late payment penalties against their trading partners.

While it is possible that trade credit can be either a substitute or complement to bank credit, the estimates presented in this article suggest that trade and bank credit are partial substitutes for the typical Australian unlisted business. This means that changes to the cost or availability of bank credit will have somewhat less effect on a business' overall debt funding than would be the case if trade and bank credit were complements. ❖

Graph 7
Business Payment Behaviour
Selected industries



Appendix A

The relationship between trade and bank credit can be estimated using a model where trade credit is a function of bank credit, controlling for a range of factors related to each firm.¹⁰ The model estimated is specified as:

$$TC_{it} = \beta_1 BC_{it} + \sum_{j=1}^J \gamma_j X_{j,it} + \sum_{k=1}^K \delta_k D_{k,it} + \alpha_i + \varepsilon_{it} \tag{A1}$$

¹⁰ This model is based on Gama and Mateus (2010). The data used in the model include 9 440 non-financial unlisted businesses giving a total of around 34 000 observations. Businesses with under \$4 million in total assets are excluded due to data quality concerns.

where TC is trade credit expressed as the ratio of accounts payable to total assets for firm i in financial year t , BC is the ratio of bank credit to total assets, X are firm-specific characteristics, D are financial year dummy variables, α are the fixed effects to control for the existence of factors that are constant over time but vary across firms and ε is an error term.

Insignificant variables were removed one at a time to arrive at a more parsimonious model specification. These variables were sales growth, age, inventory turnover and profitability. An F -test also suggested the removed variables were jointly (and statistically) insignificant.

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- The model is used to test whether businesses treat trade and bank credit as substitutes, using a one-sided test of significance on the bank credit variable.
- To examine whether the relationship between trade and bank credit is different across industries, the model is modified so that bank credit is interacted with industry variables as follows:
- $$TC_{it} = \beta_1 BC_{it} + \sum_{j=1}^J \gamma_j X_{ijt} + \sum_{k=1}^K \delta_k D_{kt} + \sum_{l=1}^L \rho_l I_{lit} BC_{it} + \alpha_i + \varepsilon_{it} \quad (A2)$$
- where I are firm-level industry dummy variables.
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Infrastructure Developments in the Market for Commonwealth Government Securities

Chris Becker, Jonathan Lees and Andrew Zurawski*

The market for Commonwealth Government securities (CGS) is a key financial market in Australia because, among other things, it provides a risk-free benchmark for the pricing of a wide range of fixed income securities. This article discusses aspects of the infrastructure that underpins the market, including: the issuance and ownership of securities; the registry and settlement of these securities; and efforts to promote improved access to the market for retail investors. Several infrastructure changes that have been implemented recently, or are soon to apply, are also discussed. These changes will result in some amendments to statistics published by the Reserve Bank on the CGS market.

Introduction

The Australian Office of Financial Management (AOFM) is responsible for the issue and management of CGS on behalf of the Australian Government. The Reserve Bank also provides some of the infrastructure underlying the market for CGS, although changes to the financial system in Australia over several decades have seen the private sector assume many of these roles.¹ Both the AOFM and the Reserve Bank have an interest in promoting a liquid and efficient bond market. The Reserve Bank has a particular interest in an efficient market arising from its monetary policy operations because government bonds are important securities for outright transactions and those executed under repurchase agreements.

Issuance of Commonwealth Government Securities

The Australian Government issues CGS in accordance with the *Commonwealth Inscribed Stock Act 1911*. Under the Act, the Treasurer borrows money on behalf of the Commonwealth by issuing Treasury

bonds, Treasury indexed bonds and Treasury notes. Treasury bonds and Treasury indexed bonds account for over 95 per cent of the outstanding stock of securities (Table 1). Currently, the AOFM conducts two tenders for the issue of Treasury bonds most weeks, with the amount of bonds offered usually in the range of \$0.6 billion to \$1 billion. There are one or two tenders for the issue of Treasury indexed bonds most months, for smaller amounts. The remainder of outstanding securities is made up of short-term Treasury notes that are mostly used to finance expenditures when there are mismatches between the timing of government receipts and outlays. The average maturity of the stock of government securities outstanding has been relatively steady in recent decades at around six years; the issuance profile ensures that an adequate supply of bonds with maturities out to 15 years or longer is maintained. In common with other highly rated sovereigns, the Australian Government only issues debt into the domestic market in local currency.

The move away from the 'tap' system of issuance toward auction-style issuance for short-term securities in 1979 and for longer-term securities in 1982 represented key financial reforms that imposed

* The authors are from Domestic Markets Department.

¹ For a history of institutional arrangements and deregulation of the financial system, see Macfarlane (1991) and RBA (1993).

Table 1: Commonwealth Government Securities
Face value, as at end June 2013

	Outstanding	
	\$ billion	Per cent of GDP
Total^(a)	257	17.2
– Treasury bonds	234	15.6
– Treasury indexed bonds	18	1.2
– Treasury notes	6	0.4

(a) Includes \$19 million in legacy liabilities such as tax-free stock, securities payable in foreign currencies and overdues
Sources: ABS; AOFM

a more disciplined approach on debt management and helped to separate it from the implementation of monetary policy.² Under current arrangements, CGS are usually issued via competitive tender, where investors are allocated stock according to their bids. Prior to 2006, the Reserve Bank conducted tenders on behalf of the government (and retains the capability to do so as a contingency). From October 2006, the AOFM assumed direct responsibility for issuance. Tenders are conducted using the AOFM Tender System, which is now accessed via Yieldbroker DEBTS.³ Registered bidders make up the primary market for CGS and there is no requirement for these parties to provide liquidity to the secondary market. There are currently around 20 market makers prepared to quote two-way prices for Treasury bonds, with most of these also quoting prices in Treasury indexed bonds, although only a few are active in the market for Treasury notes.

2 Under the tap system, the government set the yields (prices) of the securities to be sold and the market determined how many securities they would buy at those yields, with the Reserve Bank providing residual financing whenever the government did not sell enough securities to fund itself. This effectively subordinated the implementation of monetary policy to the process of debt management as the purchase and sale of securities by the central bank was not exclusively aimed at meeting the monetary policy objective. Under current arrangements, the AOFM conducts tenders in which the amount to be raised is predetermined. Interest rates, and therefore the government’s borrowing costs, reflect market demand for the securities offered. The Reserve Bank typically does not take up any stock at these tenders.

3 Yieldbroker DEBTS is an electronic trading platform used for debt securities and certain debt derivatives.

When issuing securities, the AOFM may sometimes also conduct syndicated offerings. Under this arrangement, a group of financial institutions is appointed to ‘manage’ the issue, including being responsible for placing securities with investors. Syndication can be helpful when issuing new securities, including those with longer tenor than existing securities. To help promote liquidity in the new bond, the AOFM will typically conduct a large initial issue, which syndication can help to place in the market.

The predictable and transparent approach to debt management by the AOFM and the requisite infrastructure has helped to support the development of a complementary market for derivatives. This market is important because it supports efficiency in the physical market for securities. In particular, the market for interest rate derivatives allows investors to hedge their interest rate risk. The Treasury bond futures market consists of 3- and 10-year futures contracts, which are traded on the Australian Securities Exchange (ASX). These contracts are generally more liquid than the physical CGS that they reference.⁴

The liquidity of the CGS market has been supported by Australian Government policy, even during periods of fiscal consolidation when issuance was not necessary for financing public expenditure. Following successive budget surpluses, and an extensive debt management review, in the 2003/04 Budget the government announced that it would maintain sufficient CGS on issue to support the liquidity of the Treasury bond futures market in order to provide for efficient interest rate risk management. In the 2011/12 Budget, the government reiterated its objective to maintain a liquid and efficient bond market that underpins the 3- and 10-year bond futures market. Prior to this, a panel of financial market participants and regulators had concluded that CGS outstanding should be supported at around 12 to 14 per cent of GDP over time.⁵

4 For more on Australian Treasury bond futures contracts, see Lien and Zurawski (2012).

5 See Australian Government (2011).

Registry and Settlement Services

The Australian Government issues debt in book-entry form, for which ownership records are maintained. Almost all CGS outstanding are held this way, with the Reserve Bank currently acting as the Registrar.⁶ The core functions of the Registry are the registration of new issues of CGS, transfer of title, maintenance of ownership records and distribution of payments associated with ownership.

Prior to 2002, the Reserve Bank also provided electronic settlement of CGS transactions through the Reserve Bank Information and Transfer System (RITS). This was in parallel to settlement services for other Australian dollar-denominated debt securities offered by Austraclear, a company now owned and operated by the ASX.

Since February 2002, CGS have been lodged within the Austraclear system, which acts as the central securities depository (CSD). Almost all CGS on issue are held in Austraclear, which retains legal title of the CGS as nominee for direct participants in the CSD (that is, those entities with accounts in Austraclear).⁷ Austraclear creates beneficial entitlements that can then be traded between market participants. As such, Austraclear appears on the Registry as the owner of all but a small amount of each CGS on issue.

There are well-defined market conventions that promote efficiency in the CGS market. Settlement of most CGS transactions occurs three business days after the transaction details are agreed. An exception is provided by Treasury notes, and bonds in their last coupon period, which are typically settled on a same-day basis. To ensure the integrity of the settlement process, Austraclear uses a 'delivery-versus-payment' model under which cash payment is made simultaneously with the transfer of beneficial

ownership. Through a link to RITS (the Reserve Bank's system for real-time gross settlement), these cash payments occur in central bank funds; that is, across the Exchange Settlement Accounts that Austraclear participants (or their sponsoring banks) hold at the Reserve Bank.

Many investors in CGS are not direct participants within Austraclear, preferring to transact through custodians.⁸ At times, there can be several layers of custodial, or nominee, relationships between the legal title to the security (held by Austraclear) and the ultimate beneficiary. Many non-resident investors, for example, will hold the beneficial interest in their securities through an account at one of the international CSDs (ICSDs), such as Clearstream or Euroclear, or with a custodian that is a participant in an ICSD.⁹ These ICSDs are not themselves direct participants in Austraclear, but maintain security accounts with nominee companies (JPMorgan Chase Bank and HSBC Custody Nominees). Currently, close to half of all CGS on issue is held within the ICSDs via these links or relationships. While these arrangements help to facilitate broader investor participation in the market, they make it difficult to identify the ultimate beneficiary of CGS investments (see also below).

In the past, notification of an intention to transfer CGS from an account within the ICSDs to elsewhere within Austraclear needed to be given well in advance of the cut-off times for comparable transfers between direct Austraclear participants. At times, this curtailed the ability of investors to respond in a timely fashion to the demand for specific CGS, such as would arise within the market for repurchase agreements (see 'Box A: The Securities Lending Facility'). Over time, the cut-off times for the ICSDs have moved to be close to synchronous with those applying to direct Austraclear participants, and

6 In the past, the government also issued bearer securities, for which no ownership records were maintained. The small value of these securities that remains outstanding is in the form of Australian Savings Bonds, which were mainly issued to retail investors in the 1980s.

7 A nominee is a company that is given legal title to the stock, but is not the beneficial owner who ultimately has a claim on its economic value. The nominee typically acts as a trustee and holds investments on behalf of an investor or custodian.

8 Custodians provide investors with a range of services, including safeguarding of assets, settlement, and banking services. For institutional investors, employing custodians is often a more efficient means of conducting transactions that would otherwise have to be undertaken by the investor's own back office.

9 Of the stock of CGS currently on issue, around three-quarters is estimated to be held by non-residents.

therefore better integrating non-resident investors with the domestic market.

Following a review of arrangements, the AOFM announced in 2012 that it would commence purchasing its registry services for CGS from a commercial provider. The Reserve Bank did not submit a bid but assisted in the tender process for this business, which was ultimately awarded to Computershare Fund Services Pty Limited.¹⁰ As a result, the Reserve Bank’s role as Registrar for CGS is expected to largely cease around the end of 2013. The Reserve Bank will, however, maintain a registry for CGS issued for the purposes of securities lending (see ‘Box A: The Securities Lending Facility’).

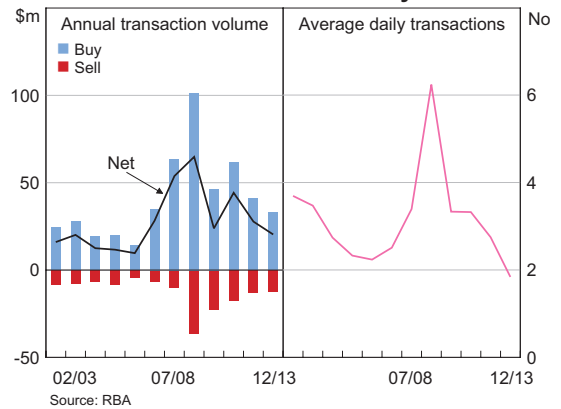
Retail Access to the CGS Market

Participation in the market for government bonds at the retail level has been limited in recent years. Retail investors are unable to transact directly in the wholesale market since it is not practical for them to set up an Austraclear account or access custodial services in a cost-effective way.¹¹ Those retail investors wanting to transact in CGS had to do so either through the Small Investor Bond Facility at the Reserve Bank or indirectly through investment vehicles such as mutual funds.¹²

Access for retail investors to the market for government bonds has been further constrained

by the large minimum parcel size required by many brokers. While the Reserve Bank’s Small Investor Bond Facility provided retail access to CGS at a lower transaction cost and in smaller parcel sizes, use of that facility remained relatively limited. In 2012/13, retail transactions conducted through the facility amounted to considerably less than half of 1 per cent of the outstanding stock. Furthermore, transactions represented an even smaller share of overall market turnover and the facility averaged only two transactions per day in 2012/13 (Graph 1).

Graph 1
Small Investor Bond Facility



As part of ongoing financial sector reform, the government announced in 2010 that it would make changes to facilitate greater access for retail investors to the existing market for CGS. These reforms sought to expand retail access to government bonds and improve the efficiency of the corporate bond market as a means of financing domestic investment and increasing competition for intermediated sources of financing.¹³

10 The main reason why the Reserve Bank was not well placed to continue providing these registry-related services flowed from the government’s objective of making the CGS market more accessible to retail investors, which would have required the Registry to be electronically integrated with a clearing and settlement system. The infrastructure costs for the Reserve Bank to upgrade the existing Registry were prohibitive, both in terms of time and outlays. Given that other service providers already had such infrastructure in place, and in view of its narrow customer base, it made little economic sense for the Reserve Bank to retain this responsibility.

11 Participants in Austraclear must be assessed by the ASX for satisfactory operational capacity, financial standing and business continuity arrangements. Along with transaction and membership fees, this makes it prohibitive to maintain Austraclear accounts for transacting in relatively small volumes.

12 In the 1970s and 1980s, the Commonwealth Government also issued Australian Savings Bonds, specifically targeted at the retail market. In Australia, another way for individuals to gain exposure to fixed income products, such as CGS, is indirectly through the asset allocation of their pool of superannuation retirement savings.

13 The government’s policy of facilitating greater retail access to the trading of CGS aims to provide a more accessible pricing benchmark for fixed income securities and thereby encourage greater interest in corporate bonds. This in turn is viewed as a desirable way to place competitive pressure on the interest rates paid on commercial borrowing from banks and to more effectively channel superannuation savings toward productive investments. Retail investors are seen to benefit through being able to diversify their savings more effectively. See Australian Treasury Department (2010).

Box A

The Securities Lending Facility

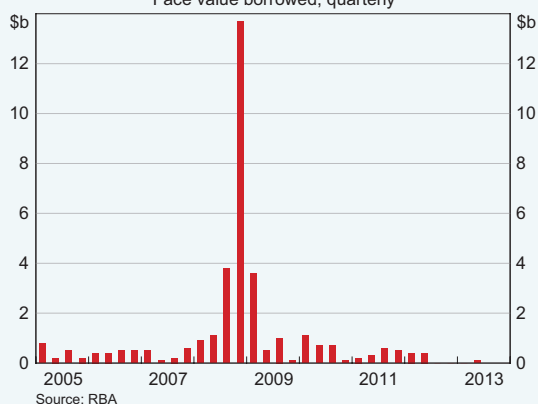
An active market for borrowing and lending securities assists market participants to meet their settlement obligations in Commonwealth Government securities (CGS). Because short positions commonly arise as a result of normal trading activity, dealers who quote two-way prices in particular securities are sometimes left with insufficient CGS to settle contracted transactions. Similarly, market participants pursuing a trading strategy might wish to cover a short position by using borrowed securities to settle an outright sale. In general, such activity can enhance the efficiency of the bond market by improving the process of price discovery.

Within the CGS market, participants generally use repurchase agreements to borrow specific securities, with the difference between the purchase and repurchase prices reflecting the interest (or repo) rate on the transaction. Where the repo rate on a specific security falls below other short-term interest rates, it indicates strong demand to borrow the security and raises the cost of maintaining a short position when a higher return could be earned on alternative investments. To ensure that market participants are always able to source CGS for their settlements, the AOFM offers a lending facility for CGS, which is operated by the Reserve Bank. Under this facility, financial institutions can borrow specific lines of CGS via a repo with the Reserve Bank. While there is no interest charge for intraday borrowings, a significant penalty (usually 300 basis points) applies to all overnight transactions executed under the facility.¹

In the period leading up to 2008, the limited supply of CGS meant that few dealers were able to maintain an inventory of bonds. To accommodate client demand

for securities in such circumstances required these dealers to assume short positions. As these positions needed to be covered through the repo market, repo rates gradually declined. During the period of financial market turmoil in 2008, dealers found it increasingly difficult to borrow CGS through the repo market, regularly needing to access the AOFM lending facility. With the size of the CGS market increasing in recent years, dealers are almost always able to borrow stock in the market, contributing to a substantial decline in use of the facility (Graph A1).²

Graph A1
AOFM Securities Lending Facility
 Face value borrowed, quarterly



The amount of CGS that can be lent via the lending facility is limited to \$5 billion. Securities available to be lent have been issued expressly for this purpose and, as such, are not counted as part of the stock of CGS outstanding. When not lent under a repurchase agreement, these securities are held outside Austraclear in the name of the government. A separate registry (administered by the Reserve Bank) will be maintained for these securities, distinct from the new, privately administered Registry described elsewhere in this article.

¹ The (overnight) repo rate on securities borrowed through the facility is set 300 basis points below the cash rate or at 25 basis points, whichever is the greater. At the same time, the Reserve Bank contracts an offsetting repo in other CGS or government-related securities, where the repo rate is equal to the cash rate.

² See also Wakeling and Wilson (2010).

The quotation and trading of exchange-traded government bonds commenced on the ASX in May 2013. Under the indirect ownership model adopted in Australia, retail investors are able to acquire beneficial entitlement to CGS without actual transfer of legal title. The legal title remains with Austraclear and a beneficial entitlement is issued to wholesale security holders who, in turn, issue further beneficial interests to retail investors. Consequently, the economic benefits associated with the securities (coupons and principal) accrue to the retail investors who have purchased the indirect interests in the bonds. These indirect interests are called CHES Depository Interests (CDIs).¹⁴ The retail and wholesale markets are linked by a depository nominee account in which market makers (who operate in both markets) deposit their interest in CGS on which the indirect interests are then sold via an exchange to investors in the retail market. The advantage of trading the indirect interest in the security, rather than the underlying legal title, is that it avoids segmentation between the retail and wholesale markets that could arise if a separate line of bonds was issued only to retail investors with subsequent trading at different prices to an equivalent security in the wholesale market. The arrangements therefore provide for an efficient translation of pricing from the wholesale bond market into the exchange-traded retail market. Three ASX appointed market makers (Commonwealth Bank, JPMorgan and UBS) are authorised to transfer beneficial interests in CGS from their own Austraclear accounts to that of a depository nominee.¹⁵ Under this transmutation of government debt securities from the wholesale to the retail market, the securities are referred to as Australian Government bonds (AGBs) to distinguish the indirect interest at the retail level from CGS in the wholesale market.

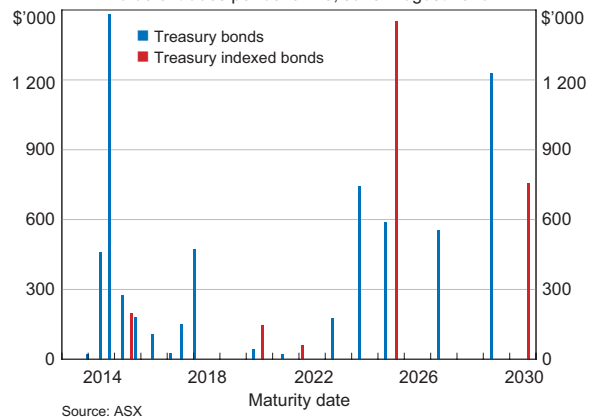
Computershare is the appointed registry service provider for AGBs and will also provide distribution instructions in relation to CDI holdings to the Reserve Bank until the company becomes the registry service provider for wholesale securities around the end of 2013. The Reserve Bank’s Small Investor Bond Facility ceased around the time that the quoting and trading of AGBs commenced on the ASX.

In the first three full months that the AGB market has been in operation, the 23 available bond lines have each been traded an average of three times per month, with the total value traded around \$2 million per month. Most of the turnover in the retail market to date appears to have been concentrated in bonds with maturity of 10 years or longer, although some of the shorter-dated bond lines have also been traded (Graph 2). Treasury notes are not available for retail trading.

Graph 2

AGB Market Activity

Value of trades per bond line, June–August 2013



Statistics Related to Commonwealth Government Securities

A wide range of data relating to CGS are publicly available. Primary market data include tender results and outstanding debt on issue and are published by the AOFM. Secondary market data are available from a variety of sources, including the Reserve Bank. By its nature, secondary market data can be difficult to compile and there are issues surrounding

14 The Clearing House Electronic Sub-register System (CHES) is the ASX retail clearing and settlement system and represents the counterpart to the wholesale market arrangements through Austraclear and RITS.

15 The depository nominee is a special purpose vehicle established by the ASX to facilitate the creation of beneficial interests in CGS.

the comparability of the different datasets that are published.

Turnover

Turnover is often used as an indicator of secondary market liquidity. For many years, the Reserve Bank has published data on CGS turnover by aggregating changes in stock ownership with movements in the securities settlement system.¹⁶ Within a settlement system, however, securities can move for a variety of reasons. These movements may be the result of settling an outright transaction (in either the primary or secondary market) or because securities have been posted as collateral against a derivative position or to settle a repurchase transaction.¹⁷ The Reserve Bank is generally not able to match security movements to their purpose. Moreover, transactions will often not give rise to any recorded movements, such as when the parties to a maturing repo agree to roll over the transaction and net the gross amounts to be settled. Similarly, the Reserve Bank's data only capture movements *between* Austraclear accounts, which means that settlements that take place *within* an Austraclear account (such as settlement across the books of an ICSD) are not recorded at all.

A more reliable method of gauging turnover is to directly survey market makers on their trading volumes. The Australian Financial Markets Association (AFMA) conducts annual surveys on turnover in both outright and repurchase transactions in CGS (Graph 3).

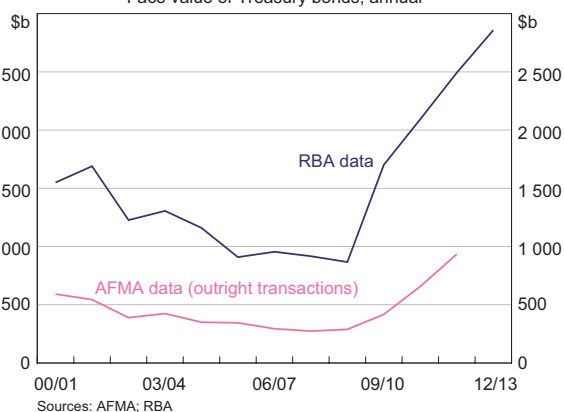
Given the inherent problems in compiling turnover data from a securities settlement system, the Reserve Bank will cease publication of turnover data from 30 September 2013.

Historical data on repurchase agreements executed through the AOFM Securities Lending Facility

¹⁶ Stock ownership is recorded on the Registry and, since 2002, the settlement system has been Austraclear.

¹⁷ Security movements may also occur when a beneficial owner is simply moving securities between their own accounts – such as when a dealer moves inventory from Euroclear or Clearstream (held within a nominee's Austraclear account) to their own Austraclear account.

Graph 3
CGS Turnover
Face value of Treasury bonds, annual



(described in 'Box A: The Securities Lending Facility') are published by the AOFM, although only those trades with a term that is longer than intraday are included.¹⁸

Ownership

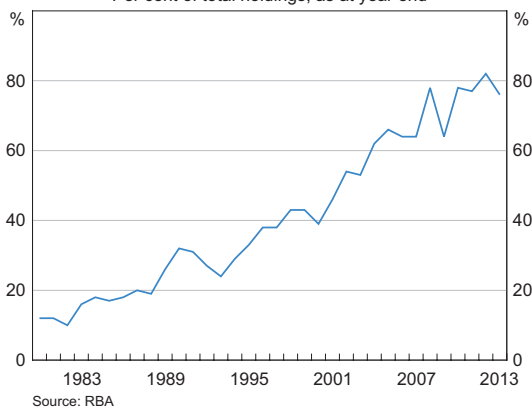
Data on beneficial ownership may provide insights into the structure of a market. Resident banks and other authorised deposit-taking institutions may hold CGS as a source of liquidity. There is also interest in what share of the market is held by non-residents. Each quarter, the Australian Bureau of Statistics publishes the sectoral breakdown of CGS holdings in the financial accounts. Separately, the AOFM publishes partial information on the domicile of non-resident holders.

On its monthly balance sheet, the Reserve Bank publishes data on its own holdings of CGS. Additionally, the Reserve Bank has long used ownership data as recorded on the Registry, or within the securities settlement system, to publish information on sectoral holdings of CGS. In deriving these data, it is only the name of the direct Austraclear participant in whose account the security is held that is visible to the Reserve Bank. Over time, there has been a trend for securities to be held with nominee companies and, as a result, the details of the underlying beneficial owners

¹⁸ The historical data are available at <<http://www.aofm.gov.au/>>.

can no longer be determined with any degree of certainty from the securities settlement system. Consequently, the Reserve Bank’s data on holdings have become less meaningful over time, with over three-quarters of total holdings now unattributed in terms of ownership under the residual category of ‘other’ (Graph 4). Given these limitations, the Reserve Bank will also cease to publish data for CGS on 30 September 2013.

Graph 4
Unattributed CGS Holdings
 Per cent of total holdings, as at year end



In summary, these changes will result in the following statistical tables no longer being published by the Reserve Bank: Commonwealth Government Securities Classified by Holder – E3; Maturity Structure of Non-official Holdings of Commonwealth Government Securities – E8; Commonwealth Government Securities Classified by Holder as at 30 June – E9; Commonwealth Government Securities on Issue – E10; and Turnover of Selected Commonwealth Government Securities – E12.

Secondary market yields

The Reserve Bank currently publishes indicative secondary market yields for Treasury bonds and Treasury indexed bonds. CGS rates published by the Reserve Bank are referenced in a variety of contexts, including Commonwealth and state legislation.

Up until recently, these data were derived from surveys of dealers conducted by the Reserve Bank at

the close of each trading day. However, following the cases of attempted manipulation of LIBOR – London Interbank Offered Rates – and other reference rates in offshore markets, financial institutions have become unwilling to participate in reference rate surveys, especially where participation requires a subjective assessment of market prices.

In recognition of this, the Reserve Bank has recently ceased its dealer surveys of CGS yields. The closing yields that the Reserve Bank publishes for Treasury bonds and Treasury indexed bonds are now sourced from Yieldbroker. Yieldbroker compiles indicative rates for debt securities using rates posted on their electronic trading platform by dealers. For the most liquid securities, such as Treasury bonds, these rates represent executable quotes. At the same time, the Reserve Bank has ceased publishing closing yields for Treasury notes as, in general, the number of dealers posting rates on these securities is low. ↘

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East Asian Corporate Bond Markets

Mark Hack and Cathie Close*

East Asian corporate bond markets have grown significantly over the past decade. The expansion of these markets has been underpinned by strong economic growth and regulatory initiatives that have helped to improve market infrastructure and encourage participation. These developments have helped corporations to diversify their funding and are likely to have played a part in supporting the economies in the region during the global financial crisis.

Introduction

Corporate bond markets have a number of important economic functions. For investors, corporate bonds offer long-term, fixed interest returns that can provide portfolio diversification benefits. For issuers, corporate bonds can enable firms to access funding for longer durations than may be available from alternative sources. This helps them to better match their liabilities with the maturities of assets being funded, lowering refinancing risk. Non-financial corporations can also issue bonds to reduce their overall reliance on intermediated financing, which may be harder to access in times of banking sector stress. As an alternative funding source to intermediated credit or equity financing, bonds can help issuers to lower the cost of capital, and local currency bonds also have the added advantage of reducing corporations' exposures to foreign exchange risks.¹

It has been widely recognised that the absence of well-developed corporate bond markets contributed to the build-up of maturity and foreign currency risks that exacerbated the 1997–1998 Asian financial crisis.² In particular, the lack of such markets meant that strong capital inflows leading up to the

crisis tended to be in the form of short-term foreign currency loans that were intermediated through the banking sector. The rapid reversal of these flows, and associated exchange rate depreciations, precipitated extreme pressure on the corporate and banking sectors and a sharp contraction in economic activity.

Accordingly, a key part of Asian regulators' efforts to strengthen financial stability and encourage sustainable growth since the Asian financial crisis has been to develop local currency corporate bond markets across the region. These have included efforts – at both an individual economy and regional level – to improve market infrastructure, lower issuance costs and promote investor participation.

As a result of these efforts, east Asian corporate bond markets have grown significantly since the turn of the century, in terms of both values and relative to gross domestic product (GDP). There have also been significant improvements to market infrastructure, such as clearing and settlement facilities and legal frameworks. In addition, governments have worked to improve liquidity in government bond markets, in part to improve pricing benchmarks for corporate issuance.

At the same time, some aspects of Asian corporate bond markets are still relatively immature. In particular, most local currency corporate bonds in east Asia are held by a small number of domestic institutional investors that have similar buy-and-hold

* The authors completed this work in International Department.

1 For more discussion on the benefits of bond market development, see RBA (2003).

2 For a more detailed account of the 1997–1998 Asian financial crisis, see Stevens (2007).

investment strategies, thereby constraining liquidity. A lack of market-making activity also weighs on liquidity, which is related in part to a lack of depth in the markets for hedging instruments and a tendency for private placements in some markets.

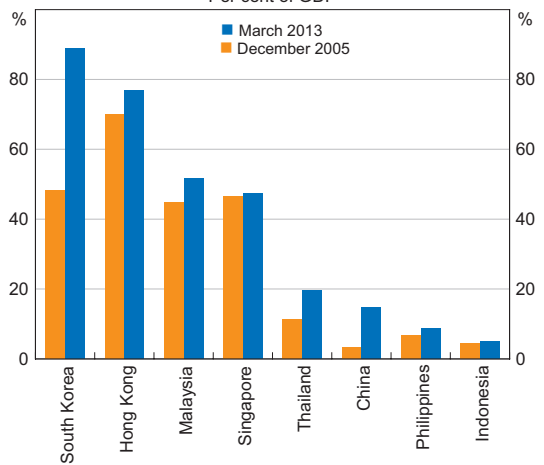
Market Size and Growth

East Asian corporate bond markets have grown significantly since the start of the century.³ The value of corporate bonds outstanding in Asia has risen fivefold over this period, to around US\$3 trillion (Graph 1).⁴ Relative to GDP, the stock of Asian corporate bonds outstanding has also increased – from 16 per cent in 2000 to 24 per cent in 2012.

This aggregate figure masks considerable diversity across economies. Corporate bond markets are larger as a share of GDP in the more advanced economies of Hong Kong, Singapore and Korea, whose bond

markets are similarly sized to those of developed economies (which range in size from 40 per cent of GDP up to 100 per cent or more; Graph 2). Malaysia's bond market is also relatively large; it benefited from public and industry initiatives in the 1990s and early 2000s, as well as the importance of Malaysia as a centre for issuing and trading Islamic bonds.⁵ In contrast, corporate bond markets in Indonesia and the Philippines remain very small, and below the size of markets in a number of other emerging economies.⁶

Graph 2
Corporate Bond Market Size*
Per cent of GDP



* Includes financial and non-financial corporations' local currency and foreign currency-denominated bonds outstanding
Sources: AsiaBondsOnline; RBA

Bond markets have increased at a considerably faster rate than GDP in many east Asian economies over the past seven years or so. The Korean market



* China, Hong Kong, Indonesia, Malaysia, the Philippines, Singapore, South Korea and Thailand; includes financial and non-financial corporations' local currency and foreign currency-denominated bonds outstanding
Source: AsiaBondsOnline

3 The east Asian economies referred to in this article are China; the financial centres of Hong Kong and Singapore; as well as 'others', which covers Indonesia, Malaysia, the Philippines, South Korea, Taiwan and Thailand. We exclude Japan, whose corporate bond market has a long history and is well established. In this article, corporate bonds include debt securities issued by the private sector and state-owned corporations.

4 This figure is based on data from AsiaBondsOnline, which are compiled using individual national sources and include short-term notes and debt securities issued by non-residents. Other sources on the size of Asian bond markets provide different estimates, but overall trends are consistent with the AsiaBondsOnline data.

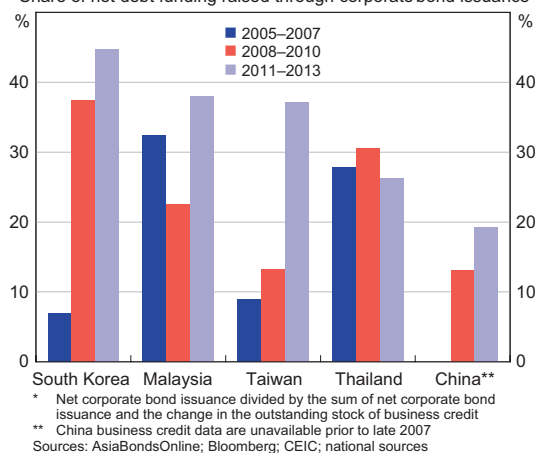
5 Initiatives included the establishment of credit ratings agencies in the early 1990s, the Bond Dealers Association in 1996, the introduction of real-time gross settlements in 1999 and a disclosure-based regulatory framework in 2000. For more information, see bin Ibrahim and Wong (2006).

6 By way of comparison, equity market capitalisation in the east Asian economies is around 30–60 per cent of GDP. This share is typically smaller than developed economies' equity markets (which range from around 80 to well over 100 per cent of GDP), but broadly in line with other large emerging markets. The main exceptions are Hong Kong, which has the largest equity market relative to economic activity in the region, at around 90 per cent of GDP, while China's equity market, similar to its bond market, remains relatively small at about 20 per cent of GDP.

grew particularly strongly between 2005 and 2012, though some of this reversed a decline in the corporate bond market in the few years following the emergence of an accounting scandal and credit card company insolvencies in 2003.⁷

The growth in east Asian corporate bond markets has also outpaced growth in intermediated credit, allowing non-financial corporations to diversify funding away from intermediated markets. This has been most evident in economies that have experienced faster rates of corporate bond market growth in recent years; in particular, the share of total corporate debt from sources other than financial intermediaries has increased significantly in China, Korea and Taiwan (Graph 3). Almost one-half of Korean corporations' net debt funding has been sourced from bond markets in recent years, while Malaysian, Taiwanese and Thai corporations also source a sizeable share of their funding needs directly from investors.

Graph 3
East Asian Non-financial Corporate Funding
Share of net debt funding raised through corporate bond issuance*

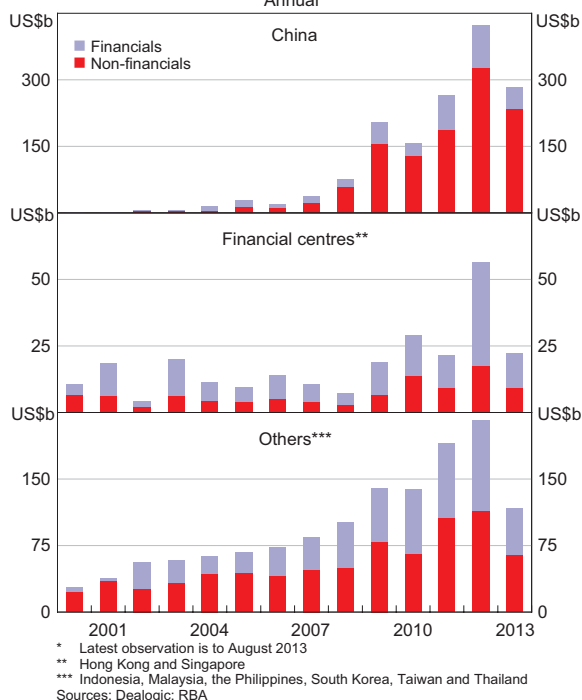


⁷ For more information on the causes of this decline, see Lee and Kim (2006).

Issuance Characteristics

East Asian corporations issued about US\$700 billion of bonds in 2012, compared with just US\$40 billion in 2000 (Graph 4).⁸ The increase in issuance has been most noticeable in China. In fact, issuance by Chinese corporations accounted for around two-thirds of all east Asian corporation issuance in 2012, up from about one-third in 2007 and close to none in 2000. Issuance by corporations in Korea, Malaysia and Thailand has also increased strongly in recent years. In contrast, issuance in Indonesia and the Philippines remains relatively subdued and has been limited to a small number of borrowers. Issuance by corporations from the financial centres

Graph 4
Asian Corporate Bond Issuance
Annual*



⁸ Issuance data are sourced from Dealogic's Debt Capital Markets database and are based on nationality of the issuing entities' parent companies. Results are little changed if issuance data are aggregated based on the issuing entities' residencies. Bonds are defined as debt securities (excluding money market securities) with an initial term to final legal maturity of greater than one year.

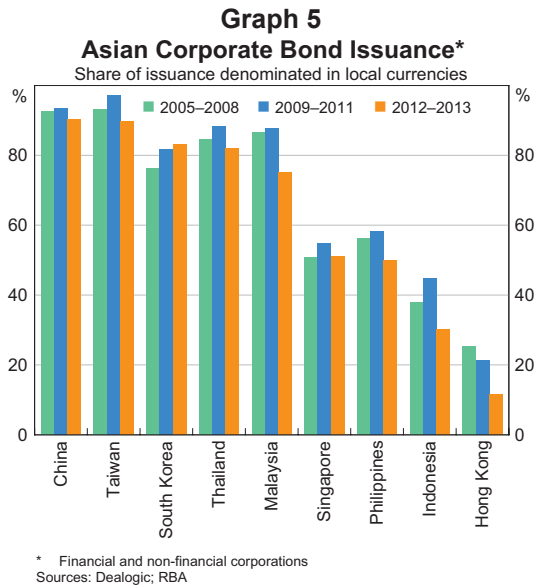
of Hong Kong and Singapore has increased in recent years, with very strong issuance in 2012.

Financial corporations in east Asia generally account for less than half of total corporate bond issuance, though the share in China is smaller at around 20 per cent. Overall, this is a low share compared with most developed markets – where financial corporations typically account for around 70 per cent of corporate issuance – as Asian banks use more deposit funding. The exception to this is in the financial centres of Hong Kong and Singapore, where around 60 per cent of corporate bond issuance is by financial corporations.

Among non-financial corporations, issuance has been most prominent across the region in the construction, real estate, transport, utilities and energy sectors, which tend to have large capital expenditure needs for long-term infrastructure projects that are well suited to bond financing. Issuance by large conglomerate holding companies has also been prominent in a number of economies.

Currency

Outside of the financial centres, the vast majority of Asian corporate bonds are issued in domestic markets and are denominated in local currencies, with non-financial corporations tending to issue a slightly higher share of local currency bonds than financial corporations, particularly in recent years (Graph 5). In contrast, less than half of corporate bond issuance in other emerging markets are denominated in the local currency. The higher share of local currency issuance in east Asia relative to other emerging markets is consistent with regulatory initiatives that have been implemented across the region to develop local currency markets together with high rates of saving in the region. Nonetheless, foreign-currency issuance has also picked up over recent years. This possibly reflects strong demand by foreigners for high-yielding fixed income securities that do not directly expose them to foreign currency risk, as well as an increase in the ability of issuers to



hedge their currency risk. Intraregional issuance – issuance by Asian firms into non-resident Asian bond markets – remains limited, although the extent of yuan-denominated bonds issued outside of China (primarily in Hong Kong) has increased from a low level in recent years.⁹

Concentration

A common criticism of Asian corporate bond markets is that issuance is dominated by a small number of corporations. Although this is perhaps true in some smaller markets in the region, such as Indonesia and the Philippines, most other markets appear as diversified as larger, more developed markets (Table 1). That said, publicly owned entities account for a high share of corporate issuance in east Asian economies. This share is typically around 40 per cent in most markets across the region, well above the single digits recorded in most developed markets. In China, the share of corporate bond issuance by publicly owned entities is even higher, at around 80 per cent, partly due to strong issuance by local government financing vehicles in recent

⁹ For more information, see Ballantyne, Garner and Wright (2013).

Table 1: Corporate Bond Market Concentration
Per cent of 2012 issuance

	Largest 5 issuers	Largest 20 issuers
China	14	27
South Korea	23	47
Malaysia	27	64
Hong Kong	30	68
Thailand	39	77
Singapore	41	74
Taiwan	44	81
Indonesia	53	89
Philippines	51	99
<i>Memo items</i>		
United States	10	22
Japan	31	55
Canada	43	64
Australia	62	85

Sources: Dealogic; RBA

years (known as 'Chengtou' bonds).¹⁰ Regulators in east Asia have introduced a number of measures to increase market accessibility for smaller corporations, which are more likely to be privately owned, though these measures are yet to bear much fruit.

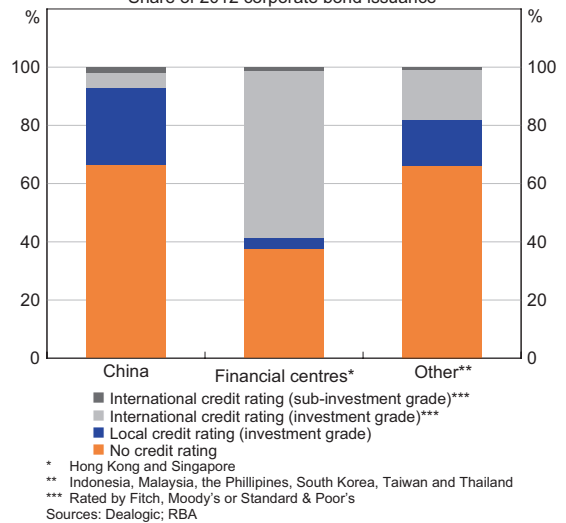
Credit ratings

Although most east Asian bond markets require publicly issued bonds to be rated at issuance, no ratings information is readily available for a large share of Asian corporate bond issuance (Graph 6). This is partly due to the preference of Asian corporations in some markets to initiate bond funding via private placements, as issuing bonds into public markets has more burdensome regulatory, reporting and disclosure requirements.¹¹ Of those that are rated,

¹⁰ Under China's budget law of 1994, local governments must maintain a balanced budget and are not permitted to issue bonds themselves (although a handful of local governments have been given permission to issue bonds in trial programs).

¹¹ The Asian Bond Markets Forum has identified the 'regulatory vacuum in private placement' in some markets as an area for future reform. See ADB (2012).

Graph 6
East Asian Corporate Bond Issuance
Share of 2012 corporate bond issuance



the available information from local ratings agencies suggests that the vast majority of outstanding corporate bonds are investment grade.¹² Consistent with the predominance of investment grade issuance, the incidence of corporate bond defaults in Asia has been low in recent years. Despite the limited availability of Asian corporate credit ratings data, the presence of local credit ratings agencies has expanded in recent years. This has been encouraged by governments and market participants across the region, reflecting a view that local agencies are well placed to access information and develop an understanding of issues particularly relevant to Asian financial markets. Private sector initiatives, such as affiliate relationships with major international ratings agencies and the development of the Association of Credit Rating Agencies in Asia (ACRAA), have also supported the development of credit ratings agencies and credit ratings standards in Asia.

¹² For example, sub-investment grade issuers account for less than 5 per cent of rated corporate bonds issued in Malaysia and Thailand and less than 10 per cent of corporate issuance in the Philippines. In comparison, around 30 per cent of corporate bond issuance by US corporations is rated sub-investment grade by major international credit ratings agencies, while in other developed markets the share of sub-investment corporate bond issuance ranges from low single digits to around 15 per cent, with the share in Australia at the lower end of the range.

Tenor

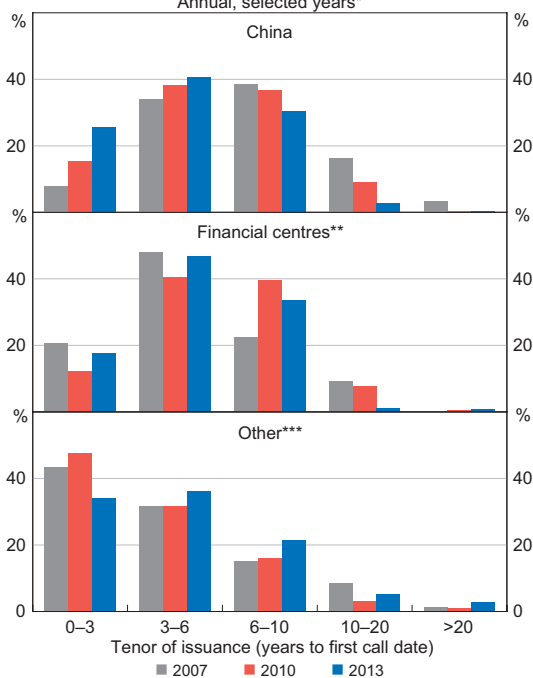
The average maturity of Asian corporate bond issuance is around six years, with corporations generally able to issue offshore at longer maturities than in local currency markets. The average length to maturity at issuance has increased over time as corporations have issued a greater share of bonds at tenors of three years or more (Graph 7). The main exception is in China, where there has been a significant increase in issuance of shorter-duration bonds following the People’s Bank of China’s 2008 decision to allow rated non-financial corporate entities to issue medium-term notes (MTNs) on the over-the-counter market. MTNs have been attractive to borrowers as they are not subject to borrowing caps or the stringent approval process associated with regular corporate bond issuance. The strong pick-up in MTN issuance has resulted in the average tenor of Chinese non-financial corporations’ bond

issuance falling slightly below that of financial corporations; in contrast, the average tenor of non-financial corporate bond issuance is longer than for financial corporations in most other east Asian markets.

Structures

Most bonds issued in the region operate under a standard fixed-rate coupon structure, though a broader range of structures has been issued in recent years. This includes zero coupon bonds, standard and reverse floating rate bonds, dual-currency bonds, step-up notes and hybrid instruments. The availability of asset-backed securities (ABS) remains limited, owing to low demand for this more sophisticated instrument as well as a lack of specific legal and regulatory frameworks and market infrastructure. ABS issuance in the region is concentrated in Korea. The covered bond market is also in its infancy, with Korea being the first jurisdiction in the region to pass enabling legislation in January 2013.¹³

Graph 7
Tenor of Corporate Bond Issuance
Annual, selected years*



* Latest observation is to August 2013
 ** Hong Kong and Singapore
 *** Indonesia, Malaysia, the Philippines, South Korea, Taiwan and Thailand
 Sources: Dealogic; RBA

Ownership and Liquidity

Domestic institutional investors are the largest group of corporate bond holders in most Asian markets. Local banks, insurance firms and pension funds tend to be the dominant participants in this category (holding around 90 per cent of corporate bonds outstanding in China, and half of corporate bonds outstanding in Korea). Investment by other types of domestic institutional investors – such as mutual funds and exchange-traded funds (ETFs) – remains relatively limited. Thailand is a notable exception, where mutual funds are more active and hold around 10 per cent of outstanding local currency corporate bonds. Direct investment by individuals is low in most economies, other than in Thailand where individuals’ holdings currently account for around half of all corporate bonds outstanding (with

¹³ The Monetary Authority of Singapore released a consultation paper on covered bond issuance in March 2012, but is yet to release final guidelines. See MAS (2012).

issuance commonly distributed through branches of the underwriting banks).

Foreigners do not currently hold many local currency corporate bonds in east Asia. For example, foreigners hold just 1 per cent of local currency-denominated corporate bonds outstanding in Korea. In China, the share is even lower with foreigners having only very limited access to Chinese debt securities via the Qualified Foreign Institutional Investor and RMB Qualified Foreign Institutional Investor programs.

The primary reason for the limited involvement of foreigners appears to be their concerns about having dual exposures to foreign currency risk and emerging market corporate credit risk. Nonetheless, foreign holdings of local currency bonds issued by *governments* in east Asia have increased significantly over recent years. However, market reports indicate that foreign investors are much more active in foreign currency-denominated Asian corporate bond markets (mostly US dollar-denominated bonds) than in local currency corporate bond markets. Foreign currency-denominated east Asian corporate debt is appealing to foreign investors due to the availability of replicable portfolio benchmarks (such as JPMorgan's CEMBI Index), larger deal sizes, and a greater likelihood that they are rated by an international ratings agency.

Asian authorities have introduced measures to improve foreigners' access to local currency debt markets over recent years. These include some loosening in restrictions on capital flows, improvements in foreign currency convertibility and an easing in foreign investor registration requirements. However, some impediments to foreign access remain, including withholding taxes and the limited availability of credit derivatives and foreign exchange hedging instruments. Prior to the global financial crisis, credit default swaps (CDS) were used increasingly by foreign investors as a hedging tool as well as a means for obtaining exposure to Asian corporate credit risk, though CDS market liquidity has since declined significantly.

The narrow investor base in local currency corporate bond markets is widely cited as a constraint on secondary market liquidity (ADB 2013). While bid-ask spreads and turnover ratios for corporate bonds in some east Asian markets are broadly comparable to those in more developed markets, the limited number of domestic institutional investors participating in local currency east Asian corporate bond markets all tend to have similar buy-and-hold investment strategies. This constrains secondary market depth and can contribute to prices moving by large amounts in response to orders. In general, turnover is also limited to the first month or two after a bond is issued. Limited market-making activity also constrains liquidity, which is in part due to a lack of depth in the markets for hedging instruments as well as a tendency for private placements in some markets (which are typically sold directly to a small number of investors). Some authorities have recently tried to make improvements on this front; for example, the Monetary Authority of Singapore announced in 2012 that it will purchase corporate securities and make them available for securities lending in an effort to boost market-making activity in the corporate bond market.

Efforts to Facilitate the Growth in Bond Markets

A number of multilateral initiatives were established in the years after the Asian financial crisis to enhance the development of local financial markets across the region. In 2003 and 2004, the Executives' Meeting of East Asia-Pacific Central Banks (EMEAP) established the Asian Bond Funds 1 and 2 (ABF 1 and 2), which were designed to promote the development of regional bond markets and retain investment of some of the region's foreign currency reserves locally.¹⁴ The ABFs have also promoted

¹⁴ The ABF 1 was launched in July 2003 and invested US\$1 billion in US dollar-denominated bonds issued by sovereign and quasi-sovereign entities in eight of the eleven EMEAP economies (excluding Australia, Japan and New Zealand). The ABF 2, launched in December 2004, invested US\$2 billion in local currency-denominated bonds issued by sovereign and quasi-sovereign entities from the same eight EMEAP economies.

private sector participation in local currency bond markets by enhancing information disclosures and governance standards, with ongoing monitoring undertaken by the EMEAP Working Group on Financial Markets. Around the same time, the Asian Development Bank, together with the Association of Southeast Asian Nations (ASEAN) and the Japanese and Chinese Governments – collectively known as ASEAN+3 – established the Asian Bond Markets Initiative (ABMI) to promote the development of local currency bond markets, improve bond market functioning and increase market accessibility to issuers and investors. The scope of the ABMI's work has expanded in recent years with the release of a new 'road map' in May 2008 and the establishment of the Asian Bond Market Forum (ABMF) in 2010 to foster standardisation of market practices and harmonisation of regulations relating to regional cross-border bond transactions.

Individual governments have also worked to encourage bond market development. For example, a number of economies have focused on improving liquidity across government bond yield curves to provide more reliable risk-free pricing benchmarks for corporate bonds.¹⁵ Governments have endeavoured to improve market infrastructure, with significant enhancements achieved in the efficiency of clearing and settlement systems; the vast majority of corporate bonds have moved to scripless form and trade via electronic book entry using delivery versus payment settlement.¹⁶ Sophisticated post-trade infrastructures have also been implemented in a range of economies, such as Korea, Malaysia and Thailand. In addition, burdensome issuance and registration requirements have been eliminated or reduced across the region.

Other efforts have focused directly on expanding the investor base. For example, a number of

jurisdictions have tried to encourage foreign investment by loosening restrictions on their involvement and reducing withholding taxes. More broadly, governments have also worked to improve transparency, particularly by enhancing disclosure and reporting standards.¹⁷ In many cases, legal frameworks, especially laws relating to bankruptcy procedures, have been strengthened.

In addition to efforts by governments, industry initiatives have also facilitated bond market growth. These include the self-regulatory organisations and other market participants involved in the ABMF, and the expansion of the ACRAA.¹⁸

Resilience during the Global Financial Crisis

Since the intention of building up corporate bond markets has been to increase the resilience of east Asian economies in the face of financial shocks, it is worth considering how these markets fared in the face of the global shock to the financial system in 2008. While this shock was centred in advanced economies outside of Asia, it was associated with a sharp reversal of portfolio capital inflows to the east Asian region during 2008 and early 2009 (Graph 8). It is notable that the volumes of corporate bonds issued in most east Asian economies were little affected during this period, as an increase in local currency bond issuance offset a decline in foreign currency bond issuance as issuers refocused on selling to domestic investors. This resilience helped to support corporations' access to funding (and financial stability, more broadly) at a time of acute stress in global financial markets and reduced access to bank funding (particularly as international lenders, especially European banks, pared back their lending activities).

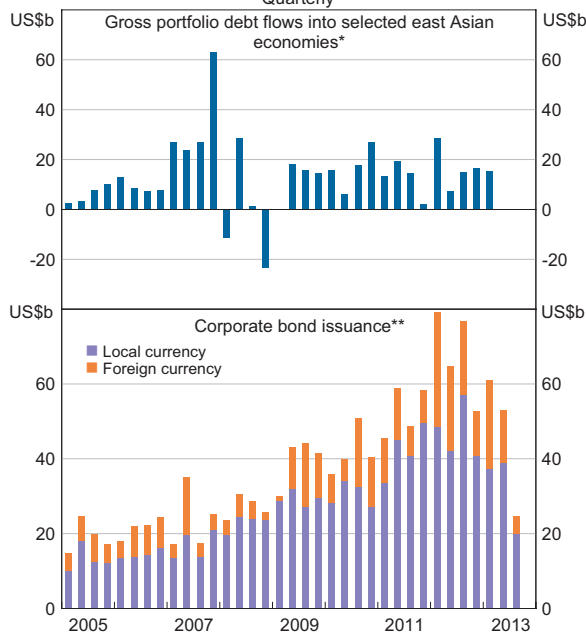
¹⁵ Efforts include the introduction of a pre-announced schedule of issuance, the concentration of bond issuance at key points along the yield curve, the establishment of a primary dealer group for government securities and buyback operations.

¹⁶ Delivery versus payment is a settlement method that ensures delivery occurs if and only if payment occurs, which reduces settlement risk.

¹⁷ In Malaysia, Korea and Thailand, all trades are required to be reported to industry associations within 10, 15 and 30 minutes, respectively.

¹⁸ Self-regulatory organisations are market bodies such as exchanges or industry associations that set and enforce market rules and standards. Examples include the National Association of Financial Market Institutional Investors in China, the Korea Financial Investment Association and the Thai Bond Market Association.

Graph 8
Capital Flows and Bond Issuance
Quarterly



* Hong Kong, Indonesia, the Philippines, South Korea and Taiwan
 ** Hong Kong, Indonesia, Malaysia, the Philippines, Singapore, South Korea, Taiwan and Thailand; latest observation is to August 2013
 Sources: Dealogic; IMF; RBA; Thomson Reuters

Conclusion

Asian corporate bond markets have grown significantly since the turn of the century, underpinned by strong economic growth and regulatory initiatives that have helped to improve bond market infrastructure. The growth of these markets has occurred in response to the recognition that excessive reliance on intermediated credit was a key source of vulnerability during the Asian financial crisis, and it is likely that the growth and increased sophistication of these markets played a role in enabling the region to quickly recover from the global financial crisis. ✎

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Financing Infrastructure: A Spectrum of Country Approaches

Sophia Chong and Emily Poole*

Over recent decades, there has been a shift away from public infrastructure financing towards private infrastructure financing, particularly in advanced economies. In this article, infrastructure financing in four countries – China, India, Australia and the United Kingdom – is examined to illustrate the different approaches taken by governments to finance infrastructure and encourage private financing. In all four countries, public financing of infrastructure remains significant, ranging from one-third in the United Kingdom to almost all financing in China.

Introduction

The question of how to channel global savings towards long-term financing for investment, and infrastructure investment in particular, has been receiving greater attention in a number of international forums, including the Group of Twenty (G20) and the Asia-Pacific Economic Cooperation forum (APEC), over the past year. For example, the G20 established a Study Group on Financing for Investment in February 2013 to consider ways in which the G20 can foster long-term investment and ensure the availability of sufficient funding for projects. Interest in this topic reflects general concerns about the pace of the global economic recovery, and recognition that the removal of infrastructure bottlenecks is very important for strong, sustainable and balanced growth. With interest rates at historically low levels across many countries, there may also be an opportunity to fund these long-term productive investments relatively cheaply.

For many countries, current and future infrastructure needs are considered to be difficult for governments to finance given prevailing fiscal constraints, raising interest in the question of whether private

sector financing can play a larger role. Traditionally, the predominant source of private financing for infrastructure has been bank funding, particularly syndicated loans, but over the past few years a number of banks (principally those headquartered in advanced economies) have been reducing lending to strengthen their balance sheets following the global financial crisis. As a result, discussions within international forums are often focused on how to encourage private infrastructure financing through capital markets, especially by institutional investors such as pension funds, which have long-term investment horizons owing to the long-term nature of their liabilities.

As part of global efforts to focus attention on these issues, the Reserve Bank's annual conference for 2014, which is being jointly hosted with the Productivity Commission and the Lowy Institute, is on the topic of 'Financial Flows and Infrastructure Financing'. Issues covered will include the role of global banking and capital markets in promoting the efficient allocation of cross-border financial flows, the particular challenges facing infrastructure financing, and countries' experiences with public-private partnerships (PPPs). After a brief discussion of the various options available for infrastructure financing, this article examines the approaches

* The authors are from International Department and would like to thank Li Tan for her input in the early drafts of this article.

taken by four countries with widely differing shares of private financing – China, India, Australia and the United Kingdom. These case studies highlight the challenges facing governments trying to promote private infrastructure investment.

Infrastructure Investment

Infrastructure can be defined as the structures and facilities that are necessary for the functioning of the economy and society – infrastructure supports economic activity and social services, rather than being an end in itself. Economic infrastructure refers to the physical infrastructure that is a direct input to economic activity, for example roads, electricity networks, telecommunication networks and water and sewerage facilities. Social infrastructure refers to the facilities that aid the provision of social services, such as schools and hospitals.

Infrastructure has a number of unique characteristics that distinguish it from other investments and mean that governments will more often than not be involved in its provision in some capacity. First, the investment needed for infrastructure is ‘lumpy’, that is, there are large up-front costs associated with planning and construction. As such, infrastructure projects often have large economies of scale and natural monopoly characteristics. In this case, governments may need to regulate prices and performance standards for the services produced using this infrastructure. Second, infrastructure can have positive externalities arising from network effects, or public good properties such as non-excludability. These things mean that the net public benefit exceeds the likely return to private investors and so it will tend to be underprovided by the private sector. In these cases, the government may be directly involved in funding infrastructure projects. This is not to say that governments necessarily need to be involved in all infrastructure provision – some infrastructure assets, such as mobile telephone networks, have enough private value and sufficient competitive pressure to be provided by the private sector without public involvement.

Financing Options

Financing of the high initial cost of constructing infrastructure and the subsequent payments for services provided by the infrastructure can both take a number of forms. At the extremes, there are public procurement (where the government finances and owns the asset) and private infrastructure investment (where the private sector finances and owns the asset). In between, there are a variety of PPP arrangements for which risk is transferred to varying degrees between the public and private parties. Payments for infrastructure services, used to repay private financing costs over the life of the asset, can either come from the government via budget transfers, or from users of the infrastructure through user charges, such as tolls.

Public financing

Public financing can take the form of general budget appropriations for infrastructure projects financed through tax revenue or government debt, revenue bonds tied to specific infrastructure projects, or infrastructure investment by government trading enterprises (GTEs), including national development banks (NDBs).¹ Developing countries may also have access to concessional and/or non-concessional financing from multilateral development banks (MDBs), such as the World Bank.

In many countries, public financing of infrastructure through the budget appropriation process is common. Budget appropriation has the benefit of a generally higher level of transparency and public scrutiny compared with other government financing vehicles, with the result that there is greater accountability over public expenditure. Given the lower cost of government debt compared with private sector debt, it can also be a cost-effective way of financing infrastructure. On the other hand, there

¹ GTEs are also known as public trading enterprises, government business enterprises, public corporations, state-owned enterprises or government-owned corporations. Examples in Australia include NBN Co and Australia Post at the federal level, and the Port of Melbourne Corporation (Victoria), Public Transport Authority (WA) and Sydney Trains (NSW) at the state level.

can be constraints on infrastructure investment from budgetary processes, such as fiscal rules (e.g. debt or deficit limits), as well as political pressures to undertake particular investments irrespective of an appropriate cost-benefit analysis. Privatisation of existing (brownfield) assets has also been utilised to unlock public financing for new infrastructure projects. However, a strong regulatory framework needs to be in place if a natural monopoly is privatised.

Many countries also engage in various types of quasi-government financing. In both advanced and developing economies, this form of financing is most commonly provided by GTEs, which are legally independent entities at least partially owned and overseen by government. Many GTEs have a core function of operating and maintaining infrastructure assets. Some GTEs also have responsibility for building new infrastructure assets. GTEs finance their infrastructure investments through several sources, including: retained earnings from user charges and fees for access to infrastructure; capital contributions or payments from government for non-commercial services that GTEs are directed to provide; bond issuance; or borrowing from banks. Proponents argue that GTEs can be more efficient and make better investment decisions than the general government sector since they are typically managed by boards with financial and technical expertise. However, GTEs also have some shortcomings. First, those GTEs operating monopoly infrastructure may lack incentives to seek out efficiency gains and to modernise services and facilities. Second, in some countries, the capacity for GTEs to raise their own debt rather than relying on the government's budget for funding has raised concerns over the circumvention of budget accountability measures. Finally, GTEs can give rise to large contingent liabilities for governments since it can be politically unpalatable to let GTE-financed infrastructure projects fail.

Governments and GTEs can also link borrowing to specific infrastructure projects. Commonly, a distinct

company will be set up to carry out the project and issue bonds (known as revenue bonds). This debt is serviced from the income stream of the infrastructure project – user charges or government/GTE payments – without recourse to general government or GTE revenue. The main benefit of revenue bonds is the potential they bring for efficiency improvements in project management due to the greater scrutiny by investors; however, compared with general budget appropriation, they can be a more costly way of financing infrastructure given that bondholders require a higher return for the greater risk faced relative to general government bonds. As with GTEs, revenue bonds can give rise to implicit contingent liabilities for governments where projects are considered too important to fail.

NDBs are a special type of GTE that are established to provide credit and other financial services to sectors of the economy that private financial institutions are considered to be under-servicing. As such, they are more commonly found in economies with less developed financial sectors. While the range of sectors served by NDBs is relatively broad, a recent World Bank survey found that 65 per cent of NDBs have infrastructure as one of the 'target sectors' to which they lend (de Luna-Martinez and Vicente 2012). NDBs typically operate with the benefit of an explicit government guarantee, which usually results in these institutions taking on a credit rating that is in line with that of the government. Accordingly, this helps these institutions to achieve lower funding costs than private banks in their jurisdictions.

MDBs also provide credit for development purposes, but operate in more than one country and have global or regional development mandates. MDBs receive capital contributions from member countries and target their activities at low- and middle-income countries.² MDBs offer a variety of products suitable for supporting both public and private infrastructure

2 Australia is a shareholder of the five World Bank Group organisations, the Asian Development Bank and the European Bank for Reconstruction and Development. The two other major MDBs are the Inter-American Development Bank and the African Development Bank.

investment, including grants, loans, equity investments and credit enhancement products such as debt guarantees. In 2012, there were over US\$90 billion of new commitments by MDBs, of which the World Bank Group accounted for around half. Over recent years, around one-third of new commitments by the MDBs have been for economic infrastructure projects. They also provide technical assistance in areas such as project preparation and improving the policy and regulatory environment for investment. Based on the strength of their capital contributions, the MDBs all currently have AAA credit ratings that allow them to borrow cheaply; they are mostly self-supporting financially with income earned on lending and other investments exceeding operating expenses. In recent years, MDBs have increasingly focused on being catalysts for private investment in infrastructure through the promotion of co-lending and instruments such as guarantees and equity investments.

Private financing and PPPs

Infrastructure projects financed by the private sector fall into two categories: those that are fully owned and operated by the private sector, for instance private telecommunications networks; and those commissioned by government but at least partly financed by the private sector. Projects in the latter category are commonly known as PPPs. A PPP generally refers to a long-term contract between a private party and a government agency for providing a public asset or service, for which the private party bears significant risk and management responsibility (World Bank 2012).

Private financing comes in two forms – debt and equity. Debt constitutes a large proportion of infrastructure financing, with this proportion usually depending on the stability and predictability of income flows; debt funding has reached up to 90 per cent of total funding for PPP social infrastructure projects where government payments for the infrastructure services are stable and predictable (Chan *et al* 2009). Debt financing is typically made

up of loans from banks, although some private projects have been partly funded via bond issuance in capital markets, especially in Europe (EPEC 2010). Inflation-linked bonds are often seen as a good fit for infrastructure projects from the point of view of the issuer since the pricing of infrastructure services is often linked to inflation, as well as for investors such as pension funds given the sensitivity of their long-dated liabilities to inflation (Lancaster and Dowling 2011). Equity investors in private projects can be classified as primary or secondary investors. Primary investors are directly involved in decisions regarding the construction of the infrastructure asset, such as construction companies. Some projects may also raise equity on financial markets through an initial public offering. A recent development in the equity financing of infrastructure projects has been the involvement of large pension or superannuation funds, some of which have invested directly in an equity stake at the start-up (greenfield) phase of the project. Once projects are in operation with a proven revenue stream, equity is often sold in the secondary market to investors with a lower appetite for risk; infrastructure funds and pension funds generally prefer to invest at this stage of the project. Selling proven assets allows primary equity investors to free up capital to invest in new infrastructure projects.

Compared with provision by government, there are a number of potential benefits of private parties being involved in infrastructure projects. Most importantly, the private party can help to deliver projects on time and at a lower cost over the life of the asset. When it comes to project financing, the involvement of the private sector allows governments to pursue projects even when facing short-term fiscal constraints. However, in the absence of user charges, PPPs will have long-term impacts on the government's budget due to the commitment to make payments to the private partner for the services generated by the infrastructure asset. In many PPP projects, private parties have sole responsibility for the financing component of the project, although some projects may receive support in the form of

government capital grants, loans from development banks and credit enhancement, such as government guarantees.

Private financing through PPPs is only suitable under a certain set of conditions, including: the existence of credible legal and regulatory frameworks that give strong legal protection to investors; public sector capacity and resources to structure and manage PPPs effectively; appropriate project selection and identification of the most efficient bidder; and appropriate risk sharing between the private sector and government. These conditions are often lacking in developing countries, reducing the likelihood that the benefits of PPPs will be realised. In advanced economies, problems in these areas are generally less pronounced, but still remain. PPPs can be a more costly way to build infrastructure than traditional government procurement due to the higher cost of private financing compared with government debt. Therefore, the net benefit of PPPs depends on the extent of any efficiency gains achieved from private participation in the project. Similarly, the value for money of PPPs can be diluted by the allowances made by governments in order to attract private financing. For example, governments may provide the private sector with market power by inserting 'non-compete' clauses into PPP contracts, which prohibits future competing infrastructure from being provided without costly renegotiations. Even where contracts are well designed and risk appropriately allocated, the ultimate risk and corresponding costs of the project may reside with government since the public will hold the government accountable for the provision and quality of infrastructure services. In the extreme, governments may (and have in the past decided to) bail out PPPs where they are deemed too important to fail. Hence, PPPs can generate implicit contingent liabilities for governments.

Governments and MDBs have used a variety of methods to encourage private participation in PPPs. First, many governments have put considerable effort into improving general investment conditions and the broad regulatory framework for PPPs. For

instance, governments have set up infrastructure 'pipelines' in order to provide certainty of their forward intentions and created government bodies with the responsibility for issuing PPP guidelines and optimising the planning and procurement process. Second, governments have used mechanisms to shield private parties from some of the downside risk of infrastructure projects, for instance in the form of guarantees. However, it should be noted that imprudent use of such mechanisms can undermine the advantages of private involvement in the first place and/or expose the public to potentially large liabilities.

Country Examples

Numerous factors, including political considerations, institutional capacity, infrastructure needs, budgetary resources, the development of local capital markets and the investment climate will influence the mix of private and public financing for infrastructure projects in a country. The examples of China, India, Australia and the United Kingdom clearly demonstrate the spectrum of approaches taken by countries over the past two decades.

Public financing through the government and GTEs still plays an important role in all four of these countries, ranging from financing almost all infrastructure investment in China, to financing around one-third of infrastructure investment in the United Kingdom. In Australia and the United Kingdom, privatisation of infrastructure assets and GTEs has played a significant role in increasing the share of private investment, whereas PPPs have played only a small, albeit highly publicised, role. Further, the various PPP models used in India, Australia and the United Kingdom have come under some criticism, although for different reasons in each country. This highlights the sensitivity of the PPP model to country-specific factors and the difficulty in getting the appropriate allocation of risks between the public and private partners to ensure that the project is both sustainable and delivers value for money to taxpayers and those paying to use the infrastructure.

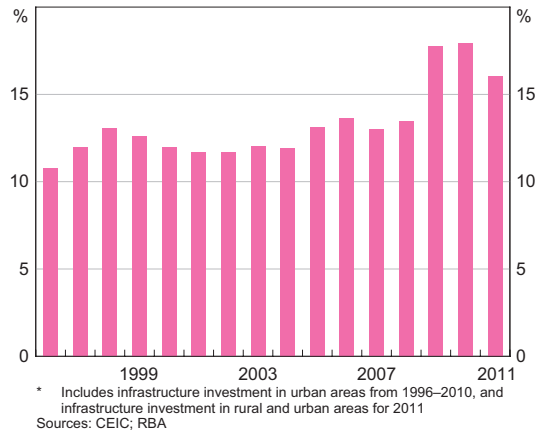
The data presented for infrastructure investment in the analysis that follows cover both economic and social infrastructure, with the exception of India, for which the data cover economic infrastructure only. Data shown for infrastructure investment are not directly comparable across countries, as data sources and definitions of infrastructure differ.

China

In China, almost all infrastructure financing is undertaken by the public sector, with private financing as a proportion of GDP close to zero. China has placed considerable emphasis on infrastructure in its national five-year plans; for instance, the Eleventh Five-Year Plan (2006–2010) listed key transport infrastructure projects to be built during the period, while the Twelfth Five-Year Plan (2011–2015) sets ambitious targets for the extent of high-speed railway and road networks to be constructed. Consistent with this, China has spent a significant amount on infrastructure: in urban areas alone, around 13.5 per cent of GDP has been invested on infrastructure, on average since the mid 1990s (Graph 1).³

Responsibility for the implementation and financing of infrastructure projects resides primarily with local governments. Although the central government provides funding to local governments to support some of their infrastructure project finance needs, local governments have also made extensive use of ‘off-budget’ financing options for infrastructure, including selling land-use rights and borrowing through local government financing vehicles (LGFVs). This reflects two factors. First, local governments are generally prohibited from borrowing directly. Second, under the current revenue sharing arrangements with the central government, local governments have insufficient capacity to levy taxes and thereby raise the funds needed to fulfil their

Graph 1
China – Infrastructure Investment*
Per cent of GDP



substantial responsibilities to provide infrastructure and social services. Hence, there are a large number of LGFVs in China – official estimates range from 6 500 to 9 800 in total. Typically, LGFVs are owned wholly by local government, but some large LGFVs are traded on the stock exchange.

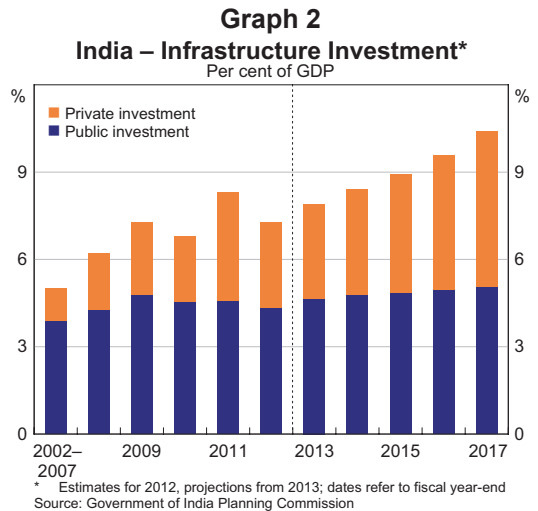
The majority of LGFV debt in China is estimated to be financed by bank loans. Outstanding bank loans to LGFVs were roughly 18.5 per cent of GDP in March 2013, or 12 per cent of banks’ total CNY-denominated loans. The majority of these loans are provided by China’s state-owned banks, including the China Development Bank (CDB); the CDB had outstanding loans for infrastructure-related projects of roughly CNY4 trillion (US\$650 billion) in June 2012. In turn, the CDB leverages its sovereign credit rating to borrow cheaply from China’s local currency bond market; almost three-quarters of its liabilities are bonds, most of which are held by commercial banks. However, local governments have been increasing their use of bonds in recent years. In 2013, the Ministry of Finance intends to issue CNY350 billion (US\$56 billion) on behalf of local governments, up CNY100 billion on 2012, while six local governments (Shandong, Jiangsu, Guangdong, Shanghai, Shenzhen and Zhejiang) now have direct access to bond market finance under pilot schemes.

³ This is likely to overstate the amount spent on infrastructure relative to GDP. The fixed asset investment data from which this measure of infrastructure investment is derived include some items that are excluded from national account aggregates, such as transfers of existing structures.

Relative to the state-owned banks, financing by MDBs for infrastructure purposes is small. Average annual new commitments by the World Bank for infrastructure projects in China since 1986 have been slightly over US\$800 million and commitments by the Asian Development Bank (ADB) have averaged US\$1.1 billion since 1997. Similarly, as a share of China's total infrastructure financing, private financing is small. Nonetheless, over the past 10 years, China has been loosening its policies on private investment (including foreign investment) in public infrastructure. For instance, in 2010 the State Council released new guidelines (the '36 New Articles') on domestic private investment that promote equal treatment of state and private sectors in a number of areas including infrastructure. The measures were aimed at lowering the barriers to entry for private investors, which include a cumbersome administrative approval process and preferential treatment for state enterprises.

India

In India, infrastructure has historically been financed by the public sector. Until the mid 2000s, budgetary allocations combined with the retained earnings of GTEs financed the majority of infrastructure investment. Total infrastructure investment was also low: from the early 1990s to 2007, total investment in infrastructure ranged from 3 to 5 per cent of GDP. However, some significant changes have taken place in recent years. Under India's Eleventh Five-year Plan (2007–2011), infrastructure investment increased substantially to just over 7 per cent of GDP. Furthermore, around 40 per cent of the funding came from private sources (Graph 2). The increase in private sector financing can be attributed to a concerted effort by the Indian Government to create a regulatory environment that strongly encouraged PPPs in the face of large infrastructure financing needs and fiscal constraints. In terms of financing sources, much of the increase in private sector financing during this period was due to an increase in bank funding, with the share of bank credit for infrastructure rising from around 2 per cent in 2000 to 14 per cent in 2012.



The Twelfth Five-year Plan (2012–2017) targets a further large increase in infrastructure investment to 10 per cent of GDP by 2017. Given constraints on the ability of government to finance this increase due to high government debt and spending needs for social services, the government aims to increase the share of infrastructure financing by the private sector to nearly 50 per cent over the course of the Twelfth Plan. However, further expansion in the provision of bank credit may be constrained, since many banks are close to their prudential ceilings for exposure to the infrastructure sector, especially the power sector (Reserve Bank of India 2012).

The Indian Government has expressed the hope that financing from long-term investors (such as insurance companies and pension funds) and foreign debt and equity will bridge this financing gap (Government of India Planning Commission 2011). To facilitate this, the government has set up programs aimed at widening the base of available private finance for infrastructure, primarily through the India Infrastructure Finance Company Limited (IIFCL), which is a government-owned company. In February 2013, the IIFCL along with four private participants set up an infrastructure debt fund – India Infradebt Limited – to sell bonds to long-term investors, the proceeds of which are used to refinance bank loans for PPP infrastructure projects that have

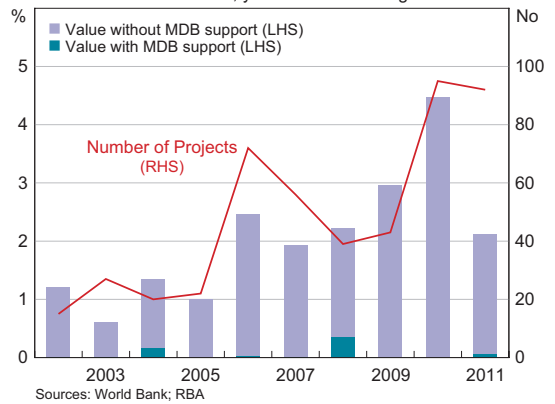
completed at least one year of operation. The IIFCL is also currently piloting a scheme whereby it provides a partial credit guarantee to enhance the credit ratings of bonds issued by infrastructure project companies. The scheme aims to tap into financing by insurance companies and pension funds – many of which have caps on assets that are not investment grade – as well as help develop India’s nascent local currency bond market. The ADB is participating in the scheme by providing a backstop guarantee facility of up to 50 per cent of IIFCL’s underlying risk.

The Indian Government has also acknowledged that reforms, especially for PPPs, will be required to support the level of private financing required. India is currently a regional leader in attracting private investment through PPPs, but new PPP projects have stalled. Over 50 per cent of projects are delayed at various stages of implementation due to regulatory hurdles, delays in land acquisitions and environmental clearances, and sector-specific bottlenecks. These have led to significant time and cost overruns and undermined private sector interest in infrastructure projects (Chakrabarty 2013). A report by the High Level Committee on Financing Infrastructure in 2012 recommended that the government pursue reforms in sustainable pricing of commodities and services (especially energy, by allowing cost pass-through for instance), reinforce the PPP policy and regulatory framework and investigate substituting state-owned monopolies for competing entities (Government of India Planning Commission 2012).

MDBs have made a relatively modest contribution to infrastructure financing in India. Over the past 25 years, on average the World Bank group has provided US\$1.2 billion in financial support each year for Indian infrastructure projects. Similarly, the ADB has provided around US\$1.3 billion in financial support for infrastructure projects each year since 1997. As in China, the MDBs do not appear to have played a significant role as catalysts for private investment, with the majority of private projects not having any MDB involvement (Graph 3). However,

this does not take into account non-financial support, such as technical assistance for project preparation and broad policy development.

Graph 3
Infrastructure Projects with Private Involvement in India
 Per cent of GDP, year contract was signed



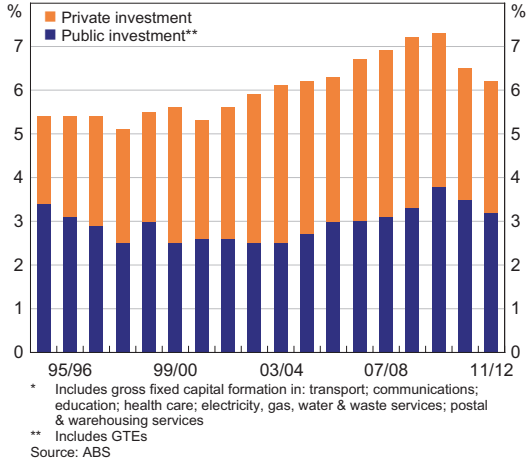
Australia

In Australia, infrastructure investment has been around 6 per cent of GDP on average over the past four decades.⁴ The share of private infrastructure investment in Australia grew steadily from the mid 1980s, reaching just above 55 per cent in 2008, although it has fallen back below 50 per cent since the global financial crisis (Graph 4). The increase in the share of private investment prior to 2008 was driven by both a decline in the level of infrastructure investment by federal and state GTEs and a pick-up in private infrastructure investment. These trends were driven by two developments. First, there was significant privatisation of federal and state GTEs over the period, including Telstra, Qantas and a number of airports and state utilities (RBA 1997). Second, the mining boom was associated with an increase in private transport infrastructure investment, such as ports and private roads (BITRE 2012).

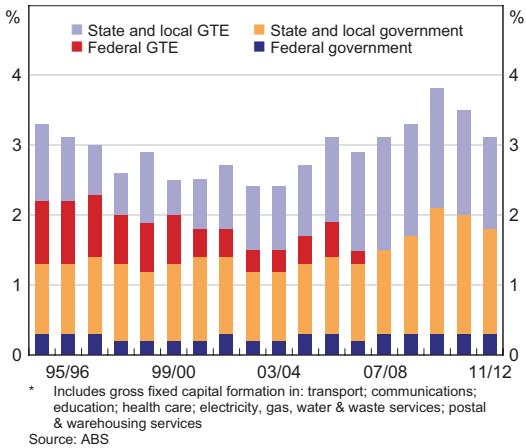
State and local governments and GTEs account for the bulk of public financing for infrastructure in Australia (Graph 5). Direct federal government infrastructure

⁴ This is likely to overestimate the amount spent on infrastructure. It is calculated using data on gross fixed capital formation in the transport, communications, education, health care, utility and postal sectors, not all of which will be related to infrastructure investment.

Graph 4
Australia – Infrastructure Investment*
 Per cent of GDP



Graph 5
Australia – Public Infrastructure Investment*
 Per cent of GDP



investment is low and stable as a percentage of GDP, and is concentrated in the education and healthcare sectors. However, this masks the fact that a large portion of state government revenue comes from federal transfer payments, and also includes payments to assist in financing specific infrastructure investments through programs such as the Regional Infrastructure Fund and the Nation Building Program (Lancaster and Dowling 2011). For example, federal grants provided almost 13 per cent of financing for public infrastructure projects in New South Wales

in 2012/13. The pick-up in infrastructure investment by state and local governments from 2008/09 can be largely attributed to the stimulus payments for school building projects from the federal government. Aside from federal grants, infrastructure investment by state governments and their GTEs are financed through a combination of state tax revenue, debt issuance by the state borrowing authorities and asset sales. Revenue bonds, where the debt is issued against a specific infrastructure project, are not currently in use as a financing tool.

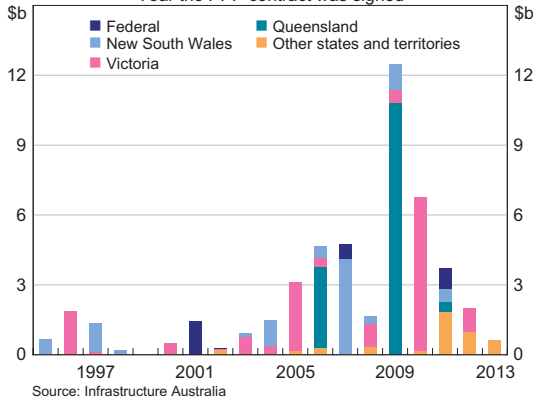
Aside from privatisation, the Australian Government has undertaken a number of measures to encourage private financing of infrastructure projects by improving investor certainty in the project pipeline and PPP framework. Infrastructure Australia was established in 2008 to assist all levels of government develop plans to ease infrastructure bottlenecks and provide arms-length advice on the prioritisation process and financing mechanisms for significant infrastructure projects. In 2012, a government infrastructure project pipeline (the National Infrastructure Construction Schedule) was released, containing information on all infrastructure projects over A\$50 million that are either committed or being procured by the general government sector. In terms of supporting PPPs specifically, the Council of Australian Governments endorsed the National Public Private Partnership Policy and Guidelines in 2008, with the aim of providing a best practice, consistent national approach to PPP delivery in Australia.

Although PPPs get a lot of publicity in Australia, they have accounted for only a small share of infrastructure financing to date. Since 1995, contract closures for PPP projects total just under A\$50 billion, compared with a total of more than A\$1 trillion invested in infrastructure over the period. Further, only three states have been significant users of PPPs over this period – New South Wales, Queensland and Victoria (Graph 6). Use of PPPs peaked in 2008/09, with the signing of the contracts for the very large BrisConnections PPP in Queensland; however,

Graph 6

PPPs in Australia

Year the PPP contract was signed



high-profile restructurings of several large PPPs for toll roads, including BrisConnections, and tighter financial conditions following the global financial crisis have seen a fall in the use of the PPP model in more recent years.

Compared with most other countries, Australia has a high proportion of private infrastructure financing supplied by institutional investors, notably superannuation funds. This is the combined result of Australia’s compulsory superannuation program creating a large pool of private savings, and Australia’s superannuation funds generally investing a higher share in infrastructure assets than average (Della Croce 2012). Private financing of infrastructure by institutional investors can be direct (through debt or equity investment in PPPs or the purchase of privatised (brownfield) infrastructure assets) or indirect (through investments in unlisted and listed infrastructure funds). Only Australia’s largest superannuation funds have the capacity to provide the level of resourcing and investor sophistication needed for direct investment. Therefore, most of the infrastructure investment by Australian superannuation funds is channelled through infrastructure funds managed externally. By investing in these products, superannuation funds can gain an exposure to infrastructure projects without the illiquidity that arises from directly

investing in an infrastructure project.⁵ According to returns data provided by Australian industry super funds, over the past 10 years returns on unlisted infrastructure investments have averaged almost 12 per cent, compared with around 9 per cent for Australian equities and 5¼ per cent for cash (Industry Super Network 2013).

United Kingdom

Of the four countries discussed in this article, the United Kingdom has the greatest proportion of private financing of infrastructure, reaching around two-thirds of annual infrastructure investment in 2011 (NAO 2013). However, the level of total infrastructure investment is also relatively low, estimated at 2–3 per cent of GDP between 2010 and 2012. The proportion of private financing is projected to continue to increase; based on the government’s plans released in 2012, more than 85 per cent of investment in infrastructure projects that are currently in the pipeline will be either fully or partly privately financed (HM Treasury 2012b). The high level of private financing in the United Kingdom is largely the result of significant past privatisation of infrastructure assets and GTEs, with transport infrastructure a notable exception, and concerted efforts by the government to design financing vehicles that encourage private involvement in the face of fiscal constraints. Notwithstanding this high proportion of private financing, the government still plays a crucial role in infrastructure provision through: planning and the regulation of prices charged by companies in the water, gas and electricity transmission and distribution sectors; direct infrastructure financing; and involvement in various financing mechanisms designed to encourage private infrastructure investment.

Given the extent of privatisation that has taken place, almost all public infrastructure investment is conducted directly by the government, rather than

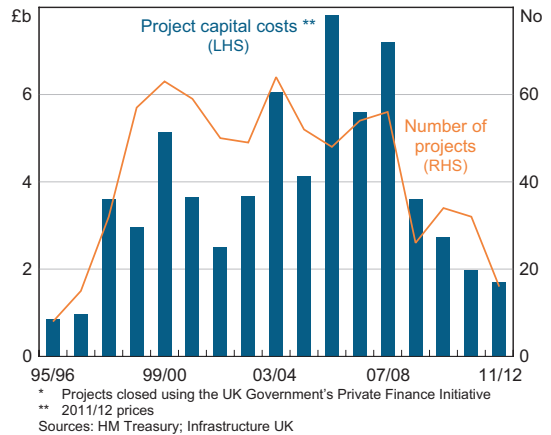
⁵ While individual superannuation investors have long-term investment horizons, Australian superannuation funds must consider the implications for liquidity of investing in illiquid infrastructure assets given that Australian legislation permits investors to switch between superannuation funds at short notice.

via GTEs. Public sector gross investment, which includes public infrastructure spending, has been falling since the financial crisis as part of a concerted fiscal consolidation by the UK Government, although it is projected to start increasing again from 2014/15 (HM Treasury 2010).

Prior to 2013, the United Kingdom used a PPP model known as the Private Finance Initiative (PFI), which the government considers to have constituted a small but important part of the government’s overall investment in public infrastructure (HM Treasury 2012a). In December 2012, the PFI was replaced with Private Finance 2 (PF2), following a review that found a number of problems with the PFI that had raised the overall costs of the projects and failed to deliver value for money to the taxpayer (HM Treasury 2012a). Key reforms include the public partner acting as a minority co-investor in PF2 projects, streamlined procurement processes and greater transparency. Under both the PFI and PF2, the private party is largely responsible for financing and constructing the infrastructure project. Once the project becomes operational and is performing to the required standard, the public sector partner pays a regular and predetermined ‘unitary charge’ to the private party, which covers maintenance costs and repayments on debt, over the life of the contract (typically 25–30 years). Equity investors receive all remaining cash flows once the project has paid off its debt, including from the potential sale of the asset at the end of the contract period. As of March 2012, contracts had been closed on more than 700 PFI projects, with a total capital cost of £54.7 billion and average annual unitary charges of £9–10 billion out to 2030 (Graph 7).

The government also introduced the UK Guarantees scheme in July 2012 in response to concerns that the contraction in European bank lending due to the global financial crisis would make it more difficult and expensive for private investors to attain long-term debt financing. Under the scheme, the government will provide a guarantee tailored to the specific financing needs of approved infrastructure

Graph 7
PPPs in the UK*



projects (in return for a fee). The scheme is targeted towards transport and energy infrastructure projects, with the government expecting that private utility companies will continue to obtain long-term financing in bond markets.

Conclusion

As shown by the four case studies in this article, countries use a variety of methods to finance their infrastructure needs reflecting their specific circumstances. Their level of success in encouraging private finance has varied, highlighting challenges faced by governments in trying to promote private investment in infrastructure. Ultimately, it is the risk-return profile of an infrastructure project that will determine the extent of private involvement, and government decisions and policy actions have a significant influence on this calculation.

International bodies such as the Study Group on Financing for Investment established by the G20 can usefully contribute to the discussion through cross-country analysis on how to facilitate long-term financing of infrastructure projects. Reflecting the need to tap into non-bank financing sources, the G20 Study Group is looking at ways to facilitate the efficient allocation of the global savings pool to generate long-term financing for investment. This work includes examining capital market

development and ways of using MDB resources to attract private co-financing for infrastructure projects in developing countries. Improving processes and transparency in relation to the planning, prioritisation and funding of infrastructure projects is also a priority. ✎

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G20 Financial Regulatory Reforms and Australia

Carl Schwartz*

The global financial crisis prompted a comprehensive international regulatory response, directed through the Group of Twenty (G20). The Reserve Bank and other Council of Financial Regulators (CFR) agencies have been heavily involved in the reform process, including engaging with international bodies on policy development, and implementing agreed reforms domestically. While the reforms have achieved a great deal, the Bank and other CFR agencies are mindful that the pace and volume of change are challenging for the financial system and regulators, and raise the potential for unintended consequences. Five years after the peak of the crisis, and with substantial policy development completed, there is an opportunity to focus the financial regulatory agenda on implementing reforms already agreed, with a close eye on their effectiveness.

Introduction

The global financial crisis prompted a comprehensive international regulatory response, directed through the G20. The Australian financial system was not as badly affected by the crisis as many other countries, though the crisis did highlight room for improvement in aspects of Australian regulatory and supervisory arrangements addressed by international reforms. More broadly, as part of the global financial system it is in Australia's interests to play by the rules.

The Bank and other CFR agencies – the Australian Prudential Regulation Authority (APRA), the Australian Securities and Investments Commission (ASIC) and the Australian Treasury – have therefore been heavily involved in the global reform process, engaging with the relevant international bodies on policy development. Domestically, there has been substantial and ongoing work to implement the agreed reforms. Another important ongoing aspect of the reform process is demonstrating, through international review processes, that Australia has implemented agreed reforms appropriately.

While the reforms have achieved a great deal, the Bank and other CFR agencies are mindful that the pace and volume of change are challenging for the financial system and regulators, and raise the potential for unintended consequences. With substantial policy development completed, there is an opportunity to focus on implementation of reforms already agreed, and pay close attention to their effectiveness.

This article provides an update on the financial regulatory reforms initiated through the G20 following the global financial crisis, and Australia's involvement in the reform process.

Post-crisis International Financial Reforms

The financial crisis revealed a number of shortcomings in regulatory and supervisory policies and practices, particularly in north Atlantic countries. International policymakers responded forcefully. In November 2008, Leaders of G20 countries gathered for the first time – previously this forum had been restricted to Finance Ministers and Central Bank Governors. In addition to declaring a united front to stabilise

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the financial system, Leaders set out principles for financial reforms and established an ambitious 47-point action plan. Financial reforms were further developed at subsequent G20 meetings and have remained a significant item on the G20 agenda.

In seeking reforms at the 2008 meeting, the Leaders called on a variety of international bodies such as the Financial Stability Board (FSB) (then the Financial Stability Forum (FSF)), the Basel Committee on Banking Supervision (BCBS) and the International Monetary Fund (IMF) to oversee policy development and implementation. In doing so, the G20 agreed that the FSF would be reconstituted as the FSB with a stronger institutional basis, enhanced capacity and wider membership.

The Leaders agreed on four key areas for reform.

- The first is to address the riskiness of financial institutions by strengthening *prudential regulatory standards*, led by banking reforms known as Basel III. To strengthen banks' ability to withstand losses, minimum capital ratios have been raised, capital has been defined more strictly to refer to genuinely loss-absorbing instruments, countercyclical capital add-ons are being considered, and a simple constraint on overall leverage has been added. To strengthen banks' liquidity management, new requirements have been developed such as the Liquidity Coverage Ratio, whereby banks must hold sufficient liquid assets to withstand a hypothetical 30-day period of funding stress.
- The second is to address the problem of an institution being '*too big to fail*', where the threatened failure of a systemically important financial institution (SIFI) would leave authorities with no option but to bail it out using public funds. The focus to date has been on global systemically important banks (G-SIBs). Currently, 28 institutions have been identified as G-SIBs, for which supervisory intensity has increased and capital surcharges will be set. Cross-border crisis management groups have been established for these institutions, and one of their key tasks

is to enhance recovery and resolution plans for these firms. The overall policy framework for SIFIs also applies more broadly: a principles-based regulatory framework has been developed for domestic systemically important banks (D-SIBs), nine global systemically important insurers have been identified and identification methodologies are being developed for global SIFIs other than banks and insurers.

- The third is to limit the scope for contagion arising from interconnections between counterparties in the *over-the-counter (OTC) derivatives market*. This is to be achieved by encouraging or mandating central clearing of standardised OTC derivatives contracts, introducing higher capital charges and collateralisation where trades are not centrally cleared, and improving transparency by requiring that all contracts be reported to trade repositories and, where appropriate, moving trading onto electronic platforms.
- The fourth is to address risks arising from *shadow banking* – entities and activities outside the regular banking system that are associated with credit intermediation and maturity/liquidity transformation. At the September 2013 Summit, Leaders agreed on implementation of a number of policy proposals regarding shadow banking, including measures to reduce the risks posed by banks' interactions with shadow banking entities, and from securities lending and repurchase agreements.

Regulatory reform work has, however, extended well beyond these areas. Other areas of reform which have been agreed include regulators taking greater account of macroprudential risks across the financial system, taking steps towards more effective supervision, and addressing misaligned incentives across a range of areas such as securitisation, credit rating agencies and bankers' remuneration. The volume of work emanating from the reform process is considerable, with steps in each workstream typically involving the development of policies, implementation and subsequent monitoring and peer review of implementation.

Table 1 presents selected information from the FSB report on progress on financial regulatory reform presented at the G20 Leaders' Summit in early September, focusing on the four main areas previously identified; these account for only 20 of the 39 workstreams covered in the full report. Reflecting the considerable work on implementation, and the goal of minimising any disruption in moving to the

new regulatory environments, the reforms are often being phased in over a long period. As judged by the FSB, global policy development across the main areas is broadly on track with the planned timetable (green shading), though national implementation is lagging in some areas, particularly for crisis resolution preparation (red shading).

Table 1: Selected G20 Recommendations on Financial Regulatory Reform and Progress



















Main Areas	Global policy development		National implementation	
	Bodies ^(a)	Status ^(b)	Deadline	Status ^(b)
1. Building Resilient Financial Institutions				
Development and implementation of the Basel III capital and liquidity framework.	BCBS		Various, often phased in by 2019	
Adoption of Basel II and II.5 (enhancing securitisation and trading book exposure) frameworks.	–	–	2011	
Develop guidelines and strengthen supervision of banks' risk management practices.	BCBS		Ongoing	
Implement FSB standards on sound compensation practices.	FSB		Ongoing	
2. Ending 'Too Big To Fail'				
Develop measures for G-SIFIs including a resolution framework, higher loss absorbency and more intensive supervisory oversight.	FSB, BCBS, IAIS, CPSS, IOSCO		Various: resolution plans 2013/14; loss absorbency 2016/19	
Extend G-SIFI framework to D-SIBs.	FSB, BCBS		2016	–
Prepare methodologies to identify systemically important non-bank financial entities.	FSB, IOSCO		–	–
Develop key attributes of effective resolution regimes. Countries to establish legal framework for crisis intervention and groups for major cross-border firms.	FSB		Ongoing	
Supervisors to have strong mandates, independence, resources and powers to proactively address risks.	FSB		Ongoing	
Establish supervisory colleges for significant cross-border firms.	–	–	June 2009	
Regular peer reviews on the effectiveness and consistency of national policy measures for G-SIFIs.	FSB		Ongoing	

Table 1: Selected G20 Recommendations on Financial Regulatory Reform and Progress (continued)

Main Areas	Global policy development		National implementation	
	Bodies ^(a)	Status ^(b)	Deadline	Status ^(b)
3. OTC Derivatives Reforms				
Standardised OTC derivative contracts to be traded on exchanges or electronic trading platforms, where appropriate, and cleared through central counterparties. All derivatives trades to be reported to trade repositories. Non-centrally cleared contracts to be subject to higher capital requirements.	CPSS, IOSCO, BCBS		End 2012	
Standards to be developed on margining for non-centrally cleared derivatives.	BCBS, IOSCO, relevant authorities		–	–
Functioning and role of credit default swaps markets to be assessed.	IOSCO		–	–
Regulation, functioning and transparency of commodity derivative markets to be improved.	IOSCO, FSB, relevant authorities		Ongoing	
4. Shadow Banking – The Regulatory Perimeter				
Develop and implement recommendations to strengthen oversight of the shadow banking system.	FSB, SSBs		Ongoing	
Develop and implement recommendations to strengthen regulation of the shadow banking system.	FSB, SSBs		Various	–
Require hedge fund registration and ongoing disclosure of appropriate information.	IOSCO		Ongoing	
Develop mechanisms for cooperation between relevant authorities to ensure effective hedge fund oversight.	FSB, IOSCO		Ongoing	
Securitisation sponsors or originators to retain a part of the risk of the underlying assets.	IOSCO, BCBS, Joint Forum		Ongoing	

(a) BCBS – Basel Committee on Banking Supervision, FSB – Financial Stability Board, IAIS – International Association of Insurance Supervisors, CPSS – Committee on Payment and Settlement Systems, IOSCO – International Organization of Securities Commissions, SSBs – standard-setting bodies; Joint Forum – group comprising BCBS, IAIS and IOSCO

(b) Colouring reflects FSB judgements on status of global progress: green denotes complete or on track in a manner consistent with the plan; amber denotes facing some difficulties in meeting its objective and timelines in a significant number of member jurisdictions; and red denotes not making adequate progress across G20 jurisdictions; dashes signify not yet applicable or not relevant

Sources: FSB (2013); RBA

The global reform process has been dominated by the north Atlantic countries most affected by the crisis. In effect, these countries are promoting a marked strengthening in their domestic regulatory approaches from the earlier approaches. There has been considerable progress and many useful reforms have been undertaken. However, applying global reforms across a wide range of financial systems and regulatory approaches is not without challenges. Some of the international reforms are addressing problems emanating from more market-based financial systems than those in other countries. Some flexibility to adapt reforms to national circumstances is needed, particularly for countries where financial systems came through the crisis in relatively better shape and regulatory settings proved more appropriate – such as Australia and much of Asia. Another challenge for regulators and financial systems has been keeping up with the rapid pace of policy development and implementation.

Australia and the International Financial Reforms

As part of the global financial system, Australia has a strong incentive to play by the rules. Also, while the Australian financial system and regulatory arrangements fared better than many during the financial crisis, the experience highlighted room for improvement. Accordingly, Australian regulatory agencies have been actively engaged in all aspects of the international reform process: policy development, implementation and peer review. This has required active engagement by the Bank and other CFR agencies in the international arena, including representation on a wide range of international groups (Table 2).

Overall, Australia is generally meeting, or in some cases is ahead of, the international implementation timetable.

- On *strengthening prudential regulatory standards*, Australia is relatively well advanced in adopting the Basel III reforms. Of the 27 member

jurisdictions, Australia is one of 11 that have issued final Basel III capital rules that are legally in force. APRA is requiring authorised deposit-taking institutions (ADIs) to meet a number of the key capital measures two or three years earlier than the extended timetable required under Basel III and it is not using the discretion available under Basel III to provide concessional treatment for certain items in calculating regulatory capital (e.g. deferred tax assets). APRA, with input from the Bank, has also made good progress on developing the Basel III liquidity standards for Australia. While the Basel Committee has allowed delayed implementation, APRA has adopted the more ambitious original timetable and will implement the Liquidity Coverage Ratio requirement fully on 1 January 2015.

- Australian banks are not globally systemic and are therefore not subject to the stricter rules for G-SIBs addressing *'too big to fail'*. However, APRA is working on policies to reflect the Basel Committee's framework for domestic systemically important banks (D-SIBs), with the initial draft expected by early 2014. The framework will involve some additional minimum capital requirements to absorb losses and more intense supervision than is applied to the 'average' ADI – a feature that is already an important part of APRA's supervisory approach. In the area of resolution arrangements, a number of steps have been taken in recent years, including strengthening APRA's crisis management powers in 2008 and 2010, enhanced powers for information sharing for the Reserve Bank, ongoing engagement with New Zealand authorities around crisis management, and moves to refine the Financial Claims Scheme (FCS). This includes the CFR recommendation to government in March 2013 that the FCS should move to a prefunded arrangement. The FSB's peer review of resolution regimes found that Australia's resolution arrangements in respect of ADIs and insurers were generally consistent with international best practice and compared well to many other jurisdictions.

Table 2: Australian Representation on Selected International Groups^(a)

Body	Reserve Bank	Other CFR agencies
Group of Twenty (G20)		
Finance Ministers and Central Bank Governors	Governor	Treasurer
Other groups	5 representatives	5 representatives
Financial Stability Board (FSB)		
Plenary	Governor	Executive Director (Treasury), Chairman (ASIC) ^(b)
Steering Committee	Governor	Executive Director (Treasury), Chairman (ASIC) ^(b)
Standing Committee on Assessment of Vulnerabilities	Governor	
Regional Consultative Group for Asia	Governor	Executive Director (Treasury)
Official Sector Steering Group (on financial benchmarks)	Assistant Governor	Chairman (ASIC)
Other groups	11 representatives	13 representatives
Bank for International Settlements (BIS)		
Governors Meeting	Governor, Deputy Governor	
Asian Consultative Council	Governor, Deputy Governor	
Basel Committee on Banking Supervision	Assistant Governor	Chairman (APRA)
Group of Governors and Heads of Supervision	Governor	Chairman (APRA)
Committee on Payment and Settlement Systems	Department Head	
Other groups	14 representatives	15 representatives
International Association of Insurance Supervisors (IAIS)		
Working groups		3 representatives
International Organization of Securities Commissions (IOSCO)		
Board		Chair: Chairman (ASIC)
Asia-Pacific Regional Committee		Chairman (ASIC)
Task Force on Unregulated Financial Markets and Products		Chair: Chairman (ASIC), Senior Advisor (ASIC)/Senior Executive (ASIC)
Task Force on Financial Market Benchmarks		Chairman (ASIC), Senior Executive (ASIC)
Other groups		11 representatives

(a) Groups are generally separately named where a CFR agency head is a member, plus the CPSS given its importance to payment system reforms; other bodies not separately mentioned include the IMF, the OECD and several regional groupings

(b) The Chairman of ASIC is represented on these committees as Chairman of IOSCO

Source: RBA

- For *OTC derivatives markets*, in line with the G20 Leaders' commitments, amendments to the *Corporations Act 2001* were passed in Australia in December 2012 that give the government the power to impose mandatory central clearing, trade reporting or platform-based execution requirements. The legislative framework established in Australia is designed to be flexible, given the cross-border reach of some other jurisdictions' legislation in this area and uncertainties around the broader effects of regulation of these markets on market functioning. In particular, the Australian framework establishes a mechanism for the government to impose such requirements on the advice of the Bank, ASIC and APRA, rather than imposing them directly via legislation. To inform their advice, the regulators produce periodic assessment reports, which in October 2012 recommended the introduction of a broad-based mandatory trade reporting obligation for OTC derivatives, and in July 2013 recommended a central clearing mandate for US dollar-, euro-, British pound- and yen-denominated interest rate derivatives. In respect of Australian dollar-denominated interest rate derivatives, which the regulators consider to be the most systemically important derivatives product class in Australia, a decision on mandatory clearing has been deferred until the next report in early 2014.
- Australia has also adopted international reforms designed to improve the operational and financial robustness of financial market infrastructures (FMIs), such as central counterparties, given that OTC derivatives reforms will increase market participants' dependence on them. The Bank has revised its own Financial Stability Standards for central counterparties and securities settlement facilities to align them with the new international principles, and recently published its first assessments of the ASX clearing and settlement facilities against the new standards (RBA 2013). The Bank will assess Australia's high-value payments system, the Reserve Bank Information and Transfer System (RITS),

against the principles on an annual basis. ASIC has similarly reflected the requirements of the principles within its regime, where relevant. The CFR is also working to improve Australia's capacity to resolve distressed FMIs, which (as in many other jurisdictions) remains a gap in the resolution framework here.

- There has been relatively less domestic focus on implementation of *shadow banking* reform given that the bulk of global proposals have only recently been finalised. During the policy development phase, Australia has argued that regulators need sufficient flexibility to respond proportionately to risks, reflecting the fact that in Australia the shadow banking sector has a relatively small share of financing activity and the possibility that heavy regulation may impose costs in excess of potential benefits. In Australia, the CFR reviews potential risks arising from the shadow banking sector on an annual basis, ASIC has increased the scrutiny on hedge funds and APRA and ASIC have moved to strengthen regulation of finance companies that issue debentures to retail investors. Also, APRA will soon release further guidelines on securitisation.

In working on these and other areas of reform, Australia's motivation has been to ensure good policy outcomes, that flexibility in rules and implementation is retained where appropriate and that global rules remain sensible for Australia. At times, the Bank and other CFR agencies have sought to modify international proposals that were not well suited to the Australian financial system. For example:

- On Basel III liquidity, Australian banks would not be able to meet the proposed Liquidity Coverage Ratio requirement purely by holding existing liquid assets because government debt is relatively scarce in Australia compared with other jurisdictions. In response, the Bank and APRA successfully argued for a menu of alternative approaches to these requirements, and developed and gained global acceptance for the Committed Liquidity Facility through which the requirement can be met in Australia.

- A key issue in implementing the OTC derivatives reforms in smaller jurisdictions has been ensuring access to appropriate clearing arrangements. Regulators from some countries, including Canada and Australia, did not want to constrain market participants' choices by insisting that OTC derivatives be cleared locally, recognising that some market participants would rather clear via an overseas-based central counterparty (CCP). The FSB developed 'four safeguards' for access to, and oversight of, overseas-based CCPs to accommodate this. They are: a framework for international cooperative oversight; fair and open access criteria that promote competition; appropriate liquidity arrangements in all relevant currencies; and procedures for effective resolution.

The Way Forward for International Regulatory Reform

A familiar refrain regarding financial regulatory reform is that 'good progress has been made but much remains to be done'. As previously noted, even just across the four main areas of reform there remain a number of aspects of policy to finalise. Further rounds of policy implementation and peer review will follow. This will add to existing work that already extends well into the future. Even within major reforms like the Basel III framework, the timetable for full implementation of key capital and liquidity requirements stretches out at least to 2019.

Moreover, new workstreams and policy proposals keep arising. For example, following the flaws exposed by abuses of the London Interbank Offered Rate (LIBOR) and other financial benchmarks, a high-level working group on reform of financial benchmarks was established on which both the Bank and ASIC are represented. Following an international review, work has recently been initiated to improve the comparability across banks of the risk weights used under the Basel capital framework, and consider whether the framework achieves the right balance between simplicity, risk sensitivity and comparability across banks. Work has also recently

been commissioned to consider the global financial stability implications of national structural banking reform measures taken in part to address the 'too big to fail' issue – such as the Volcker Rule in the United States.

The pace and volume of change is placing large demands on regulators and financial institutions, and runs some risk of absorbing resources that could be used for more useful risk management purposes. There is also potential for the vast number of reforms to cut across each other and have unintended effects. One example of the tensions in financial regulation are reform efforts to reduce counterparty risk by increasing collateralisation of banks' exposures, including through CCPs. However, a recent Bank for International Settlements report suggests that the side-effects of doing so could run counter to achieving other high-level objectives, including reducing interconnectedness, reducing procyclicality and reducing uncertainty, given the way that financial institutions are likely to respond to managing collateral.¹

The G20 in 2014 could focus on implementation of agreed reforms, with refinement where necessary if they are ineffective or there are unintended consequences.² This approach should streamline the financial regulation agenda, which in the post-crisis period has grown dramatically.³ ❖

1 This example was highlighted recently in a speech by Lowe (2013).

2 The focus on implementation was suggested in a speech by Stevens (2013).

3 For a range of views on the G20 and financial regulation agenda, see Lowy Institute (2013).

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Reserve Bank Publications

Most of the publications listed below are available free of charge on the Bank's website (www.rba.gov.au). Printed copies of these publications, as well as a wide range of earlier publications, are also available on request; for details refer to the enquiries information at the front of the *Bulletin*.

Statement on Monetary Policy

These statements, issued in February, May, August and November, assess current economic conditions and the prospects for inflation and output.

Financial Stability Review

These reviews, issued in March and September, assess the current condition of the financial system and potential risks to financial stability, and survey policy developments designed to improve financial stability.

Annual Reports

- *Reserve Bank of Australia Annual Report*
- *Payments System Board Annual Report*
- *Equity & Diversity Annual Report*

Research Discussion Papers (RDPs)

This series of papers is intended to make the results of current economic research within the Bank available for discussion and comment. The views expressed in these papers are those of the authors and not necessarily those of the Bank.

Abstracts or introductions of all RDPs, and the full text of RDPs published since 1988, are available on the Bank's website.

Conference Volumes

Conference volumes have been published on the Bank's website since 1993. The most recent titles are:

- *Property Markets and Financial Stability*, December 2012
- *The Australian Economy in the 2000s*, December 2011

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The Bank periodically produces other publications that may take the form of submissions to inquiries, surveys or consultation documents. Some recent examples include:

- *2012/13 Assessment of ASX Clearing and Settlement Facilities*, September 2013
- *Report on the Australian OTC Derivatives Market*, July 2013
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- *Review of Card System Access Regimes: A Consultation Document*, May 2013
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