Bulletin

JULY 2024

RESERVE BANK OF AUSTRALIA

The *Bulletin* is published under the direction of the Bulletin editorial team:
Beth Tasker and Gordana Peresin (Managing Editors), Amanda Martz (Advisor) and
David Norman (Advisor).

The graphs in this publication were generated using Mathematica.

ISSN 1837–7211

Bulletin

JULY 2024

Contents

Assessing Potential Output and the Output Gap in Australia

James Bishop, Jessica Hua, Shayan Omidi, Xuan Zhou and Alexander Ballantyne[*]

Photo: Peter Cade – Getty Images

Abstract

The output gap – the difference between actual output and potential output – is an important consideration for monetary policy as it is a measure of the extent of spare capacity in the economy. This article explains how RBA staff form an assessment of potential output and the output gap. We draw on a range of model-based estimates, capacity utilisation indicators and activity measures. Model-based estimates give a quantitative assessment of the level of spare capacity in the economy, but there is considerable uncertainty modelling unobserved concepts like potential output and the output gap. Ultimately, assessing spare capacity in the economy requires careful judgement in weighing up all available information, which the RBA sets out in its quarterly *Statement on Monetary Policy*.

Introduction

Monetary policy in Australia primarily influences aggregate demand – that is, the overall spending on goods and services in the economy. How the level of aggregate demand affects consumer price inflation and the labour market depends on the productive capacity of the economy. Potential output is a measure of this productive capacity. It is not an objective of monetary policy and monetary policy can do little to directly influence it. However, the output gap – the difference between actual output and potential output – is a measure of spare capacity in the economy that is closely related to the RBA's objectives of price stability and full employment. Following the 2023 Review of the RBA, the Treasurer and the Reserve Bank Board agreed in the *Statement on the Conduct of Monetary Policy* that the RBA would regularly publish its assessment of potential output (Treasurer and Reserve Bank Board 2023). An explanation about the role of potential output and the output gap in monetary policy was provided in the May *Statement on Monetary Policy* (RBA 2024a). This article explains in more detail how RBA staff form an assessment of potential output and the output gap.

Potential output and the Australian economy

What is potential output?

Potential output is the total amount of goods and services that can be produced by an economy that is operating at a 'sustainable' capacity. In this context, sustainable means being consistent with low and stable inflation over the business cycle. When output is equal to potential output, the economy is considered to be in balance. Over the medium-to-long term, an economy that is operating at its potential level of output is also achieving both price stability and sustained full employment.

Potential output captures the productive capacity of the economy, which grows over time, and so determines the longer term economic growth that Australia can sustain. It depends on all the inputs that are available for production – so-called 'factors of production' – and how efficiently and intensively they are used to produce goods and services – so-called 'multifactor productivity' (MFP). It is common to focus on two primary factors of production: labour, which comprises total hours worked; and capital, which comprises all the buildings, machinery and equipment used by firms, as well as intellectual property assets like computer software.[1]

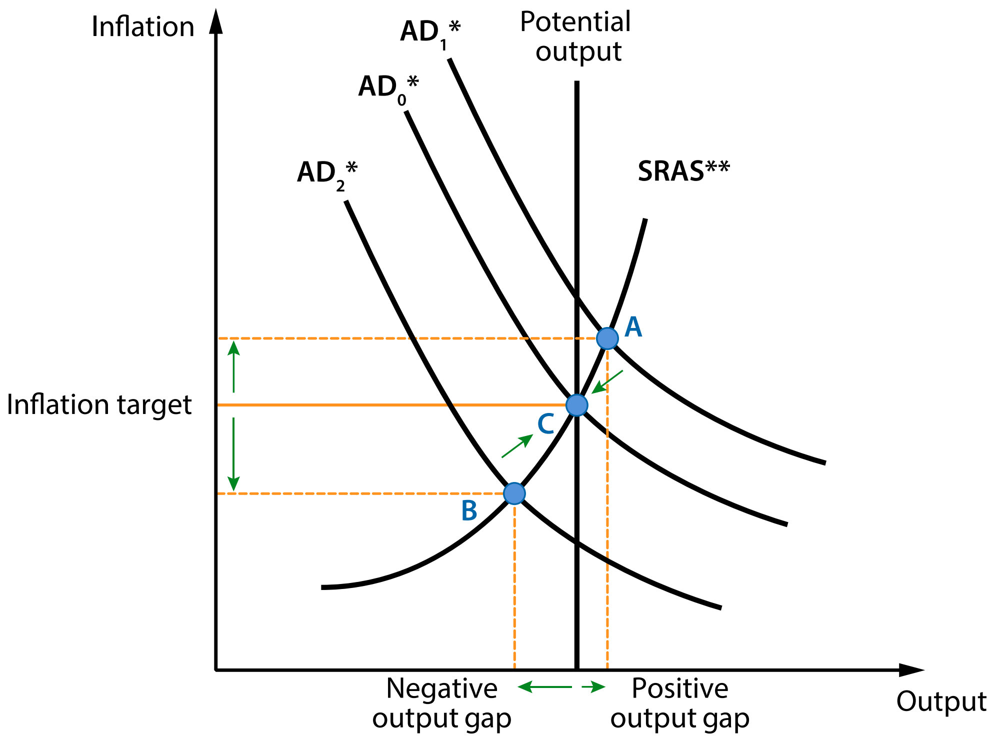
The level of potential output varies over time because of structural changes in the availability of labour and capital, as well as changes in productivity. These changes are likely to have an enduring effect on the productive capacity of the economy. The availability of labour evolves with growth in the overall size of the population and the number of hours each person is willing and able to work when the economy is at full employment. The stock of capital increases or decreases as firms invest in new assets and maintain or retire assets that have depreciated over time.[2] Productivity growth captures how efficiently the economy can use its resources to produce goods and services, which will depend on drivers including technological progress, the skills of the workforce and firms' managerial expertise. When productivity grows, the economy can produce more output even if no additional labour or capital is used. All else being equal, productivity growth can reduce inflationary pressure in the short term, as goods and services can be produced more cheaply by using inputs more efficiently.

Temporary shocks to the production of goods and services will affect the economy's supply capacity for only brief periods. As a result, they can affect short-run aggregate supply, but are not likely to affect potential output and are less likely to matter for inflation over the medium term. For example, severe weather, such as floods, can temporarily disrupt the domestic production of certain foods. While such events can lead to a shortage of these foods, and put significant upwards pressure on their prices, the effects on the overall productive capacity of the economy are typically not persistent enough to affect potential output over the horizon that is important for monetary policy. That said, if such shocks are more frequent or intense, this could affect the available resources of the economy in an ongoing manner and so weigh on potential output over time.

What is the output gap?

The level of potential output provides a benchmark to assess the balance of aggregate demand and aggregate supply. A simple aggregate demand/ aggregate supply framework can illustrate this balance, as shown in Figure 1. In the figure, aggregate demand reflects the total demand for goods and services in the economy and potential output reflects long-run aggregate supply in the economy.[3] The aggregate demand (AD) curves are downward sloping as demand is higher when inflation is low; while the potential output curve is vertical as it reflects the long-run productive capacity of the economy, regardless of prices. There is also a short-run aggregate supply (SRAS) curve, which reflects actual supply or how suppliers meet

Figure 1: Potential Output in an Aggregate Demand/Aggregate Supply Framework



Source: RBA. ***AD** - Aggregate demand ****SRAS** - Short run aggregate supply

aggregate demand in the short run. The SRAS curve is upward sloping as businesses are more willing to supply goods and services as prices rise.

When output exceeds potential output (point A), in this case due to higher demand, there is a positive 'output gap'. The economy can accommodate this in the short run, as aggregate supply can exceed potential output in the short run by utilising existing factors of production intensively to meet demand (moving along the SRAS curve). That is, workers can increase their hours and firms can ramp up their use of existing capital. But this cannot be sustained without inflationary pressures rising. Wage pressures will increase due to tight conditions in the labour market and other input costs will rise when firms operate their stock of capital intensively and compete for scarce inputs. As a result, inflation will typically rise above target. This is costly as higher inflation erodes real incomes and can hamper long-run economic growth by introducing uncertainty into the economy. To bring inflation back to target, the RBA may need to raise the nominal cash rate. This reduces aggregate demand (demand shifts to AD_0), bringing the economy to point C. At point C, the economy is considered to be in balance; aggregate demand is at the level such that output is equal to potential output and inflation is at target.

On the other hand, when aggregate demand is weak and output is below potential output (point B), there is a negative 'output gap'. A negative output gap often coincides with employment below full employment and capital being underutilised. This is costly in terms of the lost production and consumption from not making full use of Australia's resources, and in terms of the financial and social costs of employment being below full employment. The experience of many economies after deep recessions has led to suggestions that demand shortfalls can have very persistent (or even permanent) effects on potential output; for example, through so-called labour market 'hysteresis' or 'scarring effects' whereby people who are unemployed for an extended period experience a gradual erosion of their skills and become more likely to leave the labour force altogether. Along with the social costs of long-term unemployment, potential output is also reduced. A negative output gap will also see inflationary pressures (such as wage and other input cost pressures) decrease, which will lead to inflation falling below target. To bring inflation back to target, the RBA may need to lower the nominal cash rate. This will increase aggregate demand (demand shifts to AD_0), bringing the economy to point C and back into balance.

How does potential output relate to full employment?

Full employment is the maximum level of employment consistent with low and stable inflation over the business cycle.[4] While this implies a balance between demand and supply in the labour market, it also requires demand for goods and services to be in balance with what the economy can sustainably produce, and thereby economic activity in line with potential output. Over the medium-to-long term, an economy with a closed output gap is also achieving sustained full employment.

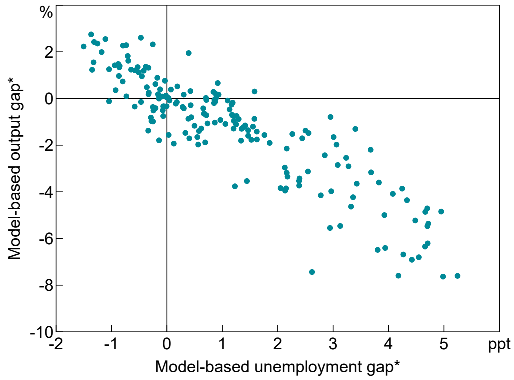
In the short term, deviations of output from potential output tend to coincide with movements in the labour market away from full employment. Tight labour market conditions – such as when the unemployment rate falls below levels consistent with full employment, creating a negative 'unemployment gap' – tend to coincide with intensive use of capital inputs and a deviation of output from its potential level. This is a well-documented empirical relationship known as 'Okun's law'. While estimates of Okun's law can be sensitive to modelling assumptions, the precise measures of spare capacity used, and structural change, a model-based estimate for Australia suggests that a negative unemployment gap of 1 percentage point tends to be associated with a positive output gap of 1¼ per cent, on average (Graph 1). In addition to the utilisation rates of capital and labour responding similarly to shifts in aggregate demand, the association in the graph also reflects the fact that labour inputs account for a large share of costs of production in the aggregate economy – that is, the 'labour' component comprises a substantial portion of the output gap.

But there is still some variation in the relationship, as the respective gaps can sometimes give different signals about the balance between demand and supply in the economy.

Graph 1

Okun's Law

1978–2023



* Estimates from one of the models in the RBA's suite.

Sources: ABS; RBA.

How does the output gap relate to inflation?

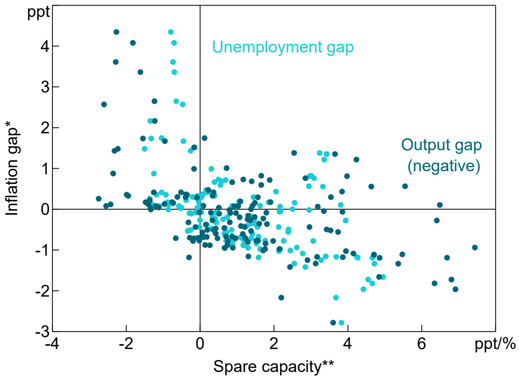
The output gap captures imbalances between aggregate demand and aggregate supply in the markets for goods and services and therefore the ability of, or need for, firms to adjust prices. When actual output and potential output diverge, inflation will typically move away from target. But over the medium-to-long term, a closed output gap sees inflation running at target.

Conceptually, the output gap is a better indicator of near-term inflationary pressures than measures of spare capacity in the labour market alone, but this might not be the case in practice. The relationship between a measure of spare capacity (either labour or activity) and inflation is known as the 'Phillips curve' (Graph 2). Since most of the cyclical variation in output gap measures is driven by the labour market, the additional information – and uncertainty – in the output gap often does not provide more statistical explanatory power than labour market gaps in models of inflation.[5] Nonetheless, the relationships between the output gap, labour market and inflation provide frameworks that helps us measure potential output and the output gap.

Graph 2

Phillips Curve

1985–2023



* Trimmed mean inflation minus trend inflation expectations.
** Unemployment gap (ppt) or negative output gap (%) estimates.
Sources: ABS; RBA.

Assessing potential output and the output gap

Potential output and the output gap cannot be observed directly, they can only be inferred from other information and so the estimates are uncertain. This is common to other so-called 'star variables', including the neutral rate of interest and the non-accelerating inflation rate of unemployment (NAIRU). The main focus of our assessment is short-to-medium term fluctuations of output from the level of potential output; that is, the extent to which the output gap moves over the business cycle.

The RBA uses a broad-based approach to assessing potential output and the output gap, which is consistent with peer central banks. Model-based estimates provide a core foundation for our assessment, as there are fewer survey-based indicators of spare capacity for product markets compared with factor markets (including the labour market). But the RBA does draw on a broad range of information beyond models – including capacity utilisation indicators, activity measures and inflation outcomes – to form an assessment of potential output and the output gap. Due to the close connection with the labour market, this includes indicators and model-based estimates that feed into our assessment of full employment. Our assessment is also guided by economic research and views from academics, market economists, government agencies, international organisations and other central banks.

How models inform our assessment

By exploiting historical relationships between economic indicators, models help us synthesise multiple pieces of information into a quantitative assessment of potential output and the output gap. There are four broad modelling approaches for estimating potential output: the production function approach, univariate filters, multivariate filters and structural models. Different modelling approaches have different strengths and weaknesses. The RBA uses a suite of models to capture a range of perspectives about potential output and the output gap. This includes a production function approach and two multivariate filters, which is broadly consistent with peer central banks and international institutions such as the Organisation for Economic Co-operation and Development (OECD) and International Monetary Fund (IMF).

Models require us to make a number of design choices and assumptions, and estimates can be highly sensitive to these features. In line with academic research and the approach of peer central banks, we use economic theory, statistical properties of the data and judgement to inform the structure of the models. However, given the uncertainty around modelling decisions, we also have alternative specifications for each model in the suite, which helps capture a broader range of possible outcomes.

Overall, the RBA's three different models emphasise different aspects of potential output and the output gap:

- The production function model draws out the various drivers of long-term economic growth and provides smooth estimates of potential output.
- The small multivariate output gap (SMOG) model relates the output gap to the cyclical components of inflation, unemployment and GDP, and results in estimates of potential output that fluctuate more than the production function estimates.
- The 'Joint-stars' model is a large multivariate filter that combines features of the production function and SMOG models to jointly estimate

long-term drivers of growth and cyclical output gap movements.

The SMOG and Joint-stars models bring together observed historical relationships and an economic structure that relates to the objectives of monetary policy (Figure 2). In contrast, the production function approach has less explicit connection to monetary policy objectives, but in focusing on the fundamental determinants of economic activity (like productivity and population) it provides a useful long-run benchmark for economic growth.

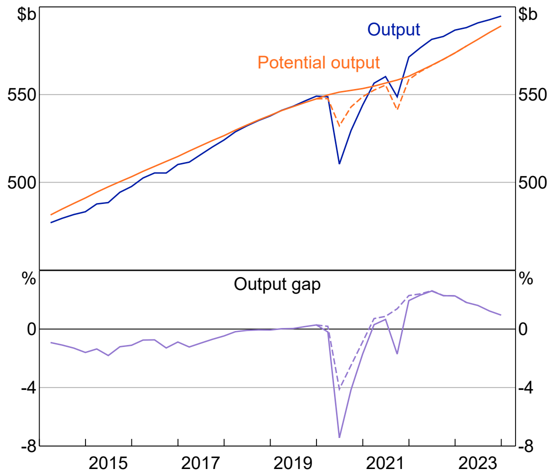
A production function model

A production function is an economic equation that expresses how much output is produced for given quantities of the factors of production. The RBA's production function model infers potential output by filtering slow-moving structural trends in the factors of production from observable data. These structural trends reflect the amount of labour, capital and MFP available in the economy when it is operating sustainably – so-called potential labour, potential capital and potential MFP. We combine these potential components using a production function to estimate aggregate potential output, which is then used to calculate an output gap (Graph 3).[6] Since it focuses on the structural trend of the factors of production, the production function approach is useful in highlighting the structural forces on the supply side of the economy that drive economic growth in the long term, such as structural trends in labour force participation.

Graph 3

Aggregate Demand and Potential Output*

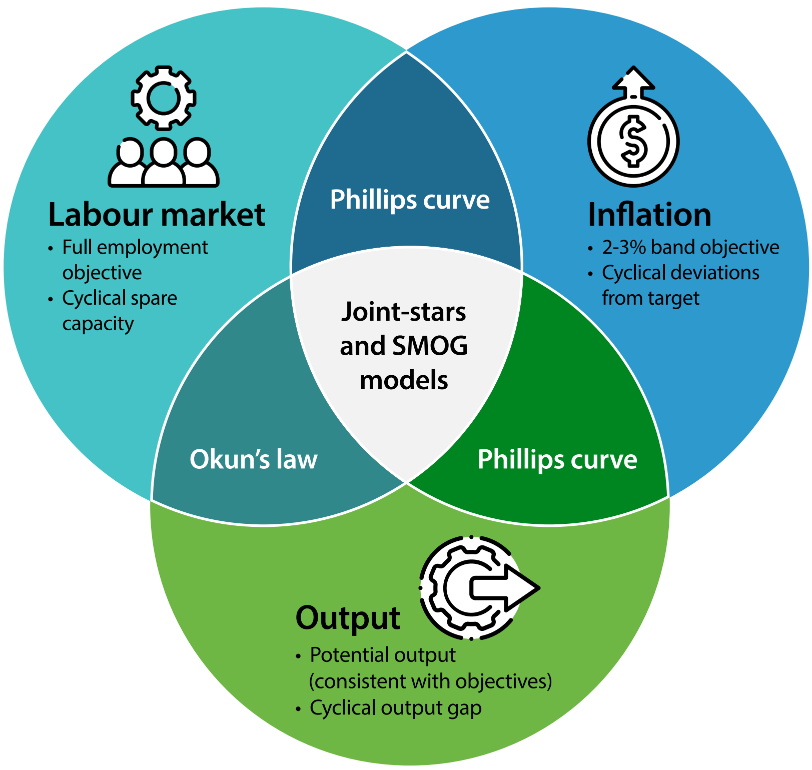
Production function model



* Estimates of potential output and output gap from the production function model in the RBA's model suite; dashed lines include an illustrative adjustment for pandemic activity restrictions; levels reflect 2021/22 prices.

Sources: ABS; RBA.

Figure 2: Potential Output Models and Monetary Policy Framework

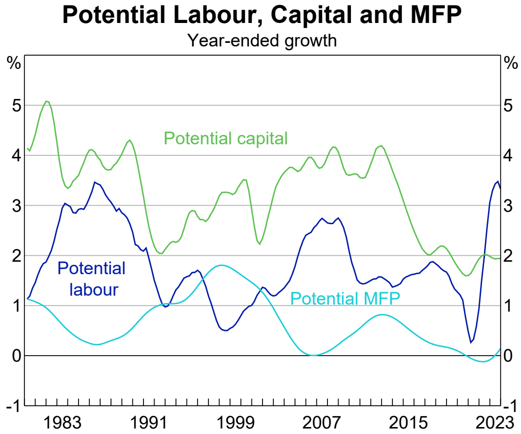


Source: RBA.

Potential labour depends on the working age population and structural trends in the participation rate, employment rate and average hours worked. As the observed participation rate and average hours worked respond to the business cycle, we need to adjust these series using statistical techniques to obtain estimates of their underlying structural trends. The trend employment rate is calculated as one minus the NAIRU (the structural trend of the unemployment rate). The NAIRU is estimated separately as discussed in Ballantyne, Sharma and Taylor (2024). Since 2020, there have been large swings in population growth and, by extension, potential labour and potential output due to the pandemic (Graph 4). Despite current population growth remaining elevated, overall these movements have broadly washed out to return the level of the working age population to around its pre-pandemic trend.

Graph 4

Potential Labour, Capital and MFP



Sources: ABS; RBA.

We assume potential capital is equal to the capital stock.[7] This implies that when the economy is operating at its potential, the entirety of the net capital stock is being utilised at normal rates. Growth in potential capital has been relatively stable over the past few years (Graph 4). Recent growth reflects broad-based investment in the non-mining sector. The large decline in potential capital growth from 2013 to 2015 reflects structural shifts in the mining sector as it transitioned from investment – that is, building potential capital – to production and realising its potential capital.

Potential MFP reflects long-run technological progress in the economy, as well as additions to the skill level of the workforce or organisational expertise. MFP is difficult to measure in practice, so we estimate it as the residual in the production function (which is a standard approach). We estimate potential MFP by extracting the slow-moving trend of MFP using a statistical filter. Growth in potential MFP has declined over the past decade, consistent with a broader slowdown in productivity growth seen in other advanced economies (Bruno, Dunphy and Georgiakakis 2023).

While the production function approach abstracts from cyclical factors by statistical filtering, a limitation of the model is that it does not take direct signal from inflation. In addition, there is considerable uncertainty in filtering structural trends, particularly for MFP. Given this uncertainty, we have an alternate specification of the model that allows for more volatility in potential MFP.

A small multivariate output gap (SMOG) model

The SMOG model is a multivariate filtering model. This class of models infers unobservable variables from data on several measurable variables. The SMOG model estimates the trend and cyclical components of non-farm GDP by using non-farm GDP, inflation, nominal unit labour costs (a productivity-adjusted measure of wages) and the unemployment rate. The trend estimates provide the level of potential output, while the cyclical component provides the output gap.

The SMOG model infers the output gap from the cyclical movements in unemployment through an Okun's law relationship and inflation through a Phillips curve relationship. Nominal unit labour costs also help inform the cyclical movements in unemployment through a Phillips curve relationship based on wages growth (instead of inflation). For example, high inflation or wages growth may indicate building price pressure in an economy that is operating beyond its ability to sustainably produce goods and services. The model would then point to a positive output gap (GDP above potential output). Alternatively, high unemployment is suggestive of supply capacity exceeding demand in the economy; the model would read this as indicating a negative output gap.

The SMOG model also takes signal from GDP to jointly inform the output gap and the level of potential output. This is one key difference with the production function approach, which focuses on estimating potential output and then allows the output gap to be calculated separately. One consequence of this modelling decision is that the SMOG model tends to produce more volatile estimates of potential output.

The model allows us to calculate how much each observable variable contributes to movements in the estimates of the output gap. Unemployment is the largest contributor, driving about 35 per cent of movements in the estimate (Graph 5). This reinforces the importance of the labour market in assessing spare capacity in the Australian economy; however, other factors also contribute substantially, which is consistent with the balance between supply and demand in the economy depending on more than just the labour market. Inflation drives a little under 30 per cent of movements in the output gap estimates, and nominal unit labour costs contribute a further 10 per cent. The large inflation contribution indicates that the SMOG model is taking meaningful signal about the output gap from price pressures in the economy, which the production function approach does not incorporate directly. As such, potential output in this model corresponds more closely to the level of output the economy can sustain while maintaining low and stable inflation. Finally, GDP also drives a little under 30 per cent of movements in the estimated output gap.

Although the SMOG model has benefits in terms of its simplicity and its ability to take signal from inflation, the model is not without its limitations. Most importantly, the simpler structure we have imposed on potential output precludes the model from taking signal from the underlying drivers of the productive capacity of the economy, such as population growth and productivity growth. The model estimates are also sensitive to assumptions, so we maintain a few alternative specifications. Further details on this model are provided in Appendix A.

A jointly estimated star variable (Joint-stars) model

The Joint-stars model is a large multivariate filter model that jointly estimates many so-called 'star variables' that together capture the unobserved determinants of the supply side of the Australia economy.[8] The model jointly estimates potential output, the output gap, the NAIRU and the neutral interest rate. It integrates features from both the SMOG model and the production function model; it takes signal from cyclical variables such as inflation, the unemployment rate and the cash rate, but also uses a production function that incorporates productivity, labour and capital to construct estimates of potential output and the output gap.

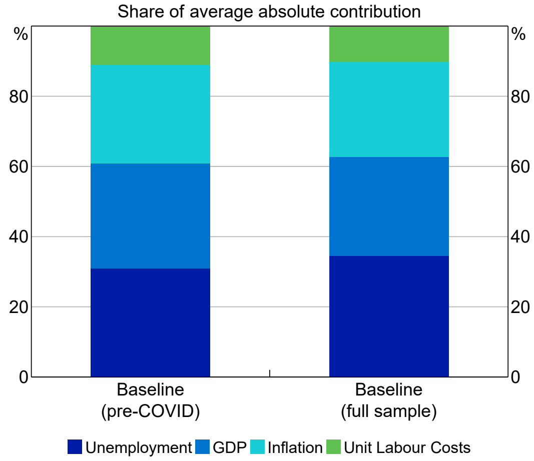
Potential output, the output gap, the NAIRU and the neutral interest rate are conceptually correlated and jointly estimating them can help to provide a consistent view of the economy. For example, short-term deviations of labour market conditions from full employment tend to coincide with deviations of output from its potential level, and the model takes this into account when estimating the NAIRU and potential output. Additionally, deviations of the real policy rate (the cash rate less expected inflation) from the neutral interest rate should reflect the stance of monetary policy and so affect the evolution of the output gap.

The Joint-stars model draws information from a larger set of economic indicators; cyclical variables such as inflation, the real cash rate and the unemployment rate, as well as factors of production

Graph 5

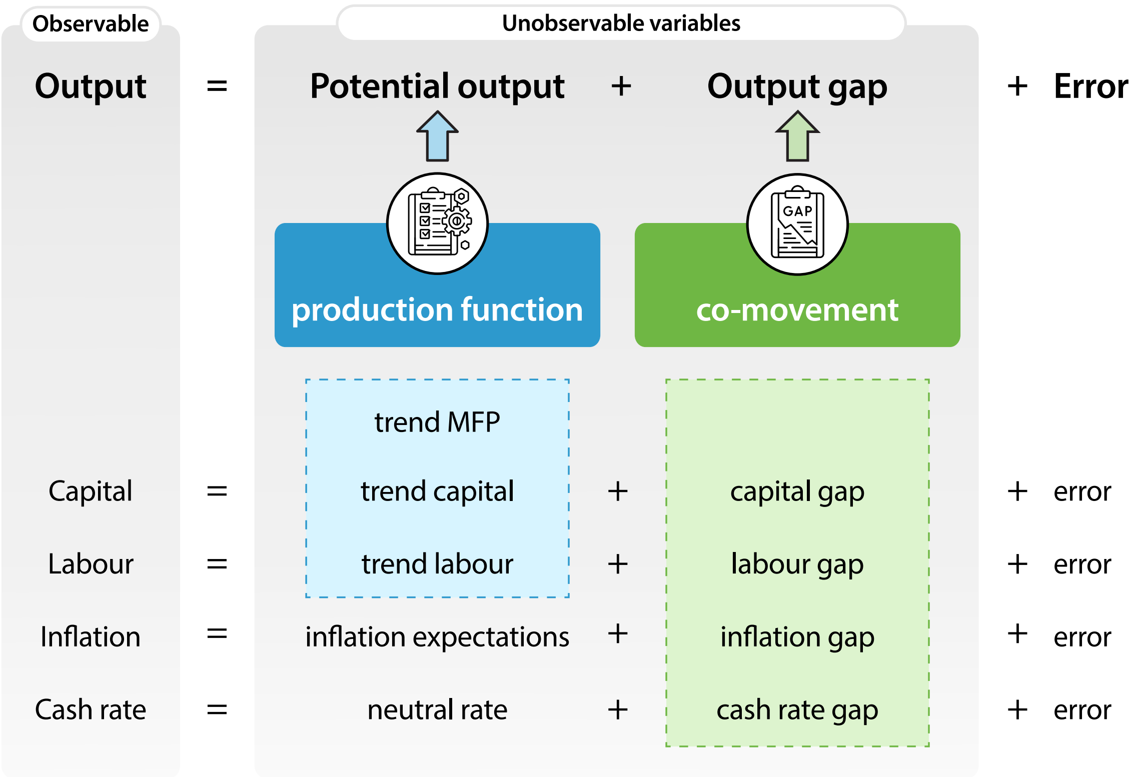
Contribution to Changes in the Output Gap

Share of average absolute contribution



Source: RBA.

Figure 3: Structure of the Joint-stars Model



Source: RBA.

like the capital stock and components of labour supply. The output gap is identified as the co-movement across a range of variables within the system, while potential output is aggregated from the structural trends in productivity, labour and capital using a production function. The model is structured so that each observable consists of a trend, a cyclical component and a measurement error (Figure 3).[9] The trend components are related through a production function, and trend labour is further decomposed into the trend working age population, the trend participation rate, the NAIRU and trend average hours worked. This is similar to the production function model. And like the SMOG model, the output gap is estimated by extracting the cyclical movements of capital, labour, inflation and the real cash rate.

An advantage of the Joint-stars model is its holistic estimation of trend and cyclical components, which are based on economic relationships rather than independently applying statistical filters (as in the production function model). By including many of the major macroeconomic indicators in a single system and estimating the trends and cyclical components jointly, we can assess the trade-offs among competing signals from these indicators in an integrated way. For example, when incoming data send different signals for the output gap – such as inflation and unemployment rising simultaneously – the model can determine how much weight to place on the different series to generate a coherent view. A limitation is that the model is complex, which can make the drivers of outcomes less transparent and so, at times, more challenging to reconcile the model's estimates with expert judgements. The Joint-stars model also has alternative specifications that vary in their approach to accounting for the impact of the COVID-19 pandemic and their use of differing measures of real interest rates.

External estimates

The RBA also takes into consideration estimates of potential output and the output gap for Australia by third parties such as the IMF and the OECD. The IMF's main model is a simple multivariate filtering model similar to the RBA's SMOG model (Blagrave *et* *al* 2015), while the OECD uses a production function approach similar to the RBA's production function model (Chalaux and Guillemette 2019). Both external models produce annual estimates of potential output and the output gap. To obtain quarterly estimates we interpolate the annual estimates using a simple statistical technique. Additionally, the RBA collects market economists' forecasts for potential output growth and current estimates of the output gap through the RBA survey of market economists, which is published in the statistical tables on a quarterly basis.

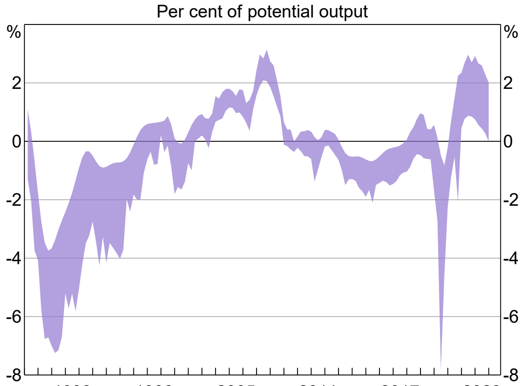
Pulling model-based estimates together

The RBA uses a suite of models to construct a range of estimates of potential output and the output gap (Graph 6). The suite includes the three models developed by the RBA, their alternative specifications, as well as some of the external estimates discussed above. The range of our model estimates covers the central estimates from each individual model (including alternative specifications) but does not capture uncertainty around each estimate. The RBA publishes the range of estimates of the output gap in the quarterly *Statement on Monetary Policy*.

Graph 6

Model Estimates of Output Gap*

Per cent of potential output



* Violet-shaded region shows illustrative range of central gap estimates from a selection of models encompassing different measures and definitions of the output gap; estimates are subject to substantial uncertainty, as well as revision due to data and model refinements.

Sources: ABS; OECD; RBA.

How reliable are model estimates?

There are many different sources of uncertainty around model estimates, including uncertainty:

- from the data (measurement error, statistical noise and revisions)
- inherent in trying to infer unobservable variables through the movement of observed ones ('filtering uncertainty')
- around the sizes of estimated relationships between variables ('parameter uncertainty')
- over whether the structure and assumptions of a model correspond to the true properties of the economy ('model uncertainty').

These different types of uncertainty can each be difficult to quantify and may interact with one another and compound, leading to each model estimate in our suite having substantial uncertainty around it.

A body of international academic research has investigated how large uncertainty is around estimates of the output gap and whether this affects how useful they are for informing policy. The results are mixed, depending on the technique used to estimate the output gap, and may also be country-specific. Most recent research indicates approaches that use a multivariate structure, such as the SMOG and Joint-stars models, produce more reliable estimates than univariate filtering.[10] However, the degree to which these estimates improve forecasting other variables such as inflation is still unclear.[11]

The use of a suite of models is one way to try to account for the substantial uncertainty inherent in modelling potential output and the output gap. Having multiple models with different underlying structures helps us determine a plausible range for the estimates to lie within. Moreover, if different model estimates and indicators agree with each other, that increases our confidence in the estimates of the output gap and potential output.

How economic indicators inform our assessment

In addition to model-based estimates, the RBA also draws on a range of labour market and non-market market indicators to inform our assessment of spare capacity. These indicators tend to focus only on specific segments of the economy, but nonetheless they help paint a fuller picture of spare capacity in the economy. For example, there are a wide range of labour market indicators used by the RBA to assess full employment (Ballantyne, Sharma and Taylor 2024). These same indicators are used to inform the RBA's assessment of potential output and the output gap. In addition, survey measures of capacity utilisation, and liaison with businesses provide insight into utilisation of existing labour and capital within businesses (Graph 7). This includes capital-intensive goods-related industries such as manufacturing, which gives a partial read on capital utilisation in the economy. Data on vacancies in residential property (reflecting spare capacity in housing) and other commercial structures in the economy also give a partial view of capital utilisation in the economy.

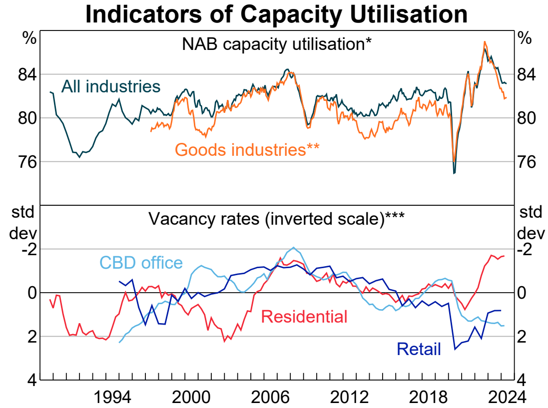
Measures of aggregate activity relative to their long-run trend can also provide some information on spare capacity in the economy. In particular, the deviation of GDP from its long-run trend provides a quick and simple assessment of spare capacity in the economy. Inflation is another potentially useful measure of spare capacity; however, imbalances of demand and supply tend to flow through to inflation with a lag and movements in inflation can also reflect temporary shocks that are not likely to affect potential output. These caveats need to be taken into account when the extent of spare capacity is being assessed on the basis of inflation.

Conclusion

Potential output and the output gap are closely related to the RBA's objectives of price stability and full employment. They provide useful economic frameworks to assess the extent of spare capacity in the economy, which is an important input into monetary policy. Staff at the RBA consider a wide range of inputs to form an overall assessment of potential output and the output gap, both of which are not directly observable. This includes using model-based estimates, labour market and non-labour market indicators, and other measures such as inflation outcomes. There is considerable uncertainty around model-based estimates of the output gap, and the RBA will continue to develop and refine its suite of models.

Graph 7

Indicators of Capacity Utilisation



* Quarterly data prior to May 1997, three-month moving average thereafter; excludes mining.

** Goods industries include manufacturing, construction, wholesale and retail.

*** Series are standardised to measure the number of standard deviations each series is from its mean value; retail refers to regional retail centres.

Sources: ABS; JLL Research; NAB; RBA; REIA.

Appendix A: Details of the small multivariate output gap (SMOG) model

The SMOG model is the simplest of the three models described in this article and is detailed here as a concrete example. The description below reflects the model as currently designed, but development of the model is ongoing. The model consists of two types of equations: 'signal' equations, which describe the movement of observable variables over time, and 'state' equations, which govern the evolution of the unobservable variables the model must estimate.

Signal equations in the SMOG model link the level of non-farm GDP, inflation, wages and unemployment to the business cycle and structural trends in the economy as follows.

Non-farm GDP:

$$\boldsymbol{y_t = y_t^* + gap_t + \epsilon_t^y}$$

Unemployment rate:

$$\boldsymbol{u_t = u_t^* + \lambda_3 gap_t + \rho_1\left(u_{t-1} - u_{t-1}^*\right) + \epsilon_t^u}$$

Trimmed mean inflation:

$$\boldsymbol{\pi_t = (1 - \beta_1 - \beta_2)\pi_t^e \times D_t^{IT} + (1 - \beta_1 - \beta_2 - \beta_3 - \gamma_1)\pi_t^e \times \left(1 - D_t^{IT}\right)}$$
$$\boldsymbol{+\beta_1\pi_{t-1} + \beta_2\pi_{t-2} + (\beta_3\pi_{t-3} + \gamma_1\,\Delta\,nulc_{t-1}) \times \left(1 - D_t^{IT}\right) + \lambda_1 gap_t + \psi_1\,\Delta_4\,pm_{t-1} + \epsilon_t^\pi}$$

Unit labour cost growth:

$$\boldsymbol{\Delta\,nulc_t = (1 - \beta_4)\pi_t^e + \beta_4\pi_{t-1} + \lambda_2\left(u_{t-1} - u_{t-1}^*\right) + \omega_1\left(\frac{\Delta\,u_{t-1}}{u_{t-1}}\right) + \epsilon_t^{\Delta nulc}}$$

GDP evolves according to a trend (y_t^*, potential output), cycle (gap_t, the output gap) and error term (to account for measurement error). Unemployment is similar, but we incorporate an extra term for the lagged unemployment gap ($u_{t-1} - u_{t-1}^*$) to allow the unemployment gap and output gap to diverge in a persistent (but not permanent) manner. This allows us to separate labour market tightness and broader spare capacity in the model.

The equations for the evolution of inflation and unit labour cost growth are more involved. They are generally similar to the equations described in Cusbert (2017), but we allow the relationship between inflation and its explanatory variables to differ before and after the inflation targeting period ($D_t^{IT} = 1$ after inflation targeting). The SMOG model also differs slightly as we link trimmed mean inflation to the output gap, the measure of spare capacity most relevant for firms' price-setting, and link unit labour costs to the unemployment gap, the measure of spare capacity most relevant for wage outcomes.

State variables in the SMOG model govern the evolution of the output gap, potential output, and the trend unemployment rate as follows.

Output gap:

$$\boldsymbol{gap_t = \varphi_1 gap_{t-1} + \varphi_2 gap_{t-2} + \epsilon_t^{gap}}$$

Potential output:

$$\boldsymbol{y_t^* = y_{t-1}^* + g^* + \epsilon_t^{y^*}}$$

Trend unemployment rate:

$$u_t^* = u_{t-1}^* + \epsilon_t^{u*}$$

where g^* is trend potential output growth.

This structure is similar to models used in academic literature and in other central banks (e.g. Blagrave *et al* 2015; Furlanetto *et al* 2023). All error terms are assumed to be uncorrelated and follow a normal distribution. The inflation equation includes a break in the variance from March quarter 1993 and the unit labour cost equation includes a break in the variance from March quarter 1984.

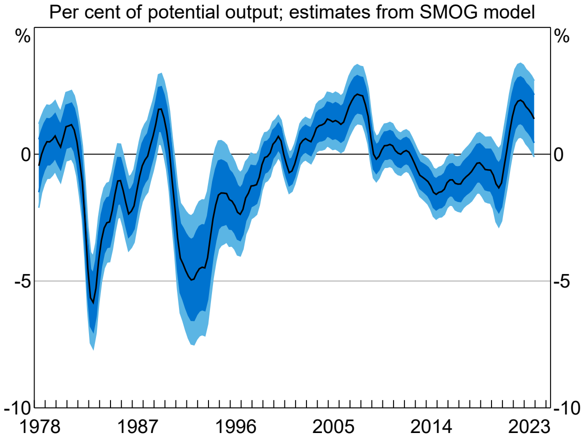
To separate movements in the output gap from potential output, additional restrictions can be imposed that determine how smooth potential output is relative to the output gap and whether GDP itself is measured with noise. The data provide limited information on the validity of these assumptions; that is, many different modelling assumptions are equally plausible. To account for this uncertainty, we produce three alternative specifications of the SMOG model that impose different assumptions about the dynamics of potential output and the amount of noise in the data. Each alternative represents a different judgement about the right balance of theoretical coherence and being consistent with the data. The alternatives can result in meaningfully different estimates of the output gap, spanning from around zero to around 1½ per cent for the December quarter 2023.

The model is estimated by maximum likelihood using the Kalman filter, from the June quarter 1978 to the current period. Evans, Moore and Rees (2018) provide an intuitive explanation of the estimation procedure. The model estimate of the output gap is shown in Graph A1, along with uncertainty bands that account for filtering and parameter uncertainty.

Graph A1

Output Gap*

Per cent of potential output; estimates from SMOG model



* Shaded areas represent one and two standard error bands for smoothed estimates from the baseline SMOG model, accounting for filtering and parameter uncertainty.

Sources: ABS; RBA.

Endnotes

[*] The authors are from Economic Analysis Department. They would like to thank Angelina Bruno, Jenny Lui, Martin McCarthy, James Morley, Matt Read and Tim Robinson, along with Dan Rees for his extensive work developing the Joint-stars model.

[1] Land is a common third factor of production. Human capital is sometimes considered a fourth factor of production, but is captured by productivity in the approach used here. Intermediate goods, such as component parts used in manufacturing of a final consumption product, are not considered a primary factor of production.

[2] The entire capital stock is not fully utilised all the time, even when output is at potential – for example, machines often require downtime for maintenance, equipment may be sitting idle while waiting to be moved to a different location, and retail and office buildings are typically not in use 24 hours a day.

[3] The RBA often uses the terms 'aggregate demand' and 'aggregate supply' (or simply, 'demand' and 'supply') to refer to actual output and potential output, respectively, which is a simplification compared with the terminology used in this article. In that context, aggregate demand and aggregate supply should not be confused with the quantity of output demanded, or the quantity of output supplied, which should be equal, aside from any changes in inventories.

[4] For details on the role of full employment in monetary policy and how it is assessed, see RBA (2024b).

[5] Spare capacity, measured by a labour market gap or output gap, is a core component of most inflation models. For details of the RBA's approaches to modelling inflation, see Cassidy *et al* (2019). These models are distinct from the models that use inflation to infer the output gap, such as the SMOG model described in Appendix A.

[6] The RBA's production function assumes constant returns to scale, which means that if each of labour and capital is increased by 1 per cent then output is increased by 1 per cent. It also allows for the share of output that is earned by the providers of labour and capital (loosely speaking, households and businesses) to vary over time. Constant returns to scale is a simplifying assumption we make and is commonly used in production function models by peer central banks.

[7] Measured as capital stock net of depreciation.

[8] The Joint-stars model approach is similar to the US Federal Reserve Board's multivariate unobserved components model (Fleischman and Roberts 2011; Reifschneider, Williams and Wilcox 2015).

[9] The data used to estimate the Joint-stars model are non-farm GDP, trimmed-mean inflation, inflation expectation, average hours worked, the unemployment rate, the labour force participation rate, the working-age population, the capital stock, and the real cash rate.

[10] For background on the issues of reliability when estimating unobserved variables, see Orphanides and van Norden (2002). More recent literature indicates that multivariate filtering models can improve reliability (including in Australia): see Gruen, Robinson and Stone (2002); Jarociński and Lenza (2016); Alichi *et al* (2017); Rünstler and Vlekke (2018).

[11] For a discussion of how unreliable estimates can lead to worse inflation forecasts, see Orphanides and van Norden (2005).

References

Alichi A, O Bizimana, D Laxton, K Tanyeri, H Wang, J Yao and F Zhang (2017), 'Multivariate Filter Estimation of Potential Output for the United States', IMF Working Paper WP/17/106.

Ballantyne A, A Sharma, T Taylor (2024), 'Assessing Full Employment in Australia', RBA *Bulletin*, April.

Blagrave P, R Garcia-Saltos, D Laxton and F Zhang (2015), 'A Simple Multivariate Filter for Estimating Potential Output', IMF Working Paper WP/15/79.

Bruno A, J Dunphy and F Georgiakakis (2023), 'Recent Trends in Australian Productivity', RBA *Bulletin*, September.

Cassidy N, E Rankin, M Read and C Seibold (2019), 'Explaining Low Inflation Using Models', RBA *Bulletin*, June.

Chalaux T and Y Guillemette (2019), 'The OECD Potential Output Estimation Methodology', OECD Economics Department Working Paper No 1563.

Cusbert T (2017), 'Estimating the NAIRU and the Unemployment Gap', RBA *Bulletin*, June.

Evans R, A Moore and D Rees (2018), 'The Cyclical Behaviour of Labour Force Participation', RBA *Bulletin*, September.

Fleischman CA and JM Roberts (2012), 'From Many Series, One Cycle: Improved Estimates of the Business Cycle from a Multivariate Unobserved Components Model', Board of Governors of the Federal Reserve System, Finance and Economics Discussion Series Paper No 2011-46.

Furlanetto F, K Hagelund, F Hansen and Ø Robstad (2023), 'Norges Bank Output Gap Estimates: Forecasting Properties, Reliability, Cyclical Sensitivity and Hysteresis', *Oxford Bulletin of Economics and Statistics*, 85(1), pp 238–267.

Gruen D, T Robinson and A Stone (2002), 'Output Gaps in Real Time: Are They Reliable Enough to Use for Monetary Policy?', RBA Research Discussion Paper No 2002-06.

Jarociński M and M Lenza (2016), 'An Inflation-predicting Measure of the Output Gap in the Euro Area', European Central Bank Working Paper Series No 1966.

Orphanides A and S van Norden (2002), 'The Unreliability of Output-Gap Estimates in Real Time', *The Review of Economics and Statistics*, 84(4), pp 569–583.

Orphanides A and S van Norden (2004), 'The Reliability of Inflation Forecasts based on Output-Gap Estimates in Real Time', Board of Governors of the Federal Reserve System, Finance and Economics Discussion Series Paper No 2004-68.

RBA (Reserve Bank of Australia) (2024a), 'Chapter 4: In Depth – Potential Output', *Statement on Monetary Policy*, May.

RBA (2024b), 'Chapter 4: In Depth – Full Employment', *Statement on Monetary Policy*, February.

Reifschneider D, W Wascher and D Wilcox (2015), 'Aggregate Supply in the United States: Recent Developments and Implications for the Conduct of Monetary Policy', *IMF Economic Review*, 63(1), pp 71–109.

Rünstler G and M Vlekke (2018), 'Business, Housing, and Credit Cycles', *Journal of Applied Econometrics*, 33(2), pp 212–226.

Treasurer and Reserve Bank Board (2023), 'Statement on the Conduct of Monetary Policy', 8 December.

Skills Match Quality Following the COVID-19 Pandemic

Georgia Wiley and Lydia Wang[*]

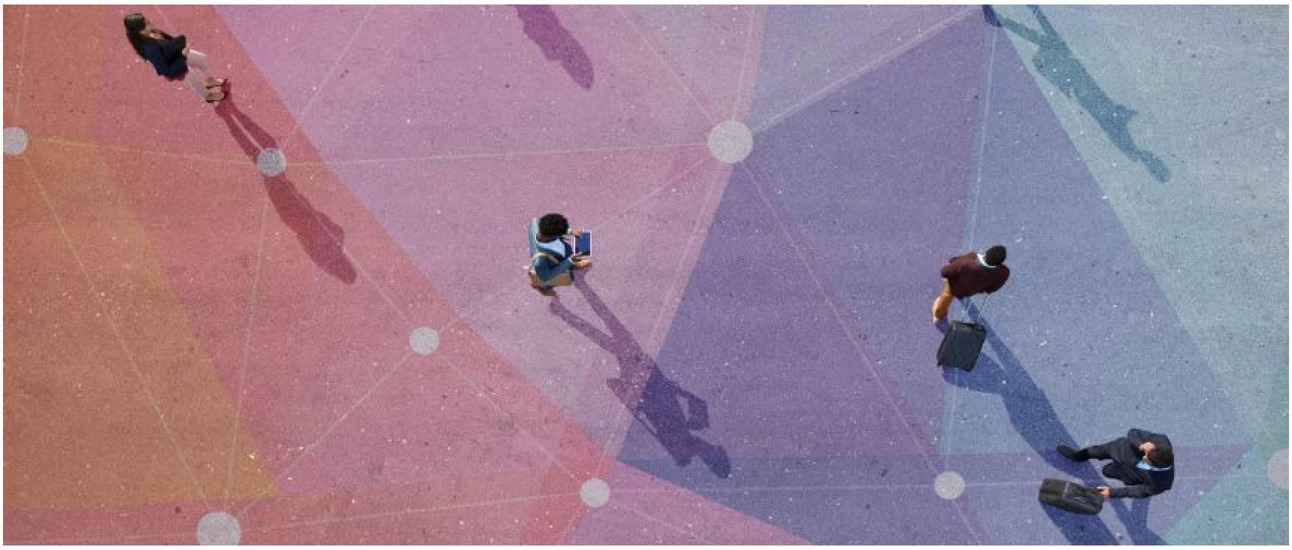


Photo: Klaus Vedfelt – Getty Images

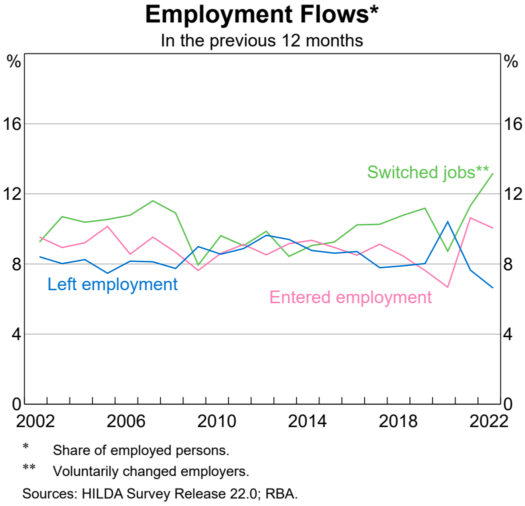
Abstract

The strength in labour market conditions after the COVID-19 pandemic caused many individuals to either enter the labour market or to change jobs. These labour dynamics may have an influence on both recent and longer term productivity outcomes by affecting how well workers' skills are matched to their new jobs. We use self-reported measures from the Household, Income and Labour Dynamics in Australia Survey to examine whether workers are better or less well matched to their jobs following the pandemic, and whether these skills matches may change in the future. Overall, based on the data, we find there is little evidence that the recent increase in labour mobility affected how well workers are matched to their jobs up until 2022, which suggests that this is not a key driver of recent slow productivity growth.

Introduction

Australian labour market conditions reached their tightest levels in several decades in late 2022 following the COVID-19 pandemic.[1] Many new workers entered the labour market during this time and existing workers were able to change or switch jobs more easily. The rate at which workers switched jobs increased significantly in 2022, more than compensating for the fall in job switches during the pandemic (Graph 1).[2] Similarly, the rate at which individuals entered into employment (either from unemployment or from outside of the labour force) increased to above-average levels in 2021 and 2022, while the rate at which individuals left employment fell. An increase in labour market movements, such as those that occurred in 2022, can influence productivity outcomes in the short and longer term by affecting the extent to which

Graph 1



workers' skills are matched to the requirements of their new jobs.

Skills matches and productivity

Productivity measures how efficiently the economy uses its resources.[3] An important driver of an economy's productivity is how well suited or matched workers are to their jobs. If a worker's skills align well with those required by their job, they will tend to be more productive (Coraggio *et al* 2023). However, if a worker's skills are less well suited or matched, they will tend to be less productive.

Higher levels of labour market movement, such as those in late 2022, can affect the quality of skills matches. If it is easy for workers to move between jobs, it can become easier for them to flow into better suited and higher paying jobs (Deutscher 2019). Better skills matches can make workers more productive and, in turn, can support productivity growth. However, individuals starting jobs from unemployment or outside of the labour force may have a lower quality of skills match to their job if, for example, they do not have all of the skills required for the job, or their skills have diminished because they are not being used. This could mean that new workers entering employment are less well matched to their jobs, and therefore less productive.

These labour dynamics can take some time to play out. For example, if workers take some time to adjust to a new job and develop relevant job-specific skills, they may initially be less well matched to the job and less productive, but they could become better matched to the job and more productive over time. If this is the case, the recent increase in labour market movements may have temporarily weighed on productivity, but this could unwind in the near future.

Given the important role productivity plays in driving sustainable wages and income growth, in this article we consider the extent to which the recent increases in labour market movements may have affected the quality of skills matches, and what this means for recent and future productivity growth. For our research, we use self-assessed measures on skills matches from the 2022 release of the Household, Income and Labour Dynamics in Australia (HILDA) Survey.

Data

Measuring how well matched workers are to their jobs is difficult because it is hard to quantify an individual's skill set and how it maps to different jobs.[4] The HILDA Survey presents a direct way to measure skills match quality as it asks individuals questions about how well suited their skills are to their job, as well as how much training they receive.

Commenced in 2001, the HILDA Survey is a longitudinal Australian study that tracks a representative group of individuals (approximately 17,000 people from 9,000 households) each year. The HILDA Survey involves individual interviews and self-completion questionnaires that contain useful demographic information, such as age, employment status and gender.

One focus area of the HILDA Survey is the labour market. Individuals are asked a range of questions on how well their job uses their skills and abilities, how much work-related training they have received, and what their level of job satisfaction is with their current job. To measure skills match, we use responses to the question asking individuals to rate the extent to which they use their skills and abilities in their current job (answered on a scale of 1 (strongly disagree) to 7 (strongly agree)). Individuals who report a higher score can be thought of as having a better skills match to their jobs. Individuals who report a lower score might do so because they do not have the required skills for their job or might have other skills that they are not able to use in their current job. The productivity implications may differ depending on whether a worker lacks required skills for the role or has underutilised skills.[5] While responses to the survey questions are subjective, they provide a simple and direct read on skills match quality that is not available elsewhere.

A key advantage of using data from the HILDA Survey is that the same group of individuals is followed each year. As such, we can look at how perceptions of skills match change when an individual starts a new job. Findings from our analysis of the HILDA Survey data are discussed below.

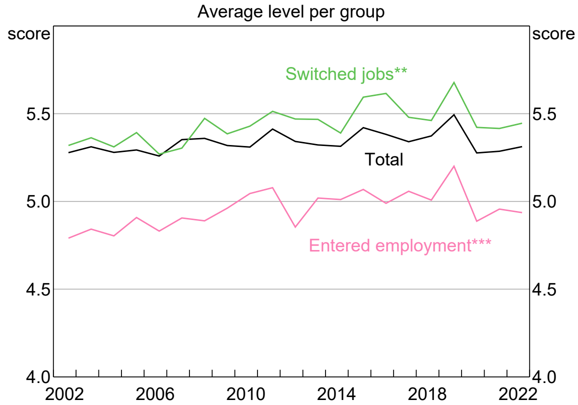
Trends in skills matching

Despite the sharp rise in labour market movements, the degree to which workers felt their job used many of their skills and abilities remained relatively flat in 2022 and was slightly below pre-pandemic levels (Graph 2). There are several reasons why this might be the case.

Graph 2

Skills Match*

Average level per group



* 1–7 response to 'I use many of my skills and abilities in my current job', 7 being strongly agree.
** Voluntarily changed employers in past 12 months.
*** Employed at time of interview, not employed in preceding year.
Sources: HILDA Survey Release 22.0; RBA.

First, there are two labour dynamics at play that are likely to have offsetting effects. Workers who switched from one job to another tend to be better matched to their new job. As such, the increase in the share of workers switching jobs would have pushed up aggregate skills match quality in the economy. However, individuals entering jobs from outside of the labour market tended to be less well matched to their jobs. The increase in the flow of new workers from outside the labour market would therefore have lowered the aggregate quality of skills matches.

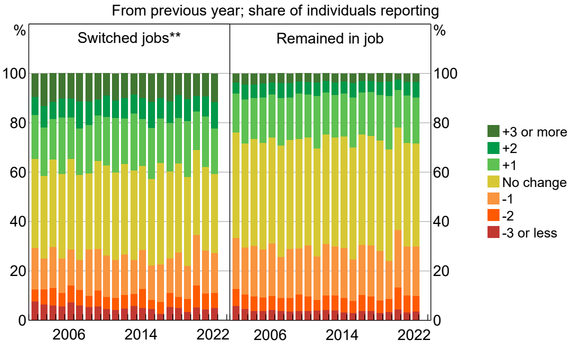
Second, while labour market mobility picked up in 2022, the share of individuals switching jobs or entering employment was still relatively low, and so any compositional effect is likely to be relatively limited. However, it may be that the HILDA Survey understates the true level of job switching that occurred in 2022 because many of the interviews were conducted before the end of the year.[6] To the extent this is the case, the compositional effect will be understated in our results.

Third, while individuals tend to feel better matched to their new jobs, the improvement in self-assessed skills match is relatively small on average. Graph 3 compares the ratings of individuals who switched jobs (left-hand panel) with those who did not switch jobs (right-hand panel).[7] While individuals who switched jobs were more likely to report an improvement in skills match (green bars), around one-third of those who switched jobs reported no change in the degree to which their skills were matched to their job (yellow bars) and one-quarter reported that their skills were less suited to their current job than reported previously (red bars).

Graph 3

Change in Skills Match Rating*

From previous year; share of individuals reporting



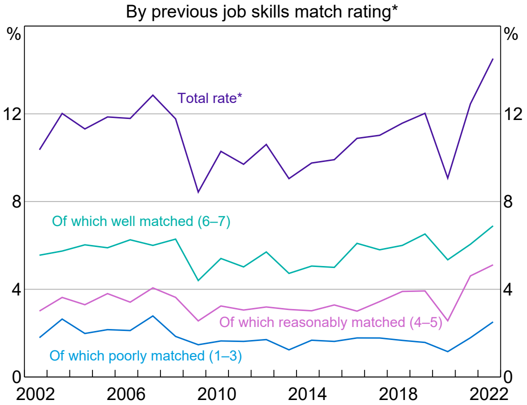
* Change in 1–7 response to 'I use many of my skills and abilities in my current job', 7 being strongly agree.
** Voluntarily changed employers in the past 12 months.
Sources: HILDA Survey Release 22.0; RBA.

The fact that a sizeable share of workers do not appear to become better matched after switching jobs may reflect that many individuals already felt reasonably well matched before they switched jobs and so the scope to increase the quality of their skills match was more limited. Of the approximately 15 per cent of individuals who switched jobs in 2022, around half reported they were already well matched to their jobs (reporting a high score of either 6 or 7) (Graph 4).[8] This reporting was broadly similar to that observed prior to the pandemic.

Graph 4

Job-to-job Switching Rate

By previous job skills match rating*



* 1–7 response to 'I use many of my skills and abilities in my current job', 7 being strongly agree.

Sources: HILDA Survey Release 22.0; RBA.

The decrease in skills match reported by some individuals switching jobs may also reflect that workers switch jobs for a variety of reasons. Individuals might choose to switch to a job less suited to their skills because, for example, it is associated with greater work-life balance, it offers a higher salary, the type of work is more satisfying, or they may be changing careers. We discuss trends in broader measures of job suitability further below.

Looking at the slightly longer term, the data suggest that since the onset of the pandemic, workers feel less well matched to their jobs. So while there is no evidence that skills matches deteriorated in 2022 due to increased labour mobility, they appear to have deteriorated somewhat previously. If this is the case, it could more generally help to explain why productivity growth has been slower over the period, though without knowing the cause it is hard to assess whether it will unwind. This finding is broadly consistent with other evidence that pandemic-related factors disrupted the efficient reallocation of labour during this time (Andrews, Bahar and Hambur 2023).

Evolution of skills match ratings

The trends discussed above suggest that the strength in the labour market did not materially affect workers' perceptions of how well their skills were being used in their jobs in 2022. However, it is possible that workers become better matched to their job over time. If this is the case, then the quality of skills matches may improve over the next few years, contributing to stronger productivity growth going forward.

In this section, we explore the quality of skills matches over time by considering:

1. if workers tend to feel better suited to their jobs after a few years in the role
2. if workers started more complex jobs than usual that might take more time to feel well matched
3. the amount of structured training that workers receive, particularly those entering new jobs.

Evolution of skills matches over history

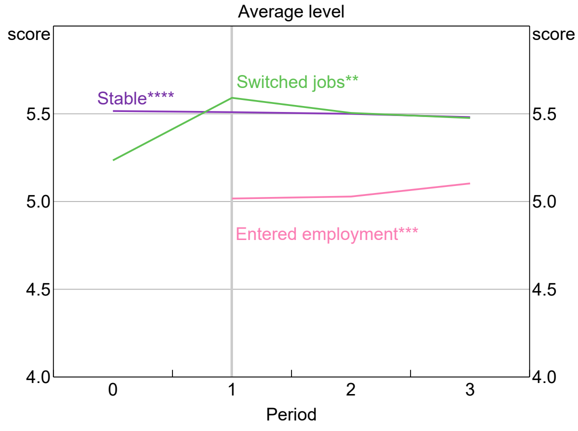
The longitudinal nature of the HILDA Survey makes it possible to track how individuals assess their suitability to their job in the years before and after starting a new job.[9]

Individuals entering employment are less likely than existing workers to feel they are using many of their skills and abilities in their job (Graph 5), but after two-to-three years in employment, they tend to feel slightly better suited to their job than when they first started. This change, however, is relatively small and these individuals overall feel less well matched to their jobs than existing workers. Existing workers who switch jobs feel better matched immediately after the switch, but maintain this level over the next couple of years. This self-assessed measure suggests that, after changing jobs, individuals do not tend to become better suited to their job in the years that follow.

Graph 5

Evolution of Skills Match Rating*

Average level

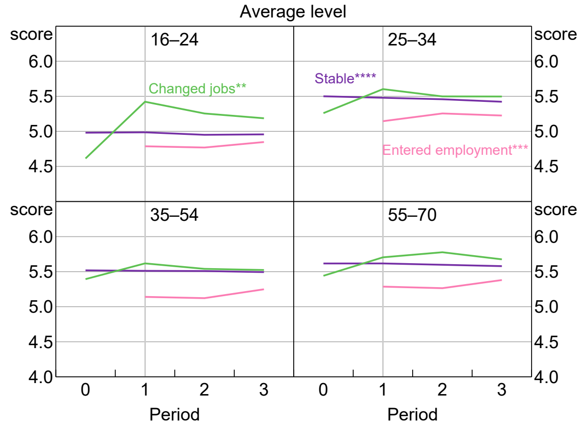


* 1–7 response to 'I use many of my skills and abilities in my current job', 7 being strongly agree.
** Changed jobs in period 1 and remained in that job.
*** Entered employment in period 1 and remained employed.
**** Maintained job from period 0.
Sources: HILDA Survey Release 22.0; RBA.

Graph 6

Evolution of Skills Match Rating by Age*

Average level



* 1–7 response to 'I use many of my skills and abilities in my current job', 7 being strongly agree.
** Changed jobs in period 1 and remained in that job.
*** Entered employment in period 1 and remained employed.
**** Maintained job from period 0.
Sources: HILDA Survey Release 22.0; RBA.

Patterns in job suitability are similar across age groups (Graph 6). In all age groups, individuals who enter employment tend to feel better suited to their jobs after some time in the role, but still tend to feel less well matched to the job than existing workers. Also in all age groups, individuals who switch jobs report an increase in job suitability immediately after switching jobs, but no further improvement over time. Younger workers (16–24 years) who switch jobs experience the largest improvement in skills match. This could reflect that younger workers tend to shift from casual employment to professional employment that better uses their skills and education. However, there is no further improvement in job suitability for younger workers after some time in their new job.[10]

Overall, based on this measure of skills match, it is unlikely that individuals who started new jobs (i.e. switched jobs or entered employment) in 2022 will become significantly better matched to their jobs over time, at least based on self-reported measures. As a result, these results provide little reason to expect a boost to productivity in coming years due to an improvement in the quality of skills matches.

Trends in job complexity

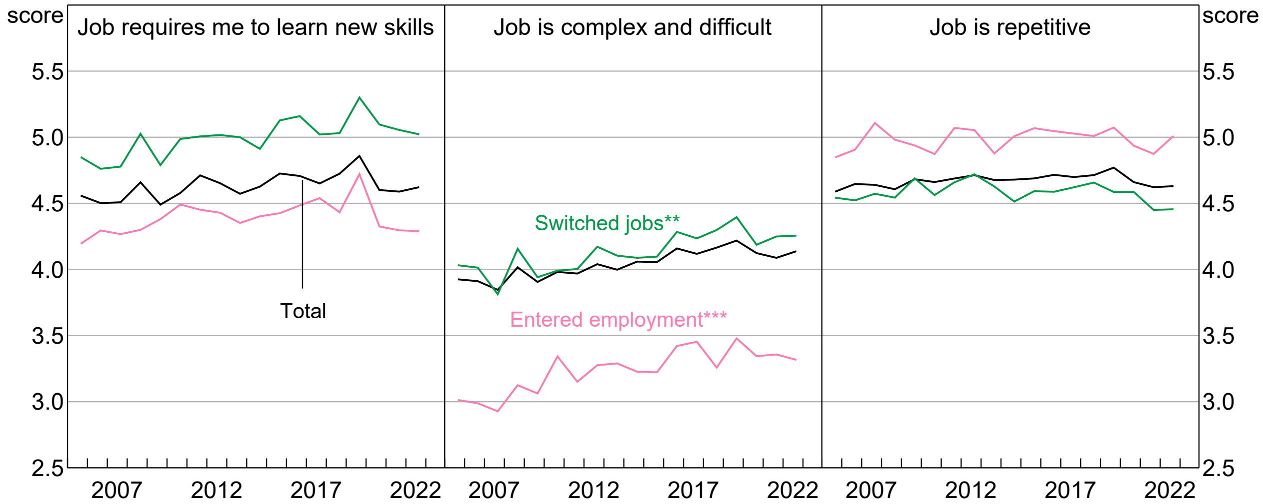
While there is limited evidence that workers feel better matched to their job over time based on history, it is possible that recent labour market dynamics differ. For example, some jobs may require more time and training before an individual feels comfortable and able to perform at their best. It might be the case that workers have been more likely to enter such jobs in recent years.

To explore this, we examine whether individuals who started jobs in 2022 have tended to enter more complex jobs that might require further skills development. While complex jobs may take some time to adjust to, they could produce greater productivity gains over time as individuals become more comfortable in their roles and work to their best potential.

In general, we find that individuals who enter employment are more likely to find their jobs repetitive and report lower-than-average job complexity and need to learn new skills (Graph 7). This finding is likely due to a higher share of these individuals starting in entry-level roles. However, individuals who switch jobs report a greater need (above the average) to learn new skills, and also report that their jobs are slightly more complex and less repetitive.

Overall, individuals who started new jobs in 2022 were not more likely than before or during the pandemic to move into jobs that were more complex or required the development of new skills. This finding suggests that the quality of skills matches for these individuals will follow a similar path to previous years and, as such, they are unlikely

Graph 7
Job Fit Metrics
Average level



* Response from 1–7, 7 being strongly agree.
** Voluntarily changed jobs in the past 12 months.
*** Employed at time of interview, not employed in preceding year.
Sources: HILDA Survey Release 22.0; RBA.

to become significantly better matched to their job over time.

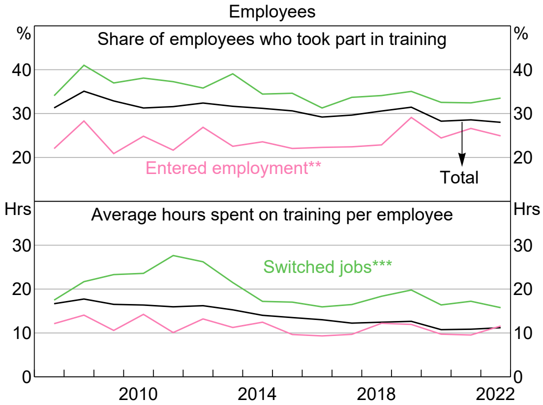
Trends in on-the-job training

We also explore trends in on-the-job training to gain insights into whether more workers are being upskilled and therefore more likely to become better matched to their jobs and more productive over time.

The HILDA Survey asks workers whether they have participated in a structured work-related training program in the past year and, if so, what its purpose was and how much time was spent on it. The latest data suggest that the share of employees who participated in structured work-related training in 2022 and the number of hours spent training per employee were below their pre-pandemic levels (Graph 8). This is also true for people with less than one year in a job. However, the measures only capture structured work-related programs, whereas new starters might be more likely to learn on the job outside of such structured courses.

Of those workers who report undertaking training since the onset of the pandemic in 2020, there was a slight increase in the share of workers who undertook compliance-related courses ('health/safety' and 'occupational standards') and onboarding courses ('help get started') (Graph 9). The latter likely reflects the increase in workers entering employment or switching to new jobs. By contrast, the share of workers who took part in courses aimed at improving skills has declined moderately since the pandemic – participation in these courses has trended down since the mid-2000s. Given these findings, it appears there has been a limited focus on upskilling existing workers since the onset of the pandemic.

Graph 8
Job-related Training Indicators
Employees

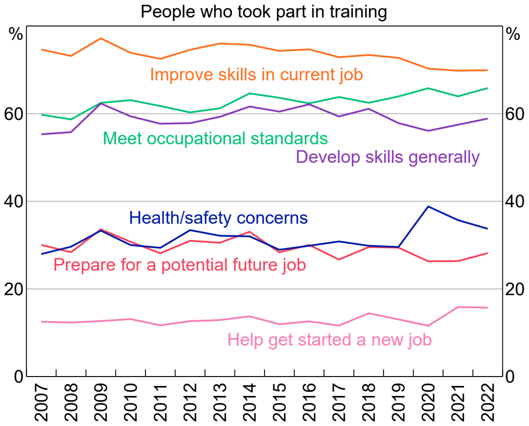


* Self-reported. In the 12 months prior to interview.
** Employed at time of interview, not employed in preceding year.
*** Voluntarily changed jobs in the past 12 months.
Sources: HILDA Survey Release 22.0; RBA.

Graph 9

Training Aims*

People who took part in training



* Self-reported. In the 12 months prior to interview. Response is not limited to one aim.

Sources: HILDA Survey Release 22.0; RBA.

Overall, there is limited evidence that there has been an increase in structured work-related training. As such, there is no evidence to suggest that there will be a large increase in worker productivity and skills match over coming years. However, as this finding is based on the 2022 HILDA Survey data, it might not capture more recent changes in job-related training in response to the strong labour market. In RBA liaison discussions since 2023, firms have indicated that they have had to hire and train less-experienced workers, with some firms using upskilling opportunities to retain existing employees.

Trends in job satisfaction levels

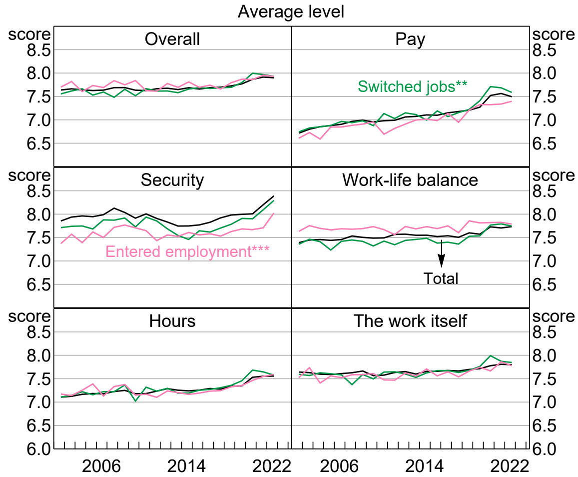
In addition to a higher quality of skills match to a job, individuals may also be more productive if they are generally more satisfied with their jobs. The HILDA Survey asks respondents to rate their satisfaction with different elements of their job on a scale from 0 to 10, with higher scores indicating greater levels of satisfaction.

Over time, individuals who start new jobs have tended to report similar scores for their satisfaction with the work itself, hours and the job overall, compared with those who have remained in their jobs (Graph 10). New starters, however, tend to report lower levels of job security satisfaction, which is consistent with shorter job tenures.

Graph 10

Job Satisfaction Metrics

Average level



* Response from 0–10, 10 being the highest level of satisfaction.

** Voluntarily changed jobs in previous 12 months.

*** Employed at time of interview, not employed in preceding year.

Sources: HILDA Survey Release 22.0; RBA.

For many of the job satisfaction measures, worker satisfaction increased in 2020 and remained elevated in 2021 and 2022. This is most evident in the measures for satisfaction with pay, job security and hours. Individuals who switched jobs during this time were more likely to report an increase in satisfaction in pay and work-life balance. This increase in worker satisfaction may be temporary because of pandemic-specific factors. However, this increase may have supported productivity during this period, and if sustained, may continue to do so.

Conclusion

Overall, our research suggests that the high level of labour market mobility in 2022 did not materially impact how well matched workers felt to their jobs in aggregate, at least based on self-assessed measures from the HILDA Survey. To the extent these measures are associated with higher observed productivity, it therefore appears unlikely that the recent pick up in labour mobility is behind recent slow productivity growth. Further, based on historical patterns, it appears unlikely that these workers will feel substantially better matched to their new jobs over coming years. Taken together, our findings suggest that the upside risk to productivity from significant improvements in skills match quality is small.

However, our findings should be interpreted with some caution. The timing of the HILDA Survey means it may not capture labour market movements over late 2022, and also may not account for all trends in on-the-job training. Additionally, while the HILDA Survey is invaluable in giving a direct read on skills match, the questions are subjective and may be better suited to capturing substantial changes in the alignment between a worker's skills and the job requirements. The self-assessed measures may be less able to capture small improvements in job suitability and satisfaction as well as increases in non-structured training, all of which may affect productivity. Finally, the relationship between self-reported mismatches and realised productivity outcomes may not be clear cut, especially given we do not distinguish between 'over-' and 'under-skilled' workers. While our results suggest changes in skills match quality have not been a significant driver of productivity outcomes in recent years, they are not definitive.

Endnotes

[*] Georgia Wiley is from Economic Research Department and Lydia Wang is from Economic Analysis Department. They would like to thank Jonathan Hambur, Anirudh Yadav, Joyce Tan, Kevin Lane and Martin McCarthy for comments on this article.

[1] For a more detailed discussion on the impact of the pandemic on job mobility, see Black and Chow (2022).

[2] We focus on voluntary job-to-job transitions. This captures individuals who were employed in the previous HILDA Survey, changed jobs in the past 12 months, were not fired and did not spend any time in unemployment or more than one month outside of the labour force.

[3] For a discussion of recent developments, see Bruno, Dunphy and Georgiakakis (2023).

[4] Other work in the United States has addressed this issue by creating a measure of multidimensional skills match using a dataset on the skill requirements of certain jobs with test scores from an individual's vocational and non-cognitive tests (Guvenen *et al* 2020). Data limitations in Australia prevent us from following this approach.

[5] For example, an under-skilled worker and an over-skilled worker might both report a 3 out of 7 rating on skills match with their current job. From the employers' perspective, the over-skilled worker would have the skills necessary to perform the job and so is likely to be as productive as a worker who is well matched to the job, but the under-skilled worker is likely to be less productive because they do not have all of the necessary skills. While both workers could be better matched and more productive in other more suitable roles, the impact of the mismatch on their current job productivity will be different.

[6] The HILDA Survey interviews most individuals in the third quarter of the year. In 2022, 37 per cent of interviews took place in August, 35 per cent in September and 17 per cent in October. The rate of job switching remained high in the fourth quarter of 2022.

[7] We define 'remained in job' as staying at the same employer, and includes individuals who were promoted and changed roles within the organisation.

[8] Interestingly, Graph 4 shows that the decline in job-switching rates from the mid-2000s was broad-based across all levels of job matching. This suggests it was not simply driven by workers being better matched to their existing jobs, and so having less of a need to switch jobs.

[9] For this exercise, we focus on a smaller sample. New entrants to employment must remain employed for the next two interviews, while individuals who switched jobs must remain in that role for the next two interviews. In doing so, we exclude individuals who switched jobs only briefly and new entrants who exited employment relatively quickly. Given these excluded groups are likely to be less well matched than the individuals who remain, this means the reported quality of matches are higher than otherwise, but ensures that our results are not being driven by these individuals leaving employment or moving to a new job.

[10] The lack of further improvement is somewhat surprising. It could reflect the important role that job switching plays in finding better matches for younger workers. It could also reflect the subjective nature of the measures, with younger workers feeling they quickly become 'over-skilled' for entry-level roles.

References

Andrews D, E Bahar and J Hambur (2023), 'The Effects of COVID-19 and JobKeeper on Productivity-Enhancing Reallocation in Australia', CAMA Working Paper No 29/2023.

Black S and E Chow (2022), 'Job Mobility in Australia during the COVID-19 Pandemic', RBA *Bulletin,* June.

Bruno A, J Dunphy and F Georgiakakis (2023), 'Recent Trends in Australian Productivity', RBA *Bulletin*, September.

Coraggio L, M Pagano, A Scognamiglio and J Tåg (2023), 'JAQ of All Trades: Job Mismatch, Firm Productivity and Managerial Quality', IFN Working Paper No 1427.

Deutscher N (2019), 'Job-to-job Transitions and the Wages of Australian Workers', Treasury Working Paper.

Guvenen F, B Kuruscu, S Tanaka and D Wiczer (2020), 'Multidimensional Skill Mismatch', *American Economic Journal: Macroeconomics*, 12(1), pp 210–244.

HILDA Disclaimer

How the RBA Uses the Securitisation Dataset to Assess Financial Stability Risks from Mortgage Lending

Adam Hughes[*]

Photo: Caspar Benson – Getty Images

Abstract

The RBA's Securitisation Dataset provides timely and detailed data on the individual mortgages underlying Australian residential mortgage-backed securities. This dataset complements other data sources the RBA uses to form its assessment of financial stability risks arising from mortgage lending. Understanding the representativeness of the dataset in relation to the broader mortgage market for key risk indicators helps to ensure that assessments are formed on a reliable basis. This article discusses the usefulness of the dataset for complementing the RBA's broader monitoring and assessment of risks from housing lending. However, caution is needed when using the dataset to assess risks from new lending, and when monitoring arrears. Information from the dataset is one of a number of sources the RBA uses in monitoring financial stability risks and is combined with other sources of complementary data, including that provided by lenders to the Australian Prudential Regulation Authority.

Introduction

Understanding risks from mortgage lending is important to assess risks to financial stability. Residential mortgages represent around two-thirds of Australian banks' domestic lending, and mortgage debt is typically the largest liability on the balance sheet of an Australian household. Therefore, stress in the household sector can have a material impact on financial stability in Australia: if a sufficiently large number of mortgagors were in negative equity and defaulted on their loans, lenders could face widespread losses. This could lead to lenders sharply restricting the supply of credit to even very sound borrowers, disrupting economic activity, and resulting in rising unemployment. This feedback between financial stress of indebted households, lending, and economic activity could be costly for all households; and these costs could be even higher if a lack of confidence in the safety of deposits led to broader instability in the financial system. However, financial stress among households does not automatically lead to financial instability. Currently, it is unlikely that financial pressures being experienced by Australian borrowers will translate into financial stability issues, as detailed in the March *Financial Stability Review* (RBA 2024a).

The RBA monitors a suite of indicators of the financial health of Australian mortgagors using a wide range of data sources (Brischetto 2023). These sources include:

- **Survey data** from third-party surveys, such as the Australian Bureau of Statistics' Survey of Income and Housing (SIH) or the Melbourne Institute's Household, Income and Labour Dynamics in Australia (HILDA) Survey. These surveys generally offer disaggregated and representative data on household financial positions but are infrequent and highly lagged.
- **Data collected by the Australian Prudential Regulation Authority (APRA)**. Authorised deposit-taking institutions (ADIs) must report data on their mortgage lending to APRA for the purposes of prudential regulation. These data are frequent and timely, and are collected on a consistent basis according to legal reporting requirements but are only available at a highly aggregated level. While the data fully cover ADI lending, they only partly cover lending by non-bank financial institutions (NBFIs).
- **Securitisation data** collected by the RBA, forming the Securitisation Dataset, on residential mortgage-backed securities (RMBS) as a condition for eligibility as collateral in repurchase agreements with the RBA. These loan-level data are provided monthly, and are both timely and granular. The data provide detailed information about each loan that can be used to help form a view of financial health among mortgagors. As lenders can face incentives to select certain types of loans for securitisation or ensure the performance of loans after issuance, the data may not be fully representative of all mortgages in the Australian market.

The RBA's Securitisation Dataset

Previous work found that the Securitisation Dataset is representative of the Australian mortgage market along many important dimensions such as the composition of lending and the average variable interest rate paid by mortgagors (Fernandes and Jones 2018). This makes it a useful tool for many purposes, including evaluating and monitoring the transmission of monetary policy through its effects on the mortgage market. But the work also highlighted that the dataset is less representative along some other dimensions; most notably new loans are underrepresented, and the share of non-performing loans was found to be below the rate of the broader mortgage market.

This article discusses the usefulness of the Securitisation Dataset *as a source of information for monitoring and assessing risks to financial stability arising from mortgage lending*. It shows how the richness of the dataset can complement more highly aggregated information from other sources, such as the data from APRA. The dataset is also found to be representative of the Australian mortgage market when split by key indicators of financial stability risks, including across borrower or loan types. It provides valuable insights into the budget pressures faced by borrowers and their savings buffers held in offset accounts or redraw facilities. In addition, the dataset offers a more comprehensive view of mortgage lending by NBFIs than other data sources.

However, information from other data sources is more suitable than information from the Securitisation Dataset when monitoring some other indicators of risk. The arrears rate derived from the dataset is typically below that of the broader mortgage market, although *trends* in arrears usually track the broader market. However, caution is needed when looking at trends in arrears of *self-securitised* loans; at times, compositional changes to the pools of self-securitised loans can lead to significant divergences between arrears rates observed in the dataset and the broader mortgage market. Finally, lags in the securitisation process mean that new loans, and in particular highly leveraged new loans, are heavily underrepresented in the Securitisation Dataset, which could lead to biased assessments of financial stability risks from new lending if not complemented with other data.

About the Securitisation Dataset

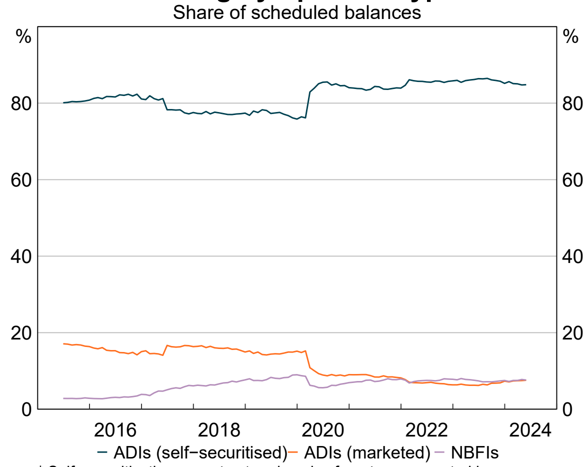
The RBA accepts RMBS as collateral for domestic markets operations providing funding and liquidity to the Australian financial system.[1] For an asset-backed security to be accepted as collateral, extensive information on the loans underlying it must be provided to the RBA. For RMBS, this information covers the terms of the loan, characteristics of the mortgage borrower, and details of the collateral secured by the mortgage.[2]

The Securitisation Dataset contains a sizeable share of all mortgages in Australia, with the majority of loans from self-securitisations. As at May 2024, the dataset contained around 1.7 million individual mortgages with a scheduled balance of almost $700 billion. By value, this represents roughly one-third of total outstanding housing credit in Australia. The majority of loans – around 92 per cent of balances – in the dataset are from ADIs, with around 85 per cent from major banks' 'self-securitisations' (Graph 1). Self-securitisations are not sold to investors but are instead held entirely by the originating ADIs for use as collateral in the RBA's market operations, including the Term Funding Facility (TFF).[3] The remaining 15 per cent of balances are marketed securities, equally split between ADIs and NBFIs. For the most part, these shares have been relatively stable, but structural changes, such as changes to the market operations for which securitisations can be used as collateral, can change the composition of the dataset. For example, this occurred when the TFF was introduced in 2020, which led to a notable increase in self-securitised deals in the dataset.[4]

Graph 1

Lending by Sponsor Type*

Share of scheduled balances



* Self-securitisations are structured pools of mortgages created by ADIs specifically to be offered as collateral to the RBA. Latest observation May 2024.

Sources: RBA; Securitisation System.

The Securitisation Dataset is also a particularly useful source of information about credit risk arising from NBFI lending. This is because NBFIs heavily rely on securitisation for funding and so while NBFIs only account for 4 per cent of outstanding mortgage housing lending, the dataset captures almost two-thirds of this type of lending. Lenders' incentives and structural features of the securitisation process can affect the representativeness of the dataset.

Purpose and structural features of the Securitisation Dataset

The primary purpose of the Securitisation Dataset is to assess the financial risk of RMBS and their suitability as collateral for the RBA's domestic market operations (Cole and de Roure 2020). That said, the timeliness, granularity and detail of the dataset means that it also lends itself to a secondary application in assessing the risks in the residential mortgage market.[5] However, some incentives and constraints faced by lenders mean that the pool of securitised mortgages can differ from the broader Australian mortgage market. For example:

- **Issuers of RMBS face incentives when selecting assets to place into securitisation pools.** Before being sold (or accepted as collateral by the RBA), RMBS must be rated by a credit rating agency. A higher credit rating leads to lower risk premia for the issuer, and so issuers may decide to exclude loans penalised by rating agencies. The RBA's margin requirements can vary depending on the type of loans included in the securitisation, and the requirement to provide data on underlying assets excludes poorly documented loans (which tend to be older) on lenders' balance sheets from being eligible.[6]
- **Loans face lags when entering the dataset.** Administrative processes, including obtaining credit ratings, take time and so there are lags between when loans are written and when they are securitised. Warehousing facilities, where financial institutions pool and temporarily hold loans before securitisation, can also contribute to these lags. In addition, each deal must be assessed against the RBA's repo-eligibility framework before being accepted and so leads to lags between securitisation and submission to the dataset.
- **Self-securitised deals have revolving pools.** ADIs using self-securitisation adds or removes loans as needed to the underlying asset pool, to calibrate the value of collateral potentially required and replace loans as they amortise or are discharged. There are strict rules limiting the active management of such loan pools.[7]

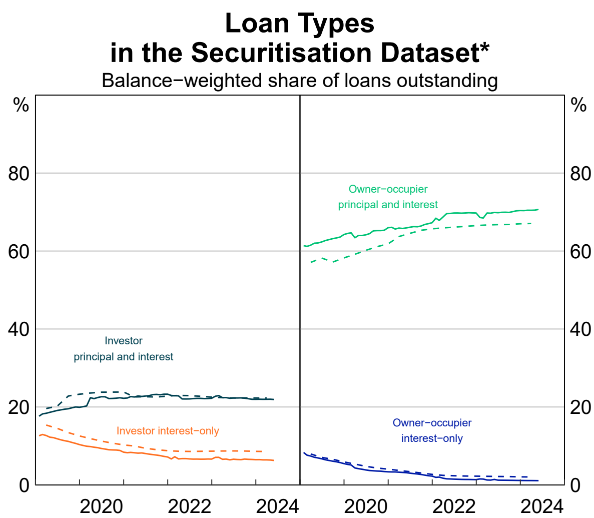
These incentives and structural features of the securitisation market and the Securitisation Dataset mean that the dataset could be materially different from the broader mortgage market. As a result, relying solely on the dataset could provide a biased assessment of financial stability risks from mortgage lending. The subsequent sections of this article explore the representativeness of the dataset along key risk indicators that the RBA monitors or constructs from the dataset to assess financial stability risks.

Where loans are well represented in the Securitisation Dataset

Financial stability risks can emerge from changes in risk-taking by lenders. For example, strong growth in lending to investors could amplify swings in the housing market, and increased issuance of interest-only loans increases the share of borrowers with high leverage (an important indicator of default risk of a loan) as these loans do not amortise.[8] Changes in the share of fixed- versus variable-rate lending can also influence the risk assessment, with variable-rate borrowers more exposed to sharply rising interest rates for example.[9]

Overall, the Securitisation Dataset accurately captures trends in the broader mortgage market. While principal-and-interest loans to owner-occupiers in the dataset are somewhat overrepresented (at the expense of interest-only loans to investors) when compared with APRA data, this difference is small and has remained broadly stable since 2019 (Graph 2). Similarly, the share of fixed-rate lending in the dataset broadly mirrors the broader mortgage market over the past years, even as fixed-rate lending increased sharply following the introduction of the TFF (Graph 3).[10]

Graph 2

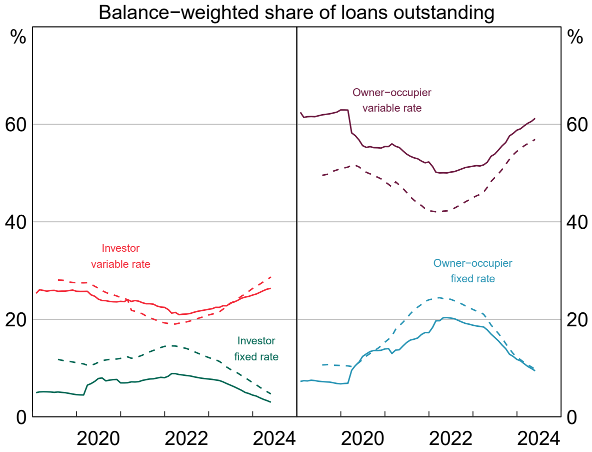


* Dashed lines indicate data from APRA; solid lines indicate data from the Securitisation Dataset. APRA data from ARF 223. Latest observation May 2024.
Sources: APRA; RBA; Securitisation System.

Graph 3

Interest Rate Types in the Securitisation Dataset*

Balance−weighted share of loans outstanding



* Dashed lines indicate data from APRA; solid lines indicate data from the Securitisation Dataset. APRA data from ARF 744 covering ADIs and NBFIs with housing credit ≥ $6bn and deposits ≥ $25bn. Latest observation May 2024.

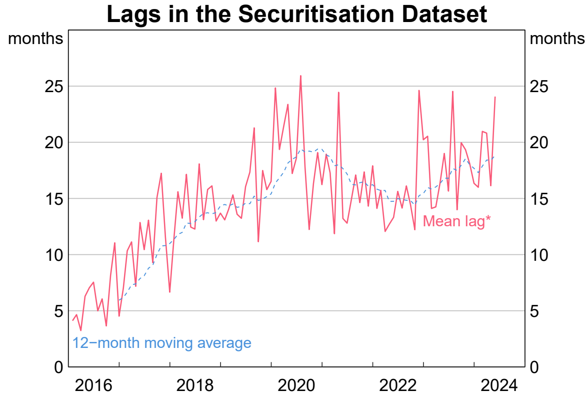
Sources: APRA; RBA; Securitisation System.

Where the Securitisation Dataset underrepresents loans

While the Securitisation Dataset appears to track high-level trends in the mortgage market well, substantial lags between loan origination and their appearance in the dataset need to be considered when using the data. On average, it currently takes about one-and-a-half years for a loan to be securitised and thus enter the dataset after origination. This lag has increased substantially between 2016 and 2018 (Graph 4).

Graph 4

Lags in the Securitisation Dataset



* Mean lag in months between a loan's origination and its first observation in the Securitisation Dataset. Latest observation May 2024.

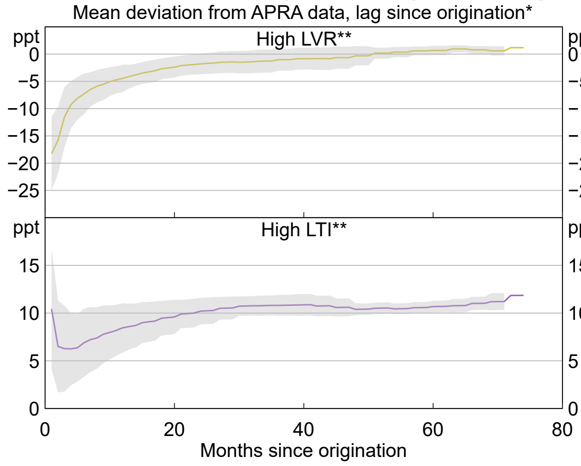
Sources: RBA; Securitisation System.

These lags can particularly limit the usefulness of the Securitisation Dataset to monitor new lending to highly leveraged loans that are particularly risky (Morgan and Ryan 2024). Indeed, these loans enter the dataset with particularly long lags. It can take up to around 20 months for loans with high leverage (loan-to-value ratio (LVR) greater than 80 per cent; an important indicator of default risk of a loan) to enter the dataset (Graph 5, top panel). Therefore, these loans are significantly *underrepresented* in the dataset relative to their cohort in the broader mortgage market (as captured in the APRA data), often for up to two years. This is consistent with rating agency policies discouraging high-LVR loans. By contrast, however, loans with high leverage relative to *income* (loan-to-income ratio (LTI) greater than six) are generally *overrepresented* in the dataset by around 10 per cent. This overrepresentation becomes stronger with the age of such loans as they progressively get securitised and enter the dataset (Graph 5, bottom panel) (see Appendix A for examples of the differences between RBA and APRA data).

Graph 5

Deviation of Shares of New High Leverage Lending

Mean deviation from APRA data, lag since origination*



* Shaded region is a 67% confidence interval (one standard deviation).

** High LTI lending is lending where the ratio of of the original loan amount to total borrower income is greater than six. High LVR lending is lending where the ratio of the original loan amount to the value of the collateral is greater than 80 per cent.

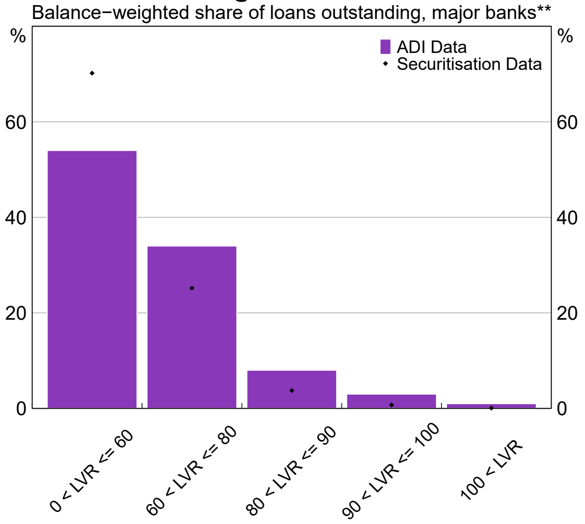
Sources: APRA; RBA; Securitisation System.

The underrepresentation of loans *originated* with high LVRs in the Securitisation Dataset also leads to an underrepresentation of loans with high *outstanding* (or '*dynamic*') LVR when compared with the loan book of the four major banks as reported in profit reports (Graph 6).[11] Specifically, low LVR loans (loans with an LVR less than 60 per cent) are overrepresented in the dataset relative to bank balance sheets, consistent with lower LVRs at origination and a decrease in LVRs due to strong housing price growth over recent years. By contrast, loans with high outstanding LVR (LVR greater than 80 per cent) are underrepresented in the dataset, and this underrepresentation extends to the share of loans in negative equity. While this suggests that risks in the dataset from high leverage are understated, the bias for the riskiest loans in negative equity is relatively small, with recent estimates suggesting that around 0.1 per cent of loans in the dataset are in negative equity, compared with around 1 per cent cited in major banks' profit reports.

Graph 6

Outstanding LVR Distributions*

Balance−weighted share of loans outstanding, major banks**



* Data sourced from ANZ, CBA, NAB and WBC profit reports. Data as at December 2023.

** Property prices in the Securitisation Dataset are estimated using SA3 price indices.

Sources: ABS; ANZ; CBA; CoreLogic; NAB; RBA; Securitisation System; WBC.

Estimating borrower cash flows and savings using the Securitisation Dataset

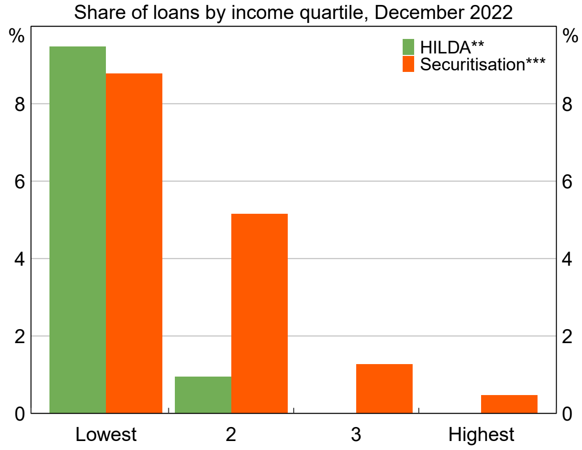
Given the Securitisation Dataset includes detailed information on borrower incomes and required mortgage payments, it can be used to estimate borrowers' spare cash flows.[12] However, borrowers' incomes are only recorded at loan origination and must be grown forward, and their essential expenses must be approximated, for example, by using the Household Expenditure Measure (HEM) from the Melbourne Institute.

Comparing the estimates from the Securitisation Dataset with those from the HILDA Survey suggests that the dataset provides conservative estimates of the share of borrowers with cash flow shortfall.[13] Around 3 per cent of mortgagors were estimated to be in cash flow shortfall in the dataset in December 2022 (to align with the survey period of HILDA) compared with 2½ per cent in the HILDA Survey (Graph 7). The dataset is particularly conservative for borrowers in higher mortgagor income quartiles, with around 5 per cent of borrowers in the second mortgagor income quartile estimated to find their income insufficient to cover their mortgage and essential expenses compared with less than 1 per cent using HILDA data. This likely reflects that incomes in the dataset are underestimated, either because mortgagors experience stronger income growth than assumed in these estimates or because some borrowers *underreport* their incomes when applying for a loan, or both.[14]

Graph 7

Borrowers with Cash Flow Shortfall*

Share of loans by income quartile, December 2022



* Estimates of borrowers with minimum scheduled mortgage payments and essential expenses (proxied by the HEM from the Melbourne Institute) exceeding their income.

** Shares estimated from the HILDA Survey.

*** Shares estimated from the Securitisation Dataset.

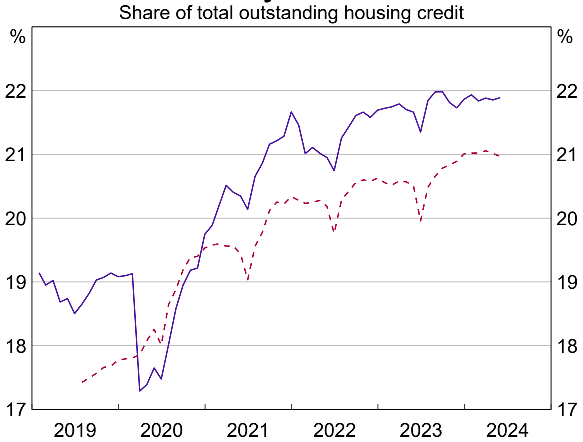
Sources: ABS; HILDA Survey Release 22.0; Melbourne Institute; RBA; Securitisation System.

With the Securitisation Dataset also providing detailed and timely data on prepayments into offset and redraw facilities attached to each loan, the data can be used to monitor the distribution of borrowers' savings in these accounts in near-real time. As a share of outstanding mortgage credit, excess payment buffers – an important indicator of the resilience of households to weather shocks to their income or expenses – in the dataset are broadly similar to the broader mortgage market as captured in APRA data (Graph 8). Flows into and out of offset and redraw accounts can also be compared with aggregate values from APRA statistics, which show that the savings behaviour of borrowers in the dataset closely matches that of the broader mortgage market.

Graph 8

Excess Payment Buffers*

Share of total outstanding housing credit



* Balances in offset and redraw accounts. Solid lines represent data from the Securitisation System; dashed lines data from APRA. APRA data from ARF 743. Latest observation May 2024.

Sources: APRA; RBA; Securitisation System.

Loan arrears using the Securitisation Dataset

The Securitisation Dataset can be used to monitor trends in loan arrears in a timely way and the detailed loan-level data allows for further disaggregation than is possible using arrears data reported to APRA. However, a divergence between aggregate arrears rates in the dataset and those observed in the APRA data suggests that greater caution is needed when interpreting the trends of more disaggregated samples.

The Securitisation Dataset can usually be used to monitor trends in aggregate arrears rates well, despite the level of arrears tracking below that of the broader mortgage market (Graph 9). In normal times, this difference is of the order of 10 basis points. This difference is consistent with the higher average quality (those with lower LVR) of loans observed in the dataset.

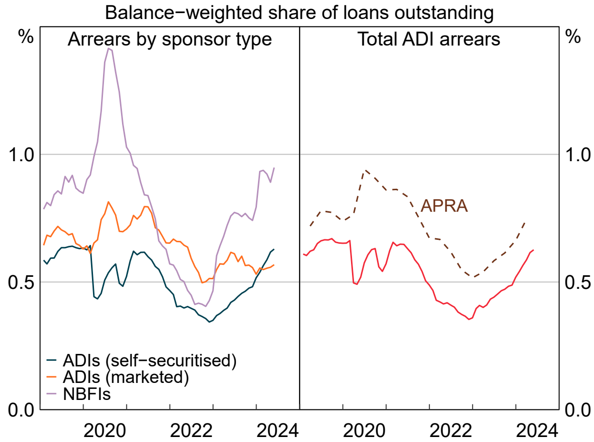
However, policy responses to significant changes to the economy can trigger a change in the composition of the securitised loan pool, requiring caution in interpreting trends in the data. The recent COVID-19 pandemic illustrates this point, when arrears rates for *self-securitised* loans decreased while rates in the broader market increased.[15] This can partially be explained by the increase in self-securitised loans entering the Securitisation Dataset in early 2020, with newer loans typically having lower arrears rates because the probability of borrowers encountering adverse circumstances cumulates over time (Morgan and Ryan 2024). However, the aggregate arrears rate still fell in the dataset even when excluding the newly added self-securitised loans.

The potential for arrears rates to diverge substantially means that it is important to consider where changes in the composition of the Securitisation Dataset are driving developments in arrears for different types of loans and borrowers in the dataset. In turn, arrears rates on marketed deals in the dataset could provide a more accurate read of financial stress experienced by different types of loans and borrowers in those instances.

Graph 9

Arrears in the Securitisation Dataset*

Balance−weighted share of loans outstanding



* Dashed lines indicate data from APRA; solid lines indicate data from the Securitisation Dataset. APRA data from ARF 220. Latest observation May 2024.

Sources: ABS; APRA; RBA; Securitisation System.

Conclusion

The Securitisation Dataset is a granular and timely source of information on mortgage lending in Australia. It provides loan- and borrower-level information that is not easily available from other sources, and complements alternative datasets for monitoring the financial stability risks associated with mortgage lending in Australia.

Overall, the Securitisation Dataset accurately reflects the distribution of housing lending across important dimensions such as lending to different borrowers, or by different loan types. It is also a powerful tool to obtain timely – albeit conservative – estimates of budget pressures faced by borrowers. However, major changes in the economy can trigger changes to the dataset's composition, and lags in the securitisation process cause new loans to be substantially underrepresented. This can affect the visibility of newer lending, especially new lending to borrowers with higher risk characteristics. Moreover, when the dataset is used to monitor arrears rates for different loan and borrower types, caution is needed to ensure that developments in arrears rates are not driven by compositional or behavioural factors. As a result, when using the dataset to assess financial stability risks in the mortgage market, it is important to be mindful of these limitations and complement the data with other sources of information.

Overall, the Securitisation Dataset is an important tool in the RBA's toolkit to assess financial stability risks from mortgage lending, particularly because it complements other less timely or less granular data sources. One of the dataset's comparative advantages is the information it provides on borrower incomes and savings buffers. For example, the dataset contains loan-level information on mortgage prepayments, including for fixed-rate lending (Lovicu *et al* 2023), which is not available in a timely way from other data sources. This also allows scenario analysis such as that exploring the resilience of mortgagors to higher interest rates and inflation (RBA 2024b). The detail included in the dataset also provides the ability to explore the impact of risk factors on borrower outcomes (e.g. the drivers of arrears (Morgan and Ryan 2024) and defaults (Bergmann 2020)).

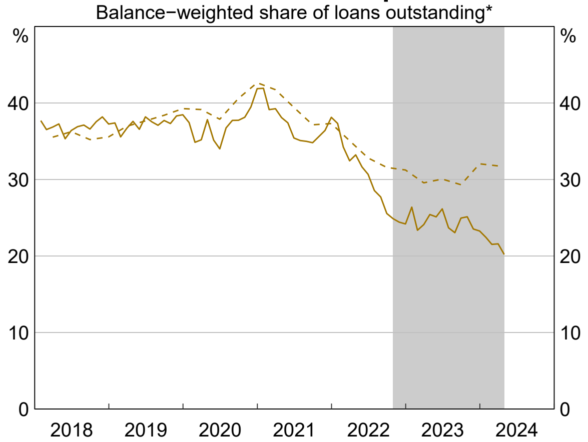
Appendix A: Differences in shares of highly leveraged loans

Graphs A1 and A2 provide examples of the differences in the shares of newly issued highly leveraged loans (by LVR and LTI) between the Securitisation Dataset and the APRA data as at May 2024.

Graph A1

Share of New Lending with a Loan-to-Value Ratio Greater than 80 per cent

Balance-weighted share of loans outstanding*



* New lending originated in the month.

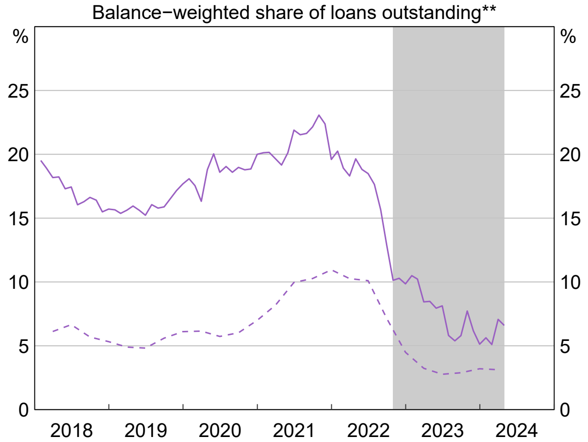
** Dashed lines indicate data from APRA; solid lines indicate data from the Securitisation Dataset. APRA data from ARF 223. Latest observation May 2024.

Sources: APRA; RBA; Securitisation System.

Graph A2

Share of New Lending with a Loan-to-Income Ratio Greater than Six*

Balance-weighted share of loans outstanding**



* New lending originated in the month.

** Dashed lines indicate data from APRA; solid lines indicate data from the Securitisation Dataset. APRA data from ARF 223. Latest observation May 2024.

Sources: APRA; RBA; Securitisation System.

Endnotes

[*] The author is from Financial Stability Department. The author would like to thank Benjamin Beckers for his contribution to this article.

[1] For more information on acceptable collateral, see RBA (2024c).

[2] The Securitisation Dataset tracks *loans*, rather than borrowers or collateral through time. This means that previous loans cannot be identified if a refinancing event occurs, and it is not possible to identify borrowers who move house or take out a second mortgage.

[3] For more information on the TFF, see RBA (undated).

[4] In 2019, the RBA also implemented system validation rules to improve the quality of the data provided. This reduced the number of data fields left blank or containing extreme values and enforced greater consistency between related data fields. For more information on validation rules, see RBA Securitisations Industry Forum (undated). Despite these significant data quality improvements, some important data fields contain missing or implausible data. For example, around 15 per cent of loans are reported with missing or clearly misreported income figures. To address these issues, missing values are imputed where appropriate.

[5] The RBA uses the Securitisation Dataset for other secondary monitoring, such as the cash flow channel of monetary policy (Lovicu *et al* 2023). This article focuses only on using the dataset for monitoring financial stability.

[6] See n 3.

[7] For a self-securitisation to be eligible, the securitising ADI must attest that it complies with APS 120 (APRA 2024).

[8] Strong investor housing credit growth and in interest-only lending motivated APRA to introduce credit growth limits in 2014 and 2017 (RBA 2018; Garvin, Kearney and Rose 2021).

[9] Fixed-rate borrowers can also face sharp increases in their mortgage repayments at the end of their loan term if interest rates increase. However, fixed-rate borrowers are better insulated from rising rates over their fixed-rate period, giving them time to make adjustments to prepare for higher payments at the expiry of their fixed-rate period. Consistent with this, fixed-rate borrowers appear no more risky than their variable-rate counterparts over the recent tightening cycle and have generally managed the transition to higher rates well (Lovicu *et al* 2023; RBA 2023b). However, fixed-rate borrowers could be more likely to fall behind on their loan repayments than variable-rate borrowers when interest rates fall, as they would not benefit from lower interest costs.

[10] The Securitisation Dataset is also representative of the geographic distribution of mortgagors when compared with data from the Census. The dataset can therefore be used to explore financial stability risks arising from regional shocks such as natural disasters or impacts of climate change (McCarthy and Reid 2024).

[11] Current property values are estimated using property value reported at origination (or at revaluation, if present), grown forward by local (SA3) House Price Indices from CoreLogic. The approach to estimating current property valuations for the four major banks varies by lender: ANZ grows valuations forwards 'where available'; the Commonwealth Bank (CBA) uses 'internal and external valuation data' to estimate current house prices on a monthly basis; the National Australia Bank (NAB) does not specify a methodology; and Westpac (WBC) uses CoreLogic House Price Indices.

[12] For an example and more detail of how the borrowers' spare cash flows can be estimated in the Securitisation Dataset, see RBA (2023a).

[13] The HILDA Survey provides current and more detailed information on borrowers' incomes, but requires an estimation of their minimum scheduled mortgage payments. Similar to the Securitisation Dataset, essential expenses are proxied using the HEM for this exercise. In line with the obligations under the Securitisation User Agreement, analysis on the HILDA Survey and the Securitisation Dataset were conducted independently by different Reserve Bank staff, and only combined at the aggregated level for graphing purposes.

[14] Income reported in the Securitisation Dataset is grown forward from loan origination by growth in the Wage Price Index. This tends to be a conservative measure of income growth as it does not capture income growth due to career progression (such as promotions), changes in working hours, or bonus payments. Borrowers' incomes are likely to be underreported in the dataset on average, as many borrowers (in particular higher income borrowers) only report the income necessary to secure the desired loan.

[15] Because of the high share of loans held in self-securitised deals in the data, trends in the aggregate arrears rate mainly reflect trends in arrears of self-securitised loans.

References

APRA (Australian Prudential Regulation Authority) (2024), 'Prudential Standard APS 120 Securitisation'.

Bergmann M (2020), 'The Determinants of Mortgage Defaults in Australia – Evidence for the Double-trigger Hypothesis', RBA Research Discussion Paper No 2020-03.

Brischetto A (2023), 'Financial Stability and the Financial Health of Australian Mortgagors', Speech at the Sydney Banking and Financial Stability Conference, University of Sydney, Sydney, 8 December.

Cole D and C de Roure (2020), 'Managing the Risks of Holding Self-securitisations as Collateral', RBA *Bulletin*, September.

Fernandes K and D Jones (2018), 'The Reserve Bank's Securitisation Dataset', RBA *Bulletin*, December.

Garvin N, A Kearney and C Rosé (2021), 'Macroprudential Limits on Mortgage Products: The Australian Experience', RBA Research Discussion Paper No 2021-07.

Lovicu G-P, J Lim, A Faferko, A Gao, A Suthakar and D Twohig (2023), 'Fixed-rate Housing Loans: Monetary Policy Transmission and Financial Stability Risks', RBA *Bulletin*, March.

McCarthy R and G Reid (2024), 'Assessing Physical Climate Risk in Repo-eligible Residential Mortgage-backed Securities', RBA *Bulletin*, April.

Morgan R and E Ryan (2024), 'Recent Drivers of Housing Loan Arrears', RBA *Bulletin*, July.

RBA (Reserve Bank of Australia) (2018), 'Chapter 5: Assessing the Effects of Housing Lending Policy Measures', *Financial Stability Review*, October.

RBA (2023a), 'Box B: Scenario Analysis on Indebted Households' Spare Cash Flows and Prepayment Buffers', *Financial Stability Review*, April.

RBA (2023b), '5.2 Focus Topic: An Update on Fixed-rate Borrowers', *Financial Stability Review*, October.

RBA (2024a), 'Chapter 2: Resilience of Australian Households and Businesses', *Financial Stability Review*, March.

RBA (2024b), '4.1 Focus Topic: Scenario Analysis of the Resilience of Mortgagors and Businesses to Higher Inflation and Interest Rates', *Financial Stability Review*, March.

RBA (2024c), 'Eligible Securities', 28 March.

RBA (undated), 'Term Funding Facility to Support the Australian Economy'.

RBA Securitisations Industry Forum (undated), 'Validation Rules'.

HILDA Disclaimer

Recent Drivers of Housing Loan Arrears

Ryan Morgan and Elena Ryan[*]

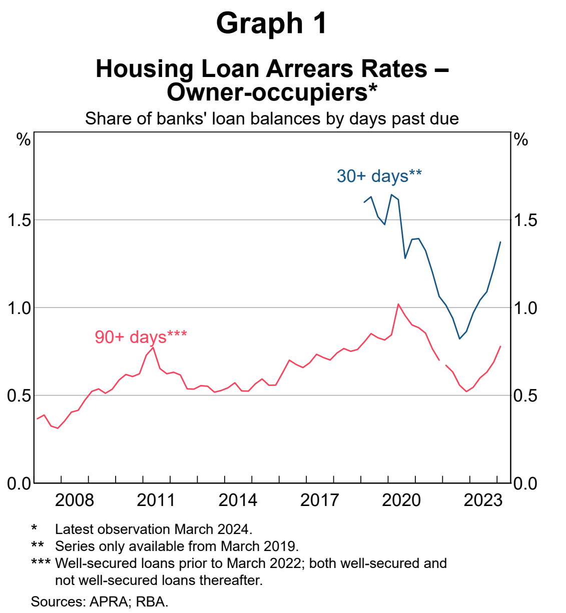
Photo: xijian – Getty Images

Abstract

Housing loan arrears rates have increased from low levels since late 2022, with banks expecting them to rise a bit further from here. Understanding what has been driving this increase is important for the RBA's assessment of risks to financial stability and the economic outlook. Using loan-level data for variable-rate owner-occupier borrowers, we find that the main drivers have been challenging macroeconomic conditions and a modest ageing of the loan pool rather than risks specific to lending in a given year. Overall, highly leveraged borrowers have been most likely to fall into arrears since 2022, consistent with their generally higher arrears rates and greater vulnerability to challenging economic conditions. We assess that financial stability risks remain contained as these borrowers represent a relatively small share of total housing lending and very few loans are estimated to be in negative equity, where the loan amount exceeds the property resale value.

Introduction

Housing loan arrears rates have increased steadily from low levels since late 2022, alongside rising household budget pressures from higher inflation and interest rates (Graph 1; RBA 2024). While arrears rates remain around pre-pandemic levels, banks expect them to increase a bit further from here.



Understanding this development is important for the RBA's assessment of risks to financial stability and the economic outlook. Housing loans are classified as in arrears when borrowers miss their minimum scheduled payment, but are still expected to return to fully servicing their loan. A default occurs when a borrower is no longer expected to fully service their loan. As housing loans account for around two-thirds of banks' total domestic lending, increases in arrears could pose risks to the Australian financial system if they result in defaults and losses. If large enough, these losses could lead to lenders sharply restricting the supply of credit to even very sound borrowers, disrupting economic activity. As an important indicator of mortgagors' financial health, housing loan arrears rates also capture information about conditions in the broader economy and are therefore relevant to the assessments formed by the Reserve Bank Board as part of their consideration of monetary policy settings.

This article presents a detailed analysis of recent developments in housing loan arrears, supports a deeper understanding of the main drivers, and discusses the financial stability implications of the results.

Developments in housing loan arrears rates

Data used for assessments

To assess developments in housing loan arrears, the RBA monitors data collected by the Australian Prudential Regulation Authority (APRA) and loan-level data from the RBA's Securitisation Dataset. While APRA data provides a representative view of trends in banks' aggregated housing loan arrears rates, the more granular Securitisation Dataset allows for a deeper understanding of developments in arrears rates for certain types of loans.[1]

To track how household financial stress is evolving, we focus on the arrears rates among variable-rate owner-occupier borrowers. Variable-rate borrowers have been more exposed to rising interest rates than fixed-rate borrowers and owner-occupiers tend to have fewer margins of adjustment compared with investors. Investors can more easily sell their property if they encounter debt serviceability challenges. Assessing the share of variable-rate owner-occupier borrowers 90 or more days in arrears helps us look through the volatility among earlier-stage arrears (which can be administrative or temporary in nature) and focus on more persistent financial stress.[2]

Risky loan characteristics

The Securitisation Dataset can be used to assess which borrowers have been more likely to fall behind on their payments. Loan characteristics typically perceived as more risky include:[3]

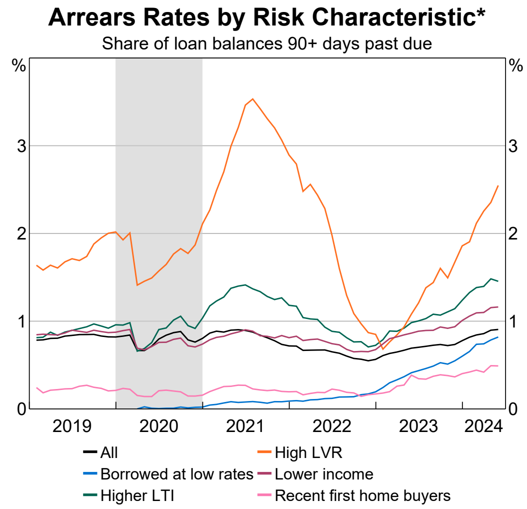
- **High leverage:**[4] Borrowers with high current debt relative to the value of their property (loan-to-value ratio (LVR) greater than 80) or income (loan-to-income ratio (LTI) greater than four) tend to have a lower stock of savings buffers as well as lower capacity to build buffers over time.[5] These borrowers have also seen larger increases to their scheduled minimum loan payments than others. Smaller equity buffers before a shock also mean borrowers are less able to avoid entering arrears by selling their property.

- **Lower income:** These borrowers tend to have lower capacity to adjust their budgets and build savings buffers because their essential household expenses comprise a larger share of their income relative to higher income borrowers. These borrowers also tend to take out larger loans relative to their income and have lower savings buffers at origination. We focus on borrowers in the first mortgagor income quintile (in May 2024 this captures borrowers estimated to earn less than $93,000 in combined household income).[6]
- **Borrowed at low interest rates:**[7] Many borrowers that took out (or refinanced) loans during the pandemic had their borrowing capacity assessed at an interest rate below their current rate.
- **Recent first home buyers:** First home buyers tend to take out loans with high LVRs as saving for a deposit can be difficult. Those who bought recently also have had less time to build equity or savings buffers; we focus on first home buyers who purchased within the past three years.

Recent developments in arrears

A comparison of recent developments in arrears among borrowers with the characteristics identified above shows that arrears rates among highly leveraged borrowers are highest and have increased at the highest rate (Graph 2).[8] This largely reflects their smaller buffers making them less resilient to changes in their mortgage payments or budgets. Arrears rates among this group also declined more significantly during the pandemic, particularly for high LVR borrowers. By contrast, arrears rates among recent first home buyers and those who borrowed at low rates are lower than the aggregate. Many of these borrowers would have been able to accumulate savings buffers during the pandemic and are therefore less likely to be liquidity constrained compared with currently highly leveraged borrowers. Newer loans also generally have lower arrears rates (discussed below). However, the arrears rate among those who borrowed at low rates has recently increased at a faster rate than arrears rates among recent first home buyers and the aggregate.

Graph 2



* Variable-rate owner-occupier loans. Shaded period indicates structural breaks, in part associated with the introduction of the Term Funding Facility, which led to a notable increase in self-securitised deals in the Securitisation Database (Hughes 2024). Latest observation May 2024.

Sources: ABS; CoreLogic; RBA; Securitisation System.

Main drivers of housing loan arrears

Insights from bank liaison support our understanding that the main reason borrowers fall into arrears is due to an unexpected loss of income and, to a lesser extent, unexpected pressure on their budgets. These shocks can be driven by:[9]

- **Idiosyncratic factors** unrelated to economic conditions, including loss of work or personal misfortune such as ill health or a relationship breakdown. These shocks happen even during periods of strong growth and, as such, there will always be some borrowers who experience difficulty making payments.[10]
- **Macroeconomic factors** including declining real wages, higher interest rates and rising unemployment that contribute to a cyclical increase in arrears rates. These factors – also referred to as *common time factors* – make it more difficult for all borrowers to service their debt, particularly those who are more highly leveraged or who have borrowed closer to their maximum capacity.

Borrowers that experience these shocks do not necessarily enter arrears immediately. Many borrowers have savings buffers that they can draw on until they find additional income or make further adjustments to their expenses. Around half of all variable-rate owner-occupier borrowers have enough buffers to service their debts and essential expenses for at least six months, slightly higher than before the pandemic (RBA 2024). Many borrowers also live in households with multiple incomes. This makes it less likely they will lose their entire household income. Lenders can also provide support by offering hardship arrangements under certain circumstances.

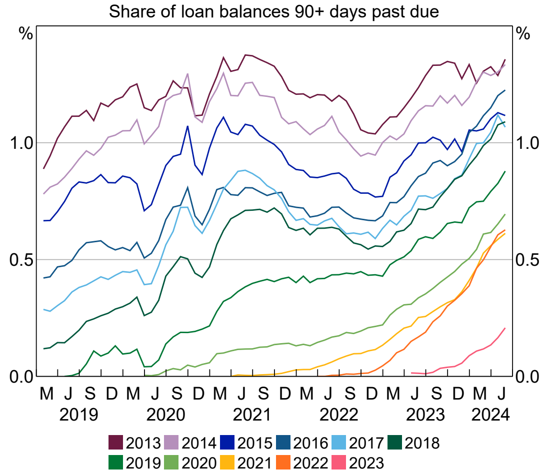
The arrears rate can also change for other reasons:

- **Cohort-specific factors** also affect arrears rates, reflecting, for example, lending standards or credit demand from borrowers common to the year a loan was originated. More prudent lending standards at origination means borrowers are less likely to encounter stress in the first instance, and also can support borrowers to build resilience over the course of their loan (such as saving buffers). This helps to mitigate the effects of adverse macroeconomic conditions on mortgage arrears.
- The **seasoning factor**, or age of a loan, also affects the arrears rate. This is because with more time since loan origination, although borrowers have the opportunity to accrue buffers over a longer period, the cumulative chance of a borrower experiencing a shock – idiosyncratic or macroeconomic – increases. In addition, borrowers' circumstances tend not to change so quickly that they fall behind on their repayments soon after taking out the loan. As a result, arrears are typically higher among older loans and the average arrears rates increases with the age (or *seasoning factor*) of the loan pool (Graph 3).[11]

Graph 3

Housing Loan Arrears by Origination Year*

Share of loan balances 90+ days past due



* Variable-rate owner-occupier loans. Latest observation May 2024.

Sources: RBA; Securitisation System.

Modelling the main drivers of housing loan arrears

The interaction of seasoning, time and cohort-specific factors makes it difficult to assess their separate contributions to changes in arrears rates. For example, higher arrears for a given cohort at one point in time could reflect cohort-specific factors (including changes in lending standards) or the impact of common time factors at an earlier point in their seasoning before borrowers have built resilience.

To disentangle the effects of these factors, we use a factor model, shown below (see Appendix A for more details). This more in-depth analysis of the Securitisation Dataset allows us to estimate the effect (β) of each factor on the arrears rate, holding the others constant. We also assess whether these factors affect borrowers differently depending on the risk characteristics discussed above.

$$arrears_{atc} = \beta_a seasoning + \beta_t month + \beta_c cohort + \varepsilon_{atc}$$

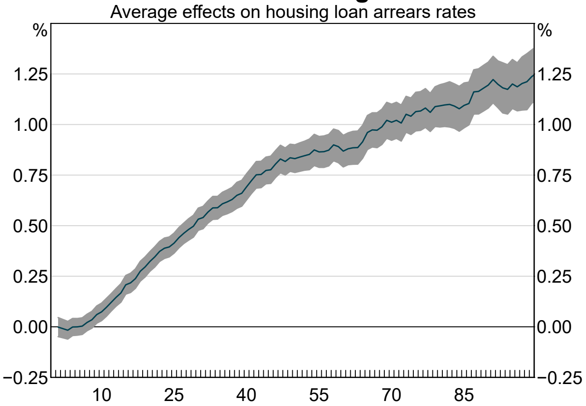
Seasoning factor effects

After controlling for cohort and time factors, we find that the seasoning factor results in higher arrears rates after around one year (Graph 4). For example, a five-year-old loan is around twice as likely to fall into arrears as a two-year-old loan on average. This is consistent with our understanding that arrears increase with time since origination, but that borrowers' circumstances tend not to change quickly.

Graph 4

Estimated Seasoning Effects*

Average effects on housing loan arrears rates



* Controlling for time and cohort effects. Arrears calculated as variable-rate owner-occupier loan balances 90+ days past due. Robust standard errors. Shaded areas represent 95 per cent confidence interval. Latest observation May 2024.

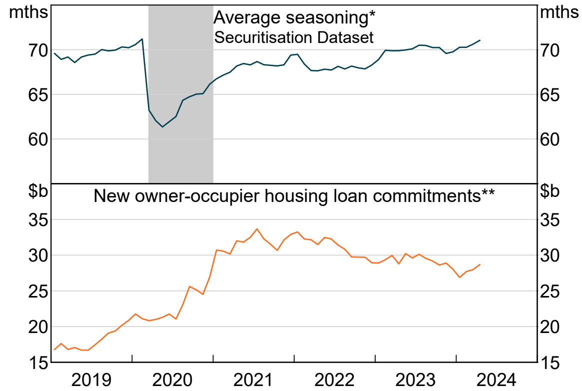
Sources: RBA; Securitisation System.

As a result of this seasoning effect, a modest ageing of the loan pool has contributed to the increase in arrears rates since 2022. Over the same period, the average seasoning in the Securitisation Dataset has increased alongside slower new housing loan commitments and credit growth (Graph 5).[12]

The seasoning effect is stronger for highly leveraged borrowers (Graph 6). That is, arrears rates tend to increase by more with loan age among highly leveraged borrowers (high LVR or LTI) than borrowers with lower leverage. We find that seasoning affects loans with other risk characteristics in a similar way to all other loans. These results support our understanding that highly leveraged borrowers are less resilient to shocks that occur over the lifetime of their loan than other borrowers. For example, after five years, the estimated average seasoning effect for borrowers with a high LVR is around three percentage points

Graph 5

Loan Pool Characteristics



* Average seasoning of variable-rate owner-occupier loans in the Securitisation Dataset. Seasoning value resets to zero when for loans refinanced with a new lender. Shaded period indicates structural breaks, in part associated with the introduction of the Term Funding Facility, which led to a notable increase in self-securitised deals in the Securitisation Database (Hughes 2024). Latest observation May 2024.

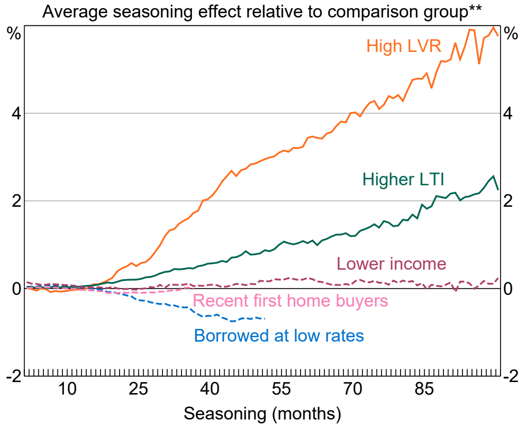
** Seasonally-adjusted. Includes external refinancing. Latest observation April 2024.

Sources: ABS; RBA; Securitisation System.

Graph 6

Estimated Seasoning Effects by Risk Characteristic*

Average seasoning effect relative to comparison group**



* Estimated average seasoning effects on arrears rates, controlling for time and cohort effects. Arrears calculated as variable-rate owner-occupier loan balances 90+ days past due. Latest observation May 2024.

** Difference between average effect among borrowers with and without risk characteristic. Dashed lines indicate series for which this difference is not consistently significant, using robust standard errors.

Sources: ABS; CoreLogic; RBA; Securitisation System.

higher than for borrowers who do not have a high LVR.

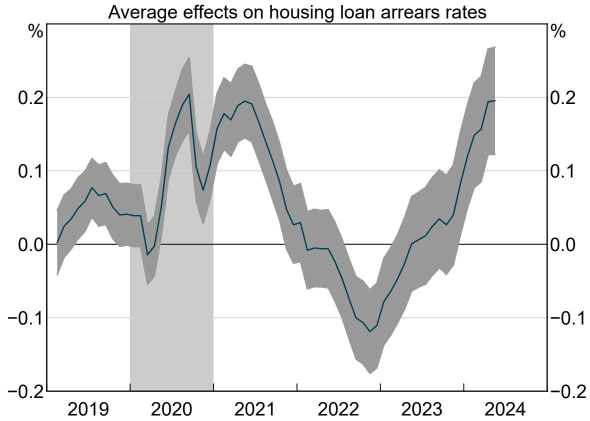
Time factor effects

After controlling for seasoning and cohort factors, we find that challenging macroeconomic conditions (common time factors) have recently contributed to a higher arrears rate (Graph 7). Challenging macroeconomic conditions associated with the pandemic have also contributed to a higher arrears rate from 2020. This effect started to ease from mid-2021 with the combination of significant policy support, limited spending opportunities because of lockdowns (which supported savings), and the subsequent strong economic recovery (which featured a very tight labour market). This all contributed to a lower arrears rate. However, these effects eased from late 2022, consistent with a higher cash rate flowing through to mortgage rates and an extended period of elevated budget pressures.[13]

Graph 7

Estimated Time Effects*

Average effects on housing loan arrears rates



* Controlling for seasoning and cohort effects. Arrears calculated as variable-rate owner-occupier loan balances 90+ days past due. Robust standard errors. Shaded areas represent 95 per cent confidence interval. Shaded period indicates structural breaks, in part associated with the introduction of the Term Funding Facility, which led to a notable increase in self-securitised deals in the Securitisation Database (Hughes 2024). Latest observation May 2024.

Sources: RBA; Securitisation System.

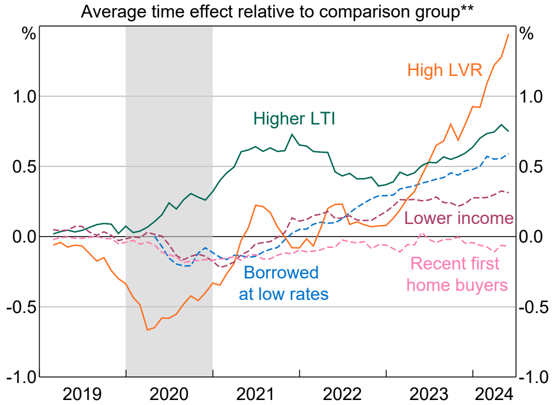
The contribution of common time factors to arrears has had a stronger effect among highly leveraged borrowers, and to a lesser extent, borrowers on lower incomes and those that borrowed at low rates (Graph 8). For highly leveraged and lower income borrowers, this supports our understanding that these borrowers have been less able to make adjustments in response to challenging macroeconomic conditions. Moreover, policy stimulus and a tighter labour market during the pandemic appears to have had a stronger downward effect on arrears among these borrowers.

In addition, those who took out loans at low rates have experienced challenging macroeconomic conditions earlier in their loan term and have not had as much time to build resilience to the large changes in their repayments. We find that recent challenging economic conditions have affected recent first home buyers in a similar way to other borrowers, consistent with previous research showing that they do not tend to be more likely to report financial stress (Alfonzetti 2022). While they have had less time to repay the principal on their loans, many of these borrowers were able to accumulate savings buffers during the pandemic in the lead up to a period of rising budget pressures.[14]

Graph 8

Estimated Time Effects by Risk Characteristic*

Average time effect relative to comparison group**



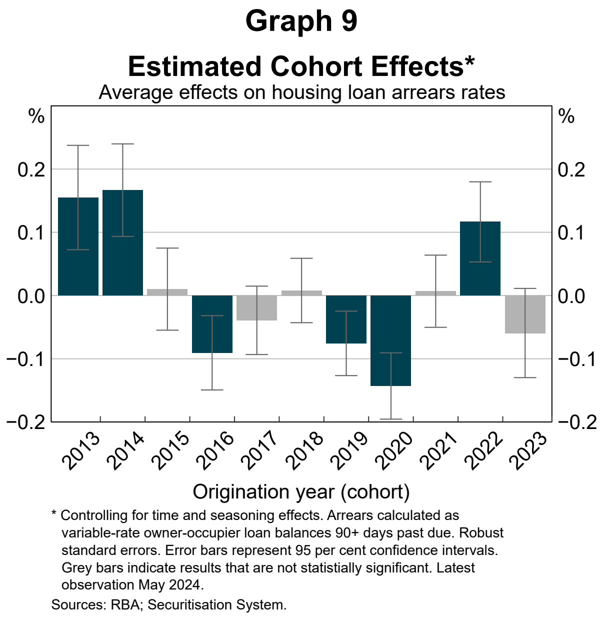
* Estimated average time effects on arrears rates, controlling for seasoning and cohort effects. Arrears calculated as variable-rate owner-occupier loan balances 90+ days past due. Shaded period indicates structural breaks, in part associated with the introduction of the Term Funding Facility, which led to a notable increase in self-securitised deals in the Securitisation Database (Hughes 2024). Latest observation May 2024.

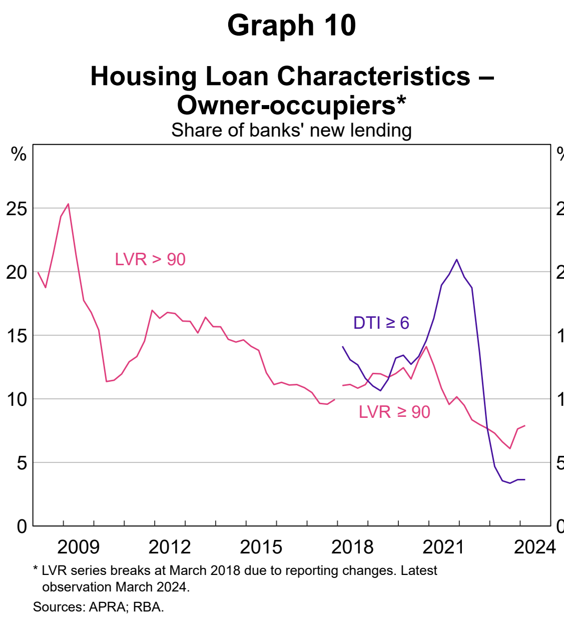
** Difference between average effect among borrowers with and without risk characteristic. Dashed lines indicate series for which this difference is not consistently significant, using robust standard errors.

Sources: ABS; CoreLogic; RBA; Securitisation System.

Cohort factor effects

We find that *some* cohorts have higher or lower arrears rates over time, after controlling for seasoning and time factors (Graph 9, blue bars). These effects are also smaller than the estimated effects for the other factors. The negative average cohort effects between 2014 and 2020 (before the pandemic) likely reflect that Australian regulators significantly tightened housing lending standards (Kearns 2019). By contrast, the positive cohort effect on arrears linked to loans originated in 2022 is consistent with the slightly stronger estimated effect of time factors on the group who borrowed at low rates (between March 2020 and April 2022, discussed above). This suggests that this group of borrowers have fallen into arrears at slightly higher rates than others. The 2022 cohort has had a reduced capacity to save, with less time than other borrowers in this group to accumulate buffers and prepare for large changes in repayments before interest rates increased. Other cohort-specific factors include increased household indebtedness and credit demand; high debt-to-income (DTI) lending increased temporarily over 2021 and 2022 (Graph 10).[15] We find no significant difference in arrears rates among borrowers that took out a loan after 2022 when budget pressures had already started to rise.





Financial stability assessment

Our findings help us understand how risks to financial stability from housing lending are evolving. We find that the recent increase in arrears has mainly been driven by a modest ageing of the loan pool (*seasoning factors*) and challenging macroeconomic conditions (*time factors*), rather than meaningful differences between the groups of borrowers taking out loans in a given year (*cohort factors*). We also find that both seasoning and time factors have had a stronger effect among more highly leveraged borrowers. To inform our assessment of financial stability risks from lending to borrowers with these risk characteristics, we focus on three main aspects:[16]

1. **Group size:** the share of total housing loans with these risk characteristics and whether this is increasing.
2. **Stock of buffers:** capacity for these borrowers to weather shocks by drawing down on savings.
3. **Equity:** whether these loans are in negative equity and pose an outsized risk to bank losses.

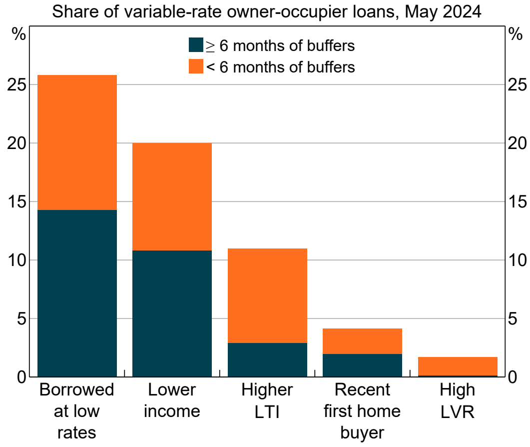
We consider risks to financial stability from housing lending to borrowers with these riskier characteristics to be contained. From an aggregate perspective, sound lending standards and the general increase in housing prices over recent years continue to support financial system resilience. Highly leveraged borrowers comprise a relatively small share of total loans; in the Securitisation Dataset around 11 per cent of variable-rate owner-occupier loans have a higher LTI ratio and around 2 per cent have a high LVR (Graph 11).[17] This share is expected to remain small as new lending to highly leveraged borrowers has fallen to historical lows (Graph 10). Moreover, while many highly leveraged borrowers have low buffers, some higher LTI loans are taken out by higher income borrowers who have greater means to service a larger loan.

Overall, less than 1 per cent of all housing loans are 90 or more days in arrears, and less than 3 per cent of highly leveraged borrowers – the group of households most at risk – are in arrears.

Graph 11

Borrowers with Risk Characteristics*

Share of variable-rate owner-occupier loans, May 2024



* Shares in the Securitisation Dataset. Buffers are balances in offset and redraw accounts. Risk characteristics are not mutually exclusive.

Sources: ABS;CoreLogic;RBA;SecuritisationSystem.

For loans in arrears to lead to bank losses, borrowers must both default on the loan and be in negative equity – that is, the value of the property collateralising the loan is lower than the outstanding value of the loan.[18] However, bank profit reports suggest that the share of loans in negative equity on their books remains very low, at around 1 per cent on average.[19] While usually a last resort and very disruptive for owner-occupier borrowers, this would allow almost all borrowers to sell their properties and repay their loans in full before defaulting. Moreover, lenders can also enter into financial hardship arrangements. The share of borrowers that have given hardship notices to their lenders (and accounts under hardship arrangement) has increased significantly since 2022.[20] However, this group accounts for a small share of total loans. While some of these arrangements could have contributed to an increase in earlier-stage recorded arrears rates, they can also allow borrowers time to make adjustments and therefore return to servicing their loan.

Conclusion

We find that the main drivers of the recent increase in arrears have been challenging macroeconomic conditions and a modest ageing of the loan pool. We assess that financial stability risks remain contained, with highly leveraged borrowers – the group of households most at risk – representing a relatively small share of total housing lending and very few loans estimated to be in negative equity. Looking ahead, household budget pressures are expected to remain elevated for some time but to ease a little as inflation moderates further. The expected gradual further labour market easing will be challenging for households who lose work. Banks expect housing loan arrears rates to increase a bit further, based in part on their latest assessments of the economic outlook. This assessment is broadly consistent with RBA analysis that shows that nearly all borrowers are expected to be able to continue servicing their debts even if budget pressures were to remain elevated for an extended period (RBA 2024). Banks are well placed to withstand increased loan losses, supported by their previous provisioning, strong profits and capital positions, and are further protected by the very low share of loans estimated to be in negative equity (RBA 2024).

Appendix A: Factor model details

Data

Using the Securitisation Dataset, we focus on the arrears rates of variable-rate owner-occupier borrowers who are 90 or more days in arrears for our assessment of how financial stress is evolving among indebted households because:

- Borrowers who are still on low, fixed rates during the pandemic continue to have substantially lower arrears rates as they have been shielded so far from rising interest rates.
- Investors tend to have higher incomes and larger savings buffers than owner-occupiers that they can use to manage adjustments to borrowing costs. Investors are also more likely to sell an investment property if they encounter debt serviceability challenges before entering arrears compared with owner-occupiers, for whom selling their home can come with significant financial and personal costs.
- We can observe variable-rate owner-occupier borrowers' savings more completely in the Securitisation Dataset than those of other borrowers, allowing for a fuller assessment of their financial positions.
- Arrears rates among earlier stage loan arrears rates are more volatile. Liaison with lenders suggests that some increases in earlier stage arrears reflect borrowers needing to update their payments when their interest rate increases rather than borrowers experiencing servicing difficulties.

For more detail on the Securitisation Dataset, see Hughes (2024).

Model

To isolate seasoning, cohort, and time factors, we estimate a factor model. This model decomposes the share of loans in arrears ($arrears_{atc}$), of seasoning a, observed in month t, and originated in period c into three additive factors: β_a (seasoning), β_t (time), and β_c (cohort) factors:

$$arrears_{atc} = \hat{\beta}_a seasoning_a + \hat{\beta}_t month_t + \hat{\beta}_c cohort_c + \hat{\varepsilon}_{atc}$$

Where $seasoning_a$ is the age of a loan in terms of months from origination and $month_t$ is a monthly date variable (equivalent to a time fixed-effects term). To overcome linear dependence that leaves the model unidentified, we constrain $cohort_c$ to be the year a loan was originated. For example, loans originated between January and December 2020 are assigned to cohort 2020, loans originated between January and December 2021 to cohort 2021, and so on. This implicitly assumes that all loans written in a year have equal cohort factors. This could be considered a fairly strong assumption, but is simple to implement and necessary for the model to be identified.

To examine the effects of these factors across the specific risk characteristics identified above, we estimate the above model for each risk group pair and interact each factor with a dummy variable equal to 1 if a loan falls within the risk group i:

$$arrears_{atc,\,i} = \hat{\beta}_{a,\,i} seasoning_a \delta_i + \hat{\beta}_{t,\,i} month_t \delta_i + \hat{\beta}_{c,\,i} cohort_c \delta_i + \hat{\varepsilon}_{atc,\,i}$$

We define the risk characteristics as follows:

Risk characteristic	Risk group	Comparison group
High LVR (current, offset adjusted)	LVR > 80	LVR ≤ 80
Higher LTI (current, offset adjusted)	LTI > 4	LTI ≤ 4
Lower income	Lowest mortgagor income quintile	Highest mortgagor income quintile
Borrowed at low rates	Borrowed between March 2020 and April 2022	Borrowed before March 2020 and after April 2022
Recent first home buyer	First loan taken out within the previous three years	All other loans not for first home buyers or taken out more than three years ago

For example, δ_i is equal to 1 in the high LVR specification when a loan has a LVR greater than 80, and 0 otherwise. As in the aggregate model, we constrain the cohort factor to be the year a loan was originated.

To determine whether a factor, under either the aggregate or risk characteristic specification, is significantly different from zero, we run a two-sided t-test for significance. To determine whether estimates using the risk characteristic specification are significantly different to the estimates for the risk characteristic comparison group, we run a Wald test. Both tests use robust standard errors. We find no further information in model residuals.

Endnotes

[*] Ryan Morgan contributed to this work while in Financial Stability Department; Elena Ryan is from Financial Stability Department. They would like to thank Ben Beckers for his contribution to this article.

[1] Hughes (2024) notes that the arrears rate for loans in the Securitisation Dataset mostly follows a similar trend to the arrears rate of the broader mortgage market, but at a lower level. However, trends in the two arrears rates have diverged at specific times, reflecting changes to the composition of the dataset (i.e. loans being securitised). For our sample period, this appears to have happened at times in 2020, in part reflecting the introduction of the Term Funding Facility, which led to a notable increase in self-securitised deals in the dataset. The results of this study are robust to excluding these periods from the sample, or only using loans from marketed deals (not self-securitisation) for the analysis.

[2] For a more detailed explanation why we focus on this measure of arrears and this group of borrowers, see the data section in Appendix A.

[3] These characteristics are not mutually exclusive. For discussion of these risk characteristics, see RBA (2023).

[4] Current loan balances are net of offset and redraw account balances, and current property values are estimated by growing forward values at loan origination using house price indices at the SA3 level. We use LTI instead of DTI as we only see mortgage loans (and not total debt) in the Securitisation Dataset. See Hughes (2024) for a discussion of the representation of highly leveraged borrowers in the Securitisation Dataset. Note highly leveraged borrowers are classified in Hughes (2024) at origination instead of current as in this article, and LTI is classified as high above a ratio of six (a subset of the group used in this article, with a ratio above four). High LVR loans tend to enter the Securitisation Dataset with a longer lag and are therefore underrepresented in the dataset relative to their cohort in the broader mortgage market often for up to two years. However, high LTI loans are overrepresented.

[5] Loans to borrowers with high leverage at origination tend to be more risky for the same reasons. However, the majority of these borrowers manage to reduce their debt and build savings buffers over time. We therefore focus on the group of borrowers most at risk – that is, borrowers who continue to be highly leveraged.

[6] By comparison, the bottom quartile of all household incomes extends to around $40,000 (based on data from Wave 22 of the Household, Income and Labour Dynamics in Australia (HILDA) Survey, released in December 2023, grown forward by Wage Price Index growth), reflecting that mortgagors tend to have higher incomes than other households.

[7] Borrowers who took out loans between March 2020 and April 2022, including those who refinanced their mortgages during the pandemic and may have had existing savings buffers.

[8] This analysis uses arrears rates weighted by loan balance rather than number to facilitate the chosen modelling. Some analysis in RBA's *Financial Stability Review* is shown with arrears rates by number so levels may differ.

[9] For discussions on factors that might cause borrowers to fall into arrears, see Debelle (2019) and Kearns (2019).

[10] Data collected from the Australian Securities and Investments Commission (ASIC) between July 2022 and December 2023 from 30 lenders show that financial hardship notices related to medical, family and natural disaster reasons accounted for around one-quarter of all applications. The most common reasons given in a

hardship notice were overcommitment, reduced income and unemployment. These data relate to hardship notices for all credit contracts that are regulated under the National Credit Code; home loans accounted for around 40 per cent of total notices (most of which were owner-occupier home loans), see ASIC (2024).

[11] The sample size of loans in the Securitisation Dataset originated before 2018 is smaller than for more recent cohorts.

[12] While the level of average seasoning in the Securitisation Dataset likely differs from the population of all loans due to compositional differences (Hughes 2024), we expect slower new lending to have a similar effect on arrears rates among all loans. A main difference between seasoning in the Securitisation Dataset and the population of loans is the significantly lower average seasoning in 2020 as a result of the introduction of the Term Funding Facility, which led to a notable increase in new self-securitised deals in the dataset (Graph 5, shaded area).

[13] For more details on cash rate pass-through to mortgage rates, see Ung (2024).

[14] For more details on the indicators of household financial stress, see RBA (2023).

[15] Differences between these estimates and those presented in Kearns (2019) include that they are calculated on updated data and are estimated average effects, rather than relative to a specific period.

[16] This risk assessment is complemented by a broader suite of information received through the RBA's liaison program with lenders and community organisations and discussions with regulators through the Council of Financial Regulators.

[17] For a discussion of how borrowers with a high LVR are underrepresented and borrowers with a high LTI ratio are overrepresented among newer loans in the Securitisation Dataset, see Hughes (2024). As a robustness check for the estimated share of highly leveraged loans, we use Wave 22 of the HILDA Survey and find that around 20 per cent of variable-rate owner-occupier borrowers had a high LTI in 2022 and around 2 per cent had a high LVR in 2022.

[18] Being in negative equity increases the probability that a borrower who cannot service their mortgage defaults on their loan. For more details on determinants of mortgage defaults in Australia, see Bergmann (2020).

[19] Estimates from the RBA's Securitisation Dataset suggest that the share of loans in negative equity, defined as a current LVR greater than 100 per cent, is around 0.1 per cent. The median LVR for loans in the dataset is lower than in the population as counterparties are incentivised to securitise prime loans (typically with LVRs below 80 per cent) to reduce the haircut applied when posting collateral. For more details, see Hughes (2024). Further, APRA data show that almost all of the small share of owner-occupier housing loans currently at least in 90-day arrears are well secured (i.e. the collateral value is sufficient to cover the outstanding loan amount). This has been little changed since 2022.

[20] ASIC (2024) sets out the findings of ASIC's review of the end-to-end policies, processes and practices of 10 large home lenders responding to customers experiencing financial hardship.

References

Alfonzetti M (2022), 'Are First Home Buyer Loans More Risky?', RBA *Bulletin*, March.

ASIC (Australian Securities and Investments Commission) (2024), 'Hardship, Hard to Get Help: Findings and Actions to Support Customers in Financial Hardship', Report No 782, May.

Bergmann M (2020), 'The Determinants of Mortgage Defaults in Australia – Evidence for the Double-trigger Hypothesis', RBA Research Discussion Paper No 2020-03.

Debelle G (2019), 'Mortgage Arrears', Speech at the FINSIA Signature Event: The Regulators, Sydney, 15 November.

Kearns J (2019), 'Understanding Rising Housing Loan Arrears', Speech at the Property Leaders' Summit, Canberra, 18 June.

Hughes A (2024), 'How the RBA Uses the Securitisation Dataset to Assess Financial Stability Risks from Mortgage Lending', RBA *Bulletin*, July.

RBA (Reserve Bank of Australia) (2023), '5.3 Focus Topic: Indicators of Household Financial Stress', *Financial Stability Review*, October.

RBA (2024), *Financial Stability Review*, March.

Ung B (2024), 'Cash Rate Pass-through to Outstanding Mortgage Rates', RBA *Bulletin*, April.

HILDA Disclaimer

The Australian Repo Market: A Short History and Recent Evolution

Laurence Bristow and Michael Tang[*]

Photo: Mark Piovesan – Getty Images

Abstract

In 2019, the repurchase agreement (repo) market became the second largest onshore short-term wholesale funding market in Australia. In addition to its size, the range of participants and diversity of collateral used to obtain funds under repo has grown in recent years. As a result, the repo market provides valuable information about conditions in short-term wholesale funding markets. This article describes the recent growth in the Australian repo market and discusses the pricing in the repo market relative to other benchmarks.

Introduction

The repurchase agreement (repo) market is one of several 'money markets' in Australia – a broad term that refers to different products available to wholesale participants to borrow or invest their money for a short term (less than 12 months). Different money markets are typically distinguished by the length (or tenor) of transactions, whether the cash lender requires collateral, the type of cash borrower, and the trade's currency denomination.

The repo market has grown and become more widely used such that it provides more valuable information about conditions in short-term money markets than previously. The RBA also uses the repo market to implement monetary policy through its open market operations (OMOs). For a short history of the repo market and the RBA's involvement in it, see Box A.

This article describes the recent growth in the Australian repo market and explores some reasons for the small increase in repo rates relative to the Exchange Settlement (ES) rate. These reasons include increases in the demand for cash to fund securities, interbank trading and collateral availability.

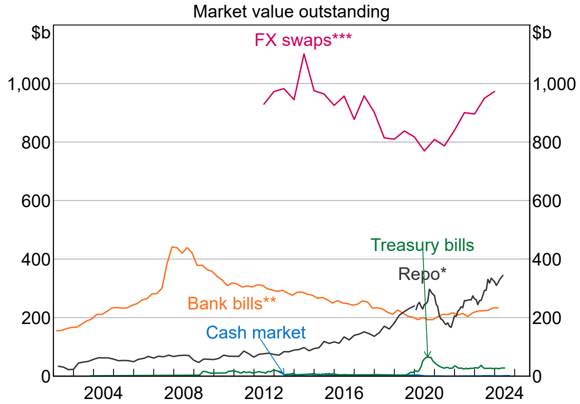
The repo market through the COVID-19 pandemic

In 2019, the repo market became the second largest onshore money market in Australia (Graph 1). In part, strong growth in the repo market is due to repo being a safer product than unsecured alternatives like bank bills (Hing, Kelly and Olivan 2016). This is because a repo involves the exchange of cash for collateral that the cash lender can sell if the cash borrower defaults. A repo is economically similar to a short-term secured loan: one party sells securities to (and receives cash from) another party and agrees to repurchase the securities (paying back the cash) at a set price later. The difference between the purchase and repurchase price represents the interest paid on the loan – the repo rate.

Graph 1

AUD Money Markets

Market value outstanding



* Includes repo and securities lending; excludes repos with the RBA and repos collateralised by equity securities.

** Issued onshore.

*** Incudes forwards, FX swaps, currency swaps and options, in Australia. Not adjusted for dealer double counting.

Sources: ABS; AOFM; APRA; BIS; RBA.

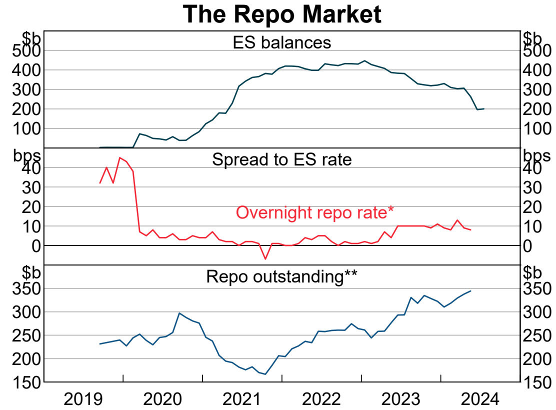
There are considerable offshore elements to each of the Australian money markets, although a complete comparison of market sizes is complicated by data limitations. Nevertheless, around three-quarters of Australian dollar (AUD) foreign exchange (FX) swap activity occurs offshore, with the total value of AUD FX swaps outstanding estimated to exceed $4 trillion. Our assessment is that a smaller, but still material, share of repo activity involving AUD-denominated securities and cash occurs offshore.

Activity and pricing in money markets, including the repo market, changed in response to the RBA's pandemic-era policies. Prior to the COVID-19 pandemic, the RBA supplied only a small amount of ES balances to banks. In this system of scarce ES balances, money market rates across a range of terms traded above the actual and expected cash rate (the price for interbank, overnight unsecured borrowing). Partly, this divergence represented a lack of arbitrage between markets because of balance sheet limitations (Cheung and Printant 2019). Further, banks that facilitate trading in repos were less willing to lend their ES balances in the repo market, wary that they may not be able to borrow back these funds in the cash market at the end of the trading day.

In 2020, the supply of ES balances increased significantly because of the RBA's repo provision via OMOs, bond purchases and the Term Funding Facility (TFF) (Debelle 2021). As the supply of ES balances expanded, money market rates converged on the interest paid on banks' deposits held at the RBA – known as the 'ES rate' (Graph 2). Further, the divergence in money market rates observed prior to the pandemic largely disappeared, which could indicate these markets are now more connected (Graph 3). In addition, banks with excess ES balances were more inclined to lend in the repo market as they were no longer concerned about the potential need to borrow these funds back at the end of the day. More recently, ES balances have declined as the TFF is paid back and some of the RBA's bond purchases roll-off. So far, the decline in ES balances has coincided with a small increase in the overnight repo rate (relative to the ES rate) and a substantial increase in activity (Graph 2, middle and bottom panels).

Graph 2

The Repo Market



* Rate on trades with 1 day residual maturity, originated within the month. Calculated using ASX's SOFIA methodology on APRA form 721_0A data.

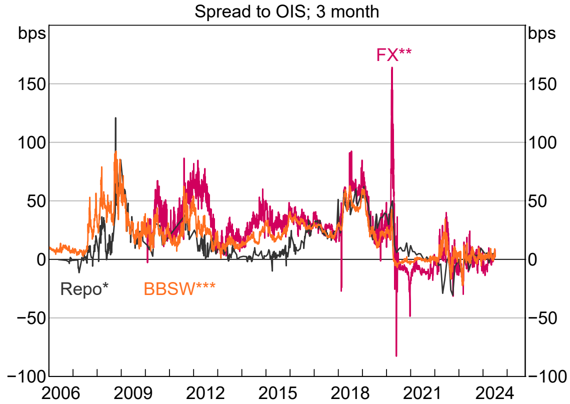
** Entered into by banks and registered financial corporations; includes repo and securities lending; excludes repos with the RBA and repos collateralised by equity securities.

Sources: APRA; RBA.

Graph 3

Australian Money Market Spreads

Spread to OIS; 3 month



* RBA OMO repos used prior to 2020, private market high−quality liquid assets (HQLA) repos used from 2020.

** Implied AUD rate based on covered interest parity.

*** Bank Bill Swap Rate.

Sources: APRA; ASX; Bloomberg; RBA; Tullett Prebon; US Federal Reserve.

Recent growth in the repo market

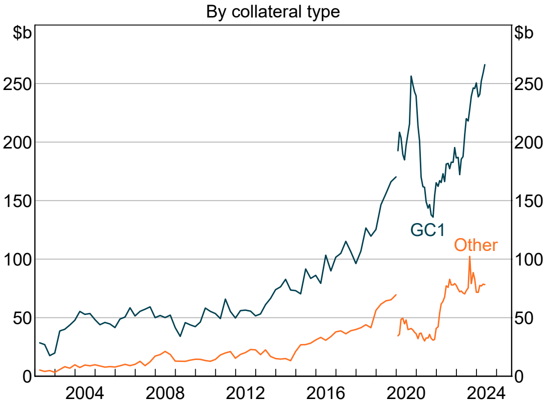
Since late 2021, repo contracts outstanding have grown from around $200 billion to around $350 billion. Over this time, there have been changes in the type of collateral posted under repo, the number of market participants and their sectoral composition.

Various types of securities are posted as collateral in repo contracts. The most common type of securities are bonds issued by the federal and state governments and referred to as 'General Collateral 1' (GC1). These securities tend to be preferred by the cash lender as they are the safest and most widely available form of collateral. Specifically, using government securities as collateral substantially reduces credit risk exposures among money market participants and there are around $1.5 trillion of bonds outstanding – making them easy to find in the market. A material share of the total demand to borrow cash in the repo market comes from market participants, such as dealers, funding their holdings of GC1 securities. These participants purchase GC1 securities and lend them in the repo market in exchange for cash. This cash is used to pay for the initial purchase of the bond (Plong and Maru 2024). The participant gains an exposure to the bond and faces a funding cost of holding the bond equal to the repo rate. Similarly, some of the supply of cash in the repo market comes from dealers borrowing bonds that they sell. The GC1 segment of the repo market has grown by around 30 per cent since 2019 (Graph 4).

Graph 4

Repo Contracts Outstanding*

By collateral type



* Entered into by banks and registered financial corporations; includes repo and securities lending; excludes repos with the RBA and repos collateralised by equity securities.

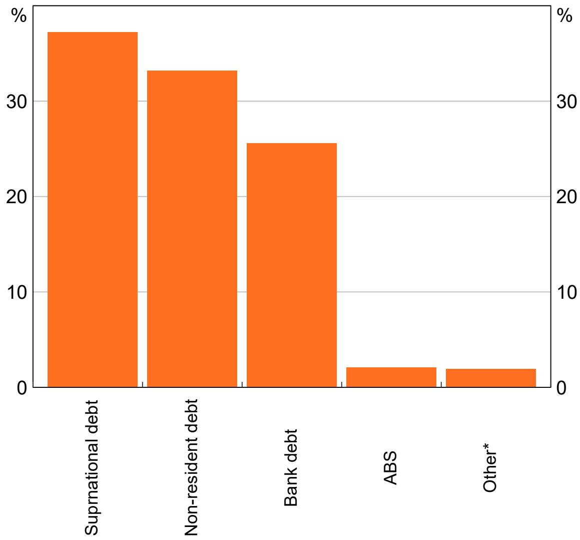
Sources: APRA; RBA.

Participants can also use other forms of collateral in the repo market. Supranational debt (a sub-category of non-resident debt), other non-resident debt and bank debt make up the vast majority of the other forms of collateral posted under repo (Graph 5). This part of the repo market has more than doubled in size since 2020 – with most of the growth occurring in 2022. Repo collateralised by bank debt increased alongside reductions in the size of the Committed Liquidity Facility (CLF). Under this facility, the RBA provided contingent funding to banks, which they could draw upon in the event of liquidity stress in exchange for collateral. Apart from self-securitisations, the largest collateral group securing CLF positions was bank debt (Bergmann, Connolly and Muscatello 2019). As the size of the facility was reduced, some of this bank debt appears to have entered the private repo market.

Graph 5

Other Securities Posted Under Repo

Share of market



* Includes private non-financial corporate debt and other resident securities.

Sources: APRA; RBA.

The repo markets for GC1 and other collateral types responded differently to the stress caused by the COVID-19 pandemic. During 2020, there was a market-wide increase in the demand for cash associated with uncertainty surrounding the pandemic. This 'dash-for-cash' resulted in market participants turning their GC1 into cash by posting them as collateral under repo (Graph 4). In contrast, there was a decline in the use of other collateral over this period. One of the reasons for this is that investors typically demand a higher premium for credit risk in times of significant uncertainty and so raising funds with these securities becomes relatively more costly. As the RBA increased the supply of ES balances, banks no longer needed to recycle their ES balances among each other in the repo and other money markets, and the demand to borrow cash in the repo market using GC1 halved between late 2020 and late 2021.

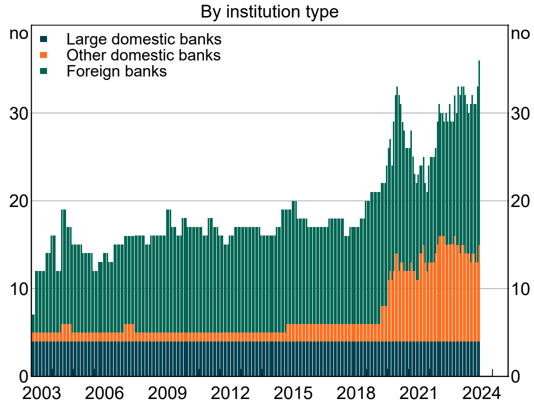
The number and variety of participants in repo markets have grown in recent years. The number of reporting dealers has increased from around 15 in the decade prior to 2018 to 33 in 2024 (Graph 6).

Non-residents have become much more heavily involved in the repo market, doubling their share of outstanding transactions over the past decade to around 60 per cent (Graph 7). Furthermore, foreign banks' dealers often act as intermediaries for non-resident clients, underscoring their role in facilitating a diverse market.

Graph 6

Repo Dealers*

By institution type



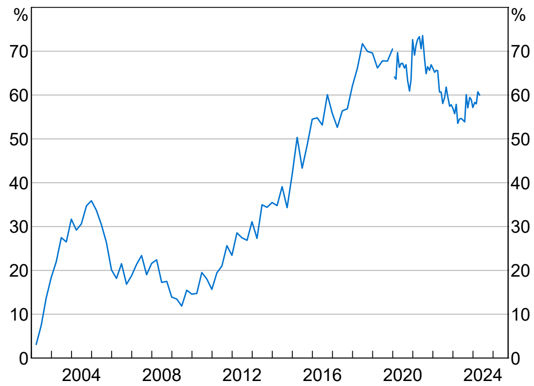
* Banks and registered financial corporations reporting to APRA with gross positions of at least $1 billion.

Sources: APRA; RBA.

Graph 7

Non−Resident Repo Outstanding*

Share of market



* Includes repo and securities lending; excludes repos with RBA and collateralised by equity securities.

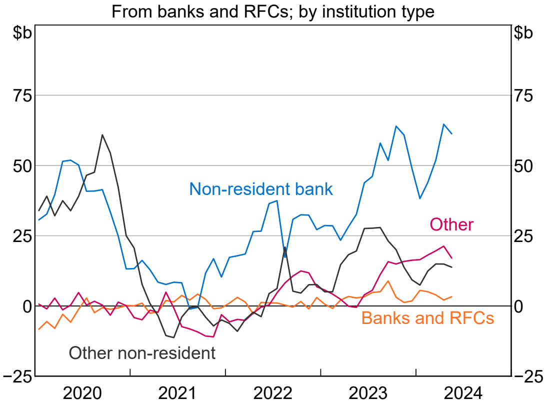
Sources: APRA; RBA.

Of the different types of clients operating in the repo market, non-resident banks are the largest net borrower of cash (Graph 8). These banks operate on behalf of their customers but may also use repo as a source of short-term funding. Domestic banks and registered financial corporations (RFCs) tend to borrow and lend similar amounts of cash in aggregate. Accordingly, the repo market is not a net funding market for domestic banks that fund themselves more with deposits. Non-bank entities have been net lenders and borrowers at different points over time. The most common non-bank entities reported in data received from the Australian Prudential Regulation Authority (APRA) are financial auxiliaries, other financial institutions and clearing houses (Graph 9).

Graph 8

Net Repo Borrowing*

From banks and RFCs; by institution type

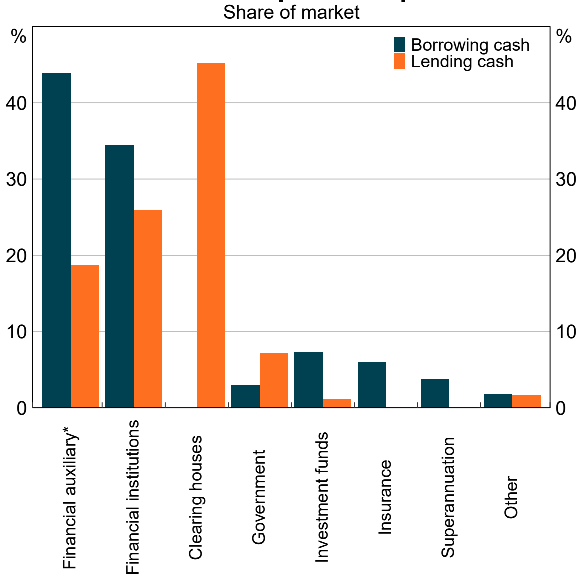


Sources: APRA; RBA.

Graph 9

Non-bank Repo Participants

Share of market



* Includes entities engaged primarily in activities closely related to financial intermediation, but which do not themselves perform an intermediation role.

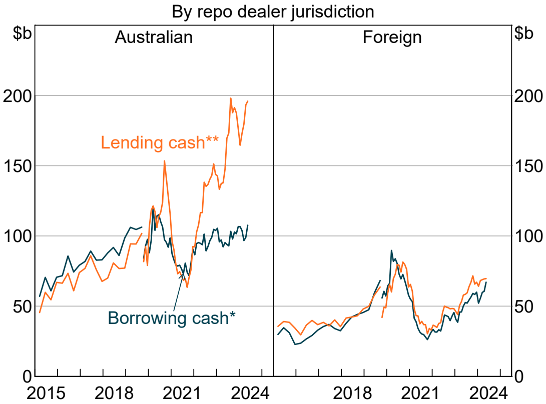
Sources: APRA; RBA.

The way repo reporting dealers act in the market has changed since the COVID-19 pandemic. Prior to the pandemic, both Australian and foreign reporting dealers ran 'matched books' in aggregate – meaning they borrowed and lent similar amounts of cash (Graph 10). Recently, Australian reporting dealers, as a group, have increased their cash lending to clients but have not funded this lending in the repo market or from the RBA. Instead, domestic dealers are receiving other internal funding. In contrast, foreign repo dealers have, as a group, continued to run a matched book. One factor may be their smaller share of ES balances (Graph 11) – limiting the ability of their repo desk to receive internal funding. Nevertheless, net repo dealer positions, both domestic and foreign, may also be driven by other institution-specific or strategic factors.

Graph 10

Repos Outstanding*

By repo dealer jurisdiction



* Includes repo and securities lending; excludes TFF, RBA open repo and repos collateralised by equity securities.

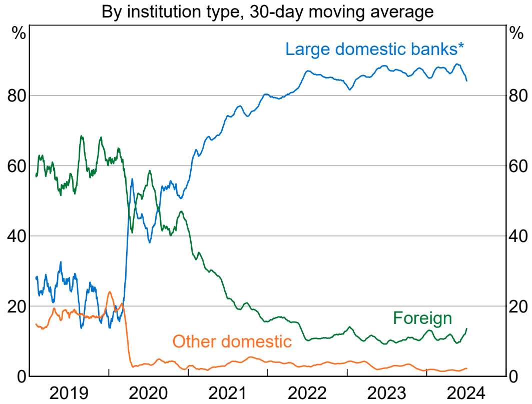
** Excludes cash lent to RBA via its securities lending facility.

Sources: APRA; RBA.

Graph 11

Share of Surplus ES Balances

By institution type, 30-day moving average



* Includes ANZ, CBA, Macquarie, NAB and Westpac.

Source: RBA.

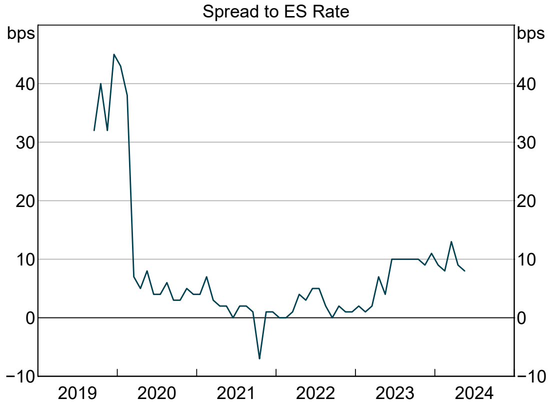
Recent drivers of increasing repo rates

Increases in the demand to fund securities, interbank trading and collateral availability have contributed to a small rise in repo rates relative to the ES rate since early 2023 (Graph 12).

Graph 12

Overnight Repo Rate*

Spread to ES Rate



* Rate on trades with 1 day residual maturity, originated within the month. Calculated using ASX's SOFIA methodology on APRA form 721_0A data.

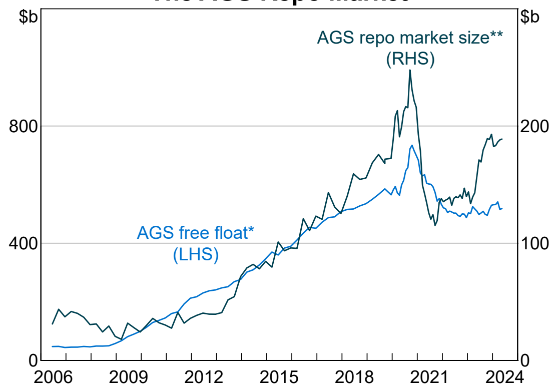
Sources: APRA; RBA.

Increased demand to fund securities purchases can put upward pressure on repo rates. As mentioned above, participants can purchase bonds and lend them in the repo market in exchange for cash, which is then used to pay for the initial purchase of the bonds. In doing so, participants are funding their bond purchases through borrowing cash via repo. Increased demand for borrowing via repo can be associated with investor perceptions that interest rates on bonds are less likely to increase much further (Plong and Maru 2024). Consistent with this, increases in borrowing from non-residents and non-banks coincided somewhat with the market's expectation of longer term interest rates having peaked.

Similarly, an increase in repo borrowing is often linked with an increase in the supply of government bonds as some investors fund their purchases of these bonds through repo. For example, repo borrowing against Australian Government Securities (AGS) collateral has historically increased alongside the amount of AGS on issue (Graph 13). However, the recent increase in borrowing under repo has not occurred alongside increased AGS outstanding, nor was AGS issuance particularly strong over the last 12 months (RBA 2023). As such, changes in the supply of government bonds is unlikely to be driving increases in repo rates.

Graph 13

The AGS Repo Market



* Market value of stock outstanding minus RBA outright holdings.
** Includes private market trades and borrowing from RBA collateralised by AGS.

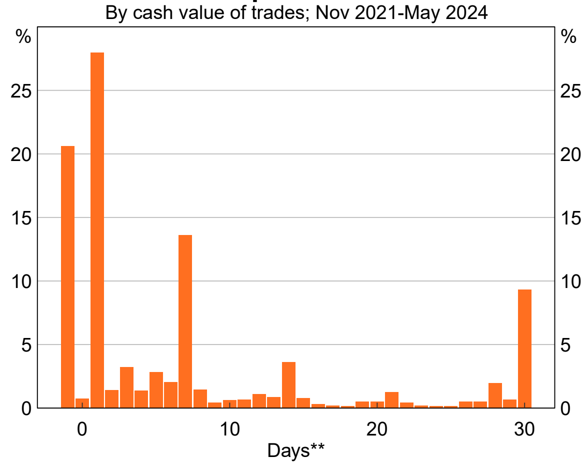
Sources: AOFM; APRA; RBA.

Banks also use the repo market to, among other things, manage their short-term cash needs. Consistent with this, around half of repo market activity is between banks – with the remainder of the market being between banks and their clients.[1] Furthermore, around 75 per cent of repo transactions have a term of less than two weeks, with the bulk being only a few days (Graph 14).

Graph 14

Repo Tenor*

By cash value of trades; Nov 2021-May 2024



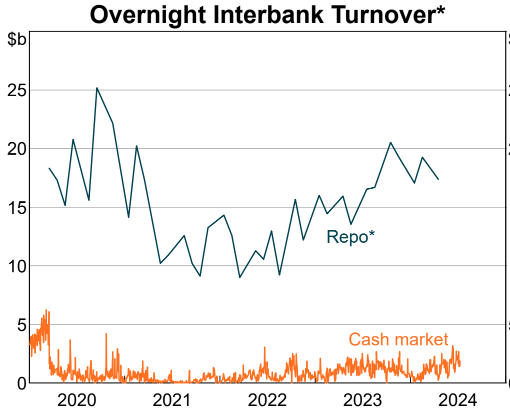
* −1 indicates open repos; 0 indicates intraday repos; repos greater than 30 days are shown as having 30 day tenor.
** Tenor adjusted for weekends. For example, an overnight repo contracted on a Friday will appear as having a 1 day tenor.

Sources: ASX; RBA.

Demand to borrow cash over short terms in money markets is also dependent on the stock of ES balances supplied by the RBA. As the stock of ES balances rose to a peak in late 2022, banks had little need to recycle these funds as rapidly among themselves and so activity in the repo market fell. As ES balances began to decline, activity recovered. While the cost of borrowing cash in the repo market has increased a little, market participants have indicated that repo markets are performing the function of redistributing cash well. Banks can also use other money markets to redistribute cash reserves among themselves. One of these markets is the interbank overnight cash market. Volumes in the cash market have not increased as much as repo volumes and remain well below pre-pandemic levels (Graph 15). As such, the pick-up in overnight repo volumes might be driven by other factors.

Graph 15

Overnight Interbank Turnover*



* Repo outstanding with 1 day residual maturity. Includes activity between domestic and foreign banks.

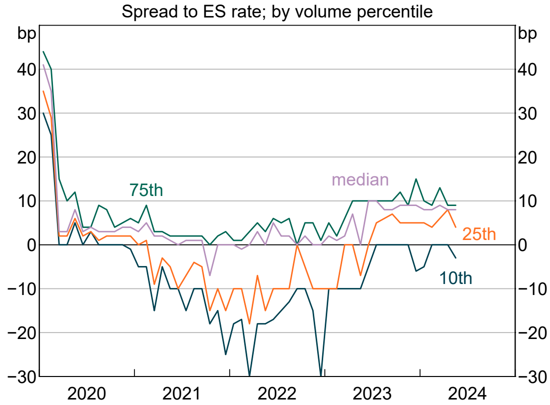
Sources: APRA; RBA.

Repo rates have also risen, in part, due to reduced bond scarcity. Counterparties can engage in repos with the purpose of borrowing specific bonds as collateral – known as 'specials'. Specials trades are distinguished by lower repo rates as the lender of cash is willing to accept a low rate of return on their cash to access a specific bond. One consequence of the RBA's Bond Purchase Program is that it reduced the supply of government bonds available to post under repo in the private market. As a result, some of these bonds were in short supply – increasing the volume of bonds under repo trading 'special' (or below the ES rate) in the repo market (Graph 15). The RBA's securities lending facility – which makes bonds available to borrow at a cost of 20 basis points below the ES rate – helped limit some of these pressures (Aziz and Jackman 2022). More recently, there has been a reduction in the number of bonds trading special, as approximated by the lower percentiles of traded rates, leading to increases in repo rates (Graph 16).

Graph 16

Overnight Repo Rate*

Spread to ES rate; by volume percentile



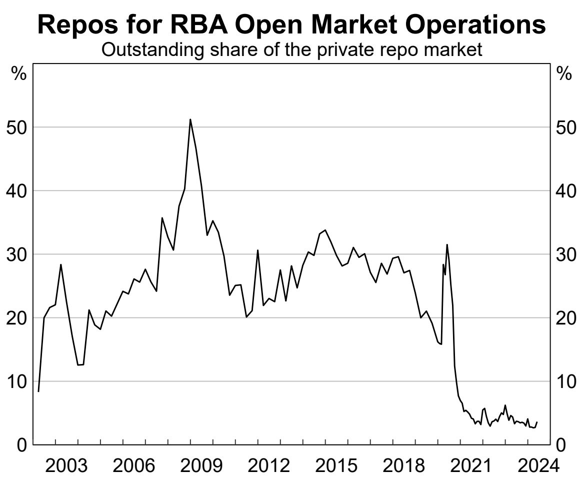
* Includes trades against government bonds as collateral with 1 day residual maturity, originated within the month.

Sources: APRA; RBA.

The repo market outlook

Prior to the onset of the COVID-19 pandemic, the RBA had a relatively large footprint in the repo market (Graph 17). Now, with ES balances still relatively large, banks have little need for additional ES balances and their demand for funds through the RBA's repo operations remains small. As the stock of ES balances declines, banks will naturally respond by obtaining ES balances under OMOs – increasing the RBA's footprint in the repo market (Kent 2024). In addition to OMO repo, the RBA could accommodate banks' demand for ES balances with a mix of FX swaps and government bond purchases. Using a range of liquidity operations will help the RBA avoid an overly large presence in the repo market, which might crowd out private sector activity.

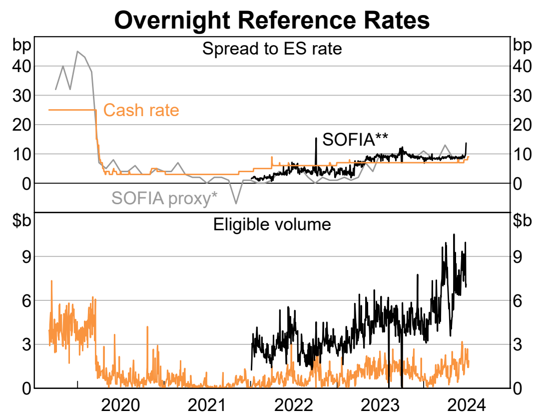
Graph 17



Sources: APRA; RBA.

Conditions in the repo market will be easier to monitor with the development of the ASX's new Secured Overnight Funding Index for Australia (SOFIA: ASX undated). SOFIA measures the cost of borrowing cash overnight under repo collateralised by government debt, for transactions settled in Austraclear. The published rate lines up closely with a repo rate calculated using the same methodology with data obtained through APRA. Activity in SOFIA is higher than the overnight cash rate (Graph 18). Alongside the rate and its eligible volume, the ASX publishes the number of trades eligible for rate calculation, as well as the minimum and maximum yield on those trades – improving market transparency.

Graph 18



* Rate on trades with 1 day residual maturity, originated within the month. Calculated using ASX's SOFIA methodology on APRA form 721_0A data.

** ASX's official beta estimate for SOFIA

Sources: APRA; ASX; RBA.

In February 2024, the RBA expanded the coverage of its repo market statistical table to assist in enhancing repo market transparency. Increased transparency in the repo market may encourage participation from a broader set of investors in the future. Finally, the market is considering the commercial viability of a repo central counterparty, which has been prompted by the RBA following similar assessments of their overall benefit in other jurisdictions (Cheshire and Embry 2023; SEC 2023).

Box A: A brief history of the Australian repo market

The distinction between a secured loan and a repo is that the title of the security passes to the cash lender for the duration of the repo. This feature distinguishes modern repos from the first repos in Australia known as 'buy-backs'.

The buy-back market (1949–1959)

Until 1949, short-term investments in Australia were limited to three- and six-month term deposits or at-call bank deposits that rarely earned interest (Cashion 1977). Around this time, several stockbroking firms began accepting 'buy-backs' – they sold government securities to the public and agreed to buy them back at a later date. This financial innovation created a new opportunity to invest spare cash for a few days up to a month.

In 1958, a group of brokers approached the original Commonwealth Bank (from which the RBA later descended) with a request to have access to lender-of-last-resort facilities – they were unwilling to expand their balance sheets without central bank support. This request was accepted in 1959 as it aligned with several bank goals at the time, including: supervising the credit growth of institutions outside the banking system, influencing conditions in short-term markets, improving government bond market liquidity, and limiting the financial stability consequences of failing dealers (Allan 1977). The official short-term money market was subsequently created to accredit certain brokers, called 'authorised dealers', to conduct operations under bank supervision in return for access to lender-of-last-resort facilities.

The official short-term money market (1959–1996)

While having access to bank facilities assisted buy-back activity, authorised dealers' operations were heavily restricted. First, authorised dealers' sell-backs with non-banks (dealer receiving collateral, giving loans) were restricted to 0.25 per cent of their asset mix on the basis that these loans did not represent asset holdings in high-quality transferrable securities. Second, authorised dealers were prohibited from conducting buy-backs or sell-backs with banks. In 1962, the RBA communicated to authorised dealers that it 'thought that the buyer should be at risk if he found it necessary to sell the securities [at a later date]' and that buy-backs that circumvented this principle were not 'of benefit in assisting in the establishment of a market [for government bonds]' (RBA Archives).

In 1984, the RBA began transacting in repos to implement monetary policy. However, on occasion, the RBA wanted to buy large quantities of government securities (by sale or under repo) to increase the level of settlement balances in the banking system. This proved difficult as dealers owned only a small quantity of securities and were reluctant to sell them to the RBA in favour of clients' needs. The RBA lifted all restrictions on buy-backs in 1986, which allowed dealers to borrow securities from banks and non-banks and thus increase the supply of securities available for the RBA to purchase in OMOs. With restrictions lifted, authorised dealers' turnover increased 4.5 times between 1985 and 1990 (RBA 1991).

The post-dealer era (1996–present)

In the period when authorised dealers were the main OMO counterparties, banks held settlement balances in the form of interest-earning loans to authorised dealers; interest was not paid on bank balances in ES accounts at the RBA. In 1996, during preparations for Real-time Gross Settlement (RTGS), the RBA began dealing directly with all major financial institutions, including banks. Authorised dealers ceased to exist (Campbell 1998) and banks transferred their transaction balances with dealers to their ES accounts and interest was paid on these balances. Since then, banks have been the main intermediaries in the Australian repo market.

Endnotes

[*] The authors are from Domestic Markets Department.

[1] APRA data used in this analysis do not provide visibility over the non-bank to non-bank sector of the repo market. In 2016, a Council of Financial Regulators' special working group on shadow banking found that the volume of non-bank to non-bank transaction was not material.

References

Allan RH (1977), 'The Economics of Intervention in the Short-term Money Market', PhD Thesis, Australian National University, June.

ASX (Australian Securities Exchange) (undated), 'Benchmarks Overview'. Available at <https://www.asx.com.au/connectivity-and-data/information-services/benchmarks/benchmark-data>.

Aziz A and B Jackman (2022), 'The RBA and AOFM Securities Lending Facilities', RBA *Bulletin*, December.

Bergmann M, E Connolly and J Muscatello (2019), 'The Committed Liquidity Facility', RBA *Bulletin*, September.

Campbell F (1998), 'Reserve Bank Domestic Operations under RTGS', Remarks to the AFMA TechnoFuture '98 Seminar Program, Sydney, 19 October.

Cashion M (1977), 'Comments: The Short Term Money Market in Australia and Its Regulations', *UNSW Law Journal*, 2(1), pp 90–104.

Cheshire J and J Embry (2023), 'Reassessing the Costs and Benefits of Centrally Clearing the Australian Bond Market', RBA *Bulletin*, March.

Cheung B and S Printant (2019), 'Bank Balance Sheet Constraints and Money Market Divergence', RBA *Bulletin*, September.

Debelle G (2021), 'Monetary Policy during COVID', Shann Memorial Lecture, Online, 6 May.

Hing A, G Kelly and D Olivan (2016), 'The Cash Market', RBA *Bulletin*, December.

Kent C (2024), 'The Future System for Monetary Policy Implementation', Address to Bloomberg Australia Briefing, Sydney, 2 April.

Plong B and N Maru (2024), 'What Has Been Putting Upward Pressure on CORRA?', Bank of Canada Staff Analytical Note No 2024-4.

RBA (Reserve Bank of Australia) (1991), 'Authorised Short Term Money Market Dealers', RBA *Bulletin*, June.

RBA (2023), 'Chapter 3: Domestic Financial Conditions', *Statement on Monetary Policy*, August.

RBA Archives, 'Unreserved'.

SEC (US Securities and Exchange Commission) (2023), 'SEC Adopts Rules to Improve Risk Management in Clearance and Settlement and Facilitate Additional Central Clearing for the U.S. Treasury Market', Media Release No 2023–247, 13 December.

Copyright and Disclaimer Notices

HILDA

Disclaimer