RESERVE BANK OF AUSTRALIA

Bulletin

April 2025

Some graphs in this publication were generated using Mathematica.

ISSN 1837–7211

April 2025

Bulletin

Articles

How Useful are 'Leading' Labour Market Indicators at Forecasting the Unemployment Rate?

Joyce Tan*

Photo: Solstock – Getty Images

Abstract

The RBA draws on a wide range of information to form our assessment of current labour market conditions and our outlook for the labour market. One of the key labour market indicators that the RBA monitors and forecasts is the unemployment rate. This article considers whether information contained in indicators that are typically viewed as signalling a change in conditions before it becomes apparent in the official labour market statistics – referred to here as 'leading indicators' – are helpful in forecasting the unemployment rate. It finds that information contained in measures of unmet demand, such as job advertisements and vacancies, and consumers' expectations for unemployment are useful in informing the RBA's near-term forecasts for the unemployment rate. Models containing these leading indicators can complement our existing framework for forecasting the unemployment rate, which also considers information such as developments in economic activity, insights from firms in the RBA's liaison program and the experience of economies overseas.

Introduction

The unemployment rate plays an important role in Australian monetary policy, as it is relevant for both sides of the RBA's dual mandate. It is a key metric in our assessment of full employment, and forecasts for the unemployment rate are an important input into the inflation forecasts. That said, the unemployment rate is only one of many indicators that the RBA monitors when evaluating labour market conditions. In practice, our view of the labour market is formed by considering a number of other indicators (Ballantyne, Sharma and Taylor 2024). This includes indicators of labour demand that are typically considered to 'lead' changes in aggregate employment and unemployment statistics (referred to here as 'leading indicators'), flows of workers between states of the labour market (i.e. employment, unemployment and outside the labour force), broader measures of labour underutilisation and measures of capacity utilisation.

Changes in labour market conditions are typically first observable in various other indicators before they become apparent in the unemployment rate.[1] For example, firms may respond to a pick-up in economic growth by increasing their demand for labour, which may cause them to post new job vacancies or recruit more intensely for existing vacancies, or increase the hours worked by their current workforce. Consumers may also react to improvements in economic conditions by becoming more optimistic about future labour market conditions and revising down their expectations for unemployment. We consider these indicators as having leading properties. Over time, as firms increase their rate of hiring, we may observe a greater flow of people into employment from unemployment or outside the labour force. When these flows become sufficiently large in magnitude, we are likely to observe a more evident decline in the unemployment rate and higher rates of employment growth.

This article considers the leading indicators the RBA currently monitors and then explores how useful they are at forecasting the unemployment rate.
When forming forecasts for the unemployment rate, we also make use of both a suite of Okun's law models that uses information on economic growth and growth in real unit labour costs to predict the unemployment rate (Lancaster and Tulip 2015; Ballantyne *et al* 2019), as well as more qualitative information (such as from the RBA's liaison program). Further, we are developing a forecasting model that takes signal from labour market flows into and out of unemployment. These are all used to put together the unemployment rate forecasts that are published in the RBA's quarterly *Statement on Monetary Policy*.

What are the 'leading' labour market indicators that the RBA monitors?

The RBA monitors a number of leading indicators including job advertisements and vacancies, consumers' expectations for unemployment over the year ahead and firms' hiring intentions. We look at a range of series because each indicator offers a partial view of the labour market and has its own limitations.

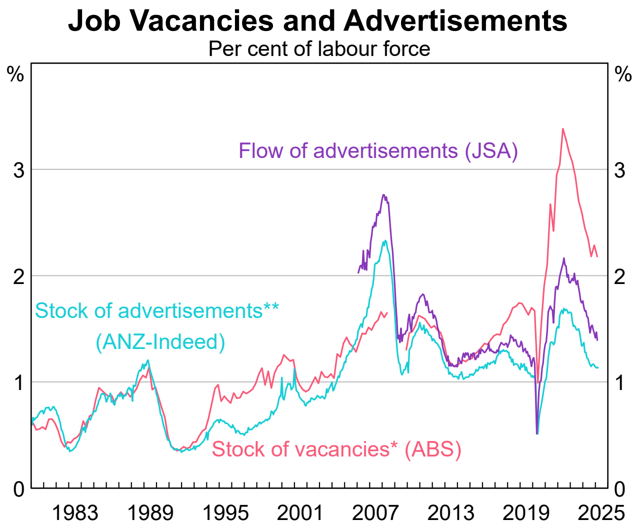
Job advertisements and vacancies capture firms' unmet demand for labour and are indicative of the degree of tightness that exists in the labour market (Graph 1). When labour demand is stronger than supply, vacancies tend to rise because firms not only tend to post more vacancies but are also more likely to find it difficult to find workers to fill those vacancies. By contrast, those searching for work can find a job more readily in these circumstances and this will reduce the unemployment rate. Together, this leads to the observed negative correlation between the job vacancy and unemployment rates known as the Beveridge Curve (Graph 2).[2] This relationship has historically been non-linear. When the labour market tightens, vacancies remain open for longer as firms find it increasingly more challenging to hire workers and fill vacancies, which then results in vacancies rising with only a small corresponding decline in unemployment.

Measures of job vacancies and advertisements can reflect either the *stock* of vacant positions or the *flow* of new job postings. The Australian Bureau of Statistics (ABS) measures the stock of job vacancies every three months, which captures all jobs that are ready to be filled immediately, are open to external applicants and for which some form of recruitment action (such as advertising) has been taken by the employer.[3] This is therefore a broader measure of aggregate labour demand than other stock-based measures such as the ANZ–Indeed measure of job advertisements; for instance, the latter currently only captures online job postings on the Indeed and Workforce Australia websites, while the ABS measure would also capture recruitment through other channels such as jobs advertised on social media. However, the ANZ–Indeed job advertisement series, which is available monthly, is a timelier and higher frequency indicator compared with the ABS vacancies series.

We also monitor indicators that capture the flow of new online advertisements, such as the Jobs and Skills Australia (JSA) Internet Vacancy Index.[4] This measure captures job advertisements newly lodged on the SEEK, CareerOne and Workforce Australia platforms. Flow-based measures of job advertisements can move ahead of stock-based measures and therefore signal a change in labour market conditions earlier. Moreover, they are more sensitive to recent changes in firms' demand for labour because, unlike stock-based measures, they are not affected by withdrawals or the filling of longstanding vacancies. However, the JSA Internet Vacancy Index has the disadvantage of having a comparatively shorter back history (which begins in 2006).

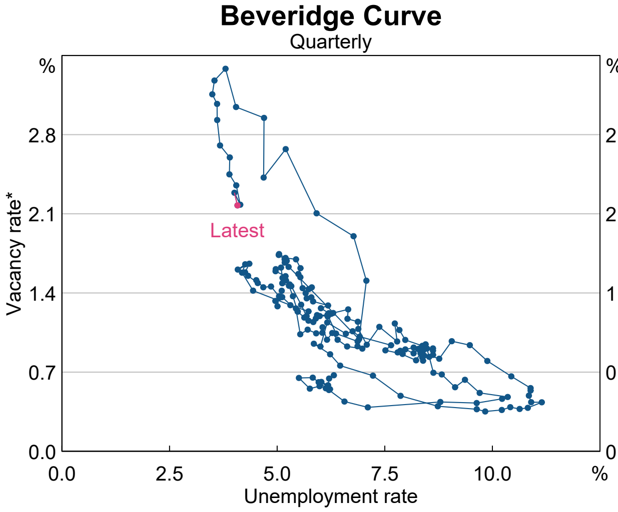
The Westpac–Melbourne Institute (WMI) measure of consumers' unemployment expectations provides an alternative view on the outlook for the unemployment rate (Graph 3). Unlike measures of job vacancies and advertisements, the WMI indicator does not directly capture information on employers' hiring decisions but instead considers how households perceive future labour market conditions. A decline in the index suggests that more consumers expect that unemployment will decline over the year ahead.

Graph 1



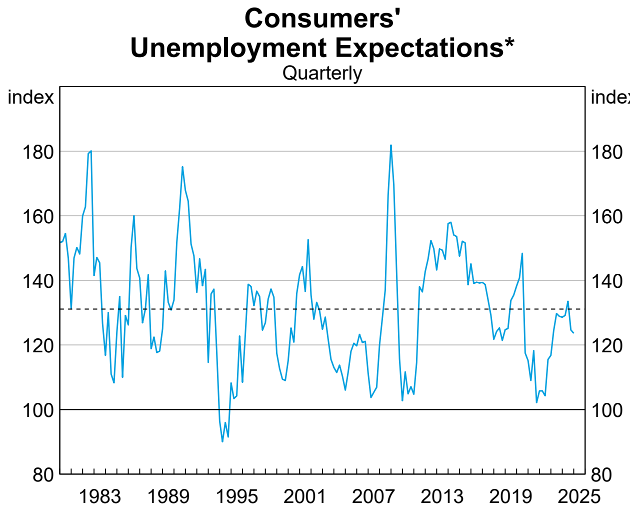
* The survey was suspended between May 2008 and November 2009.
** Volumes are backed out by splicing the current ANZ-Indeed job advertisements series with the historical ANZ Australian job advertisements series.
Sources: ABS; ANZ-Indeed; Jobs and Skills Australia; RBA.

Graph 2



* Ratio of job vacancies to the labour force; estimates for vacancies are used between May 2008 and November 2009 as the survey was suspended during this period.
Sources: ABS; RBA.

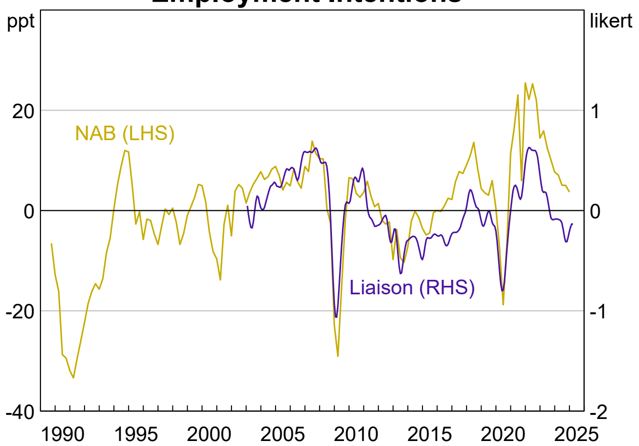
Graph 3



* Dotted line represents long-run average; not seasonally adjusted.
Sources: RBA; Westpac-Melbourne Institute.

Finally, we also consider information on employment intentions from the NAB business survey and the RBA's liaison program (Graph 4). These measures are forward looking and capture changes in firms' hiring plans, with a strengthening in firm employment intentions potentially signalling that the unemployment rate could decline going forward. However, these indicators tend to better reflect developments in the market sector – that is, all industries except the health care, education and public administration industries, which are typically less sensitive to the business cycle. Thus, they likely provide an imperfect view of overall demand for labour (which would also capture demand from the non-market sector). Furthermore, some of these measures have relatively short back histories compared with indicators such as stock-based measures of job vacancies and advertisements and the WMI measure of unemployment expectations. They would therefore be less able to capture the underlying dynamics of the labour market during different business cycles over time.

Graph 4
Employment Intentions*



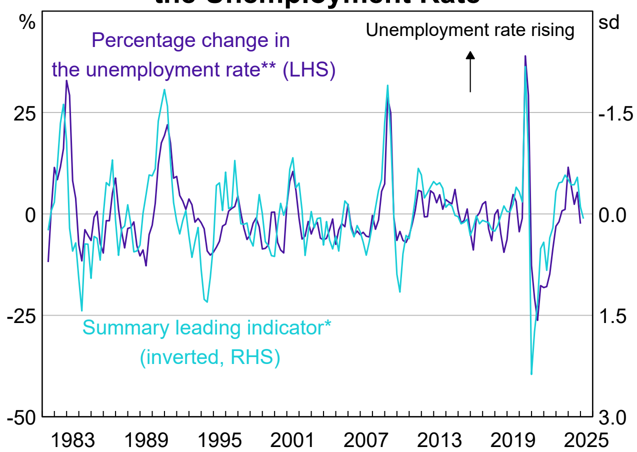
* Deviation from long-run average.
Sources: NAB; RBA.

Exploring the relationship between leading indicators and the unemployment rate

Movements in leading indicators can reflect momentum in the labour market and signal how the unemployment rate may evolve in the period ahead. To better understand how leading indicators and the unemployment rate co-move, I examined the correlation between the *percentage change* in the unemployment rate and the change in the relevant leading indicator. Specifically, I investigated the correlation between the *percentage change* in the unemployment rate and the *percentage change* in job vacancies and advertisements (as ratios to the labour force); this is so I could better account for the non-linear relationship between the unemployment rate and these leading indicators (described above). For all other leading indicators, I considered the correlation between the *percentage point* change in the indicators and the *percentage change* in the unemployment rate.

Given that no indicator provides a holistic view of the labour market, I also considered drawing together information contained in multiple leading indicators into a single metric called the 'summary leading indicator'. In this article, I focus on a summary leading indicator constructed using information on the ABS measure of vacancies, ANZ–Indeed job advertisements and the WMI measure of unemployment expectations. These series have the longest back histories and therefore can offer more information about how the labour market behaves during different economic cycles.[5] The summary leading indicator is calculated as a simple average of the standardised percentage changes in vacancies and job advertisements (as ratios to the labour force) and the percentage point change in the unemployment expectations index. It has historically co-moved and led movements in the unemployment rate (Graph 5).

Graph 5
Summary Leading Indicator and the Unemployment Rate



* Summary leading indicator is calculated as the average of the standardised quarterly changes in ABS vacancies, ANZ-Indeed ads and WMI unemployment expectations; two-quarter moving average.
** Two-quarter change.
Sources: ABS; ANZ-Indeed; RBA; Westpac-Melbourne Institute.

The strongest correlations between these labour market indicators and the unemployment rate tend to be contemporaneous or leading by one quarter (Table 1). For all indicators, the strongest leading correlation occurs between changes in the indicator one quarter ago and changes in the unemployment rate today. However, the correlations at a lead length of two quarters are also reasonably strong for some indicators. The correlations suggest that the leading indicators may be useful for near-term forecasts of the unemployment rate.

Table 1: Correlation between the Percentage Change in the Unemployment Rate and Movements in Leading Indicators of Labour Demand[(a)]

Correlation coefficients

	Indicator leads changes in the unemployment rate			Indicator lags changes in the unemployment rate	
Quarters	**2**	**1**	**0**	**1**	**2**
Full sample[(b)]					
ABS vacancies	–0.39	–0.40	**–0.47**	–0.10	0.00
ANZ–Indeed job advertisements	–0.44	–0.57	**–0.69**	–0.22	–0.08
JSA job advertisements	–0.38	–0.53	**–0.64**	0.07	0.07
WMI unemployment expectations	0.21	**0.30**	0.18	–0.11	–0.24
NAB employment intentions	–0.31	**–0.50**	–0.14	0.23	0.32
Liaison employment intentions	–0.45	**–0.60**	–0.34	0.15	0.28
Summary leading indicator	–0.45	–0.56	**–0.59**	–0.09	0.07

(a) I tested the correlation between the percentage change in the unemployment rate and the percentage change in ABS vacancies, ANZ–Indeed job advertisements and JSA job advertisements (as shares of the labour force), the percentage point change in the WMI unemployment expectations measure and the NAB and liaison measures of employment intentions, and the summary leading indicator (without any further transformations). Bolded numbers refer to the strongest correlation coefficients for each indicator.

(b) The first observation used for ABS vacancies, ANZ–Indeed job advertisements, WMI unemployment expectations and the summary leading indicator is 1980:Q1. The first observation for the NAB survey measure of employment intentions, employment intentions from the RBA's liaison program and the JSA measure of job advertisements is 1989:Q4, 2003:Q2 and 2006:Q2 respectively.

Sources: ABS; ANZ–Indeed; Jobs and Skills Australia; NAB; RBA; Westpac–Melbourne Institute.

Evaluating the forecasting performance of potential leading indicator models

To assess how useful leading indicators are at forecasting the unemployment rate, I assessed the forecasting performance of models containing these leading indicators. Each model includes up to two lagged values of a particular indicator given the results from the correlation analysis above. I conducted an out-of-sample forecasting exercise, which involves estimating a model using a subset of the available data, generating forecasts with the estimated model and then comparing those forecasts to the realised outcomes. This approach better captures how well the model would have performed in practice as it attempts to replicate the conditions and information a forecaster would have had at the time they needed to construct their forecasts.

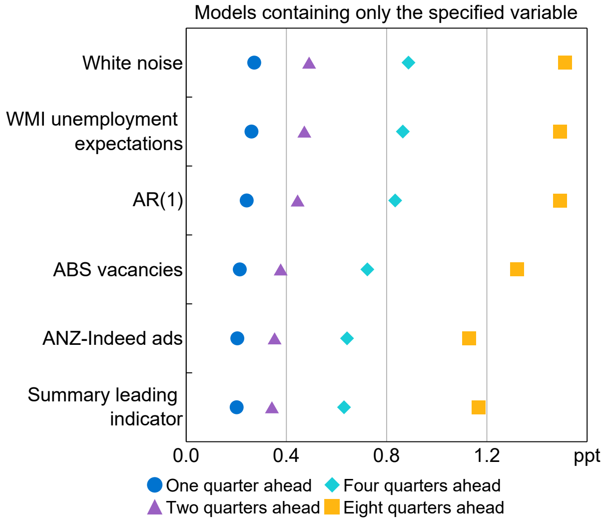
For each potential leading indicator model, I generated a set of forecasts with a model estimated using the initial subset of data.[6] I repeated this process, adding an additional quarter of data each time to the subset of data used to estimate the model, until all available data had been used. Finally, I evaluated the forecasting performance of these models. How accurately a model forecasts the unemployment rate is measured using its root mean squared errors (RMSEs), which capture the difference between the forecasts and the realised outcomes.[7] Models with lower RMSEs are better at forecasting as their predictions are closer to the realised outcomes on average. I evaluated the performance of the forecasts over the pre-pandemic period to ensure the results were not distorted by pandemic-related volatility.

Comparing the RMSEs of models with different leading indicators can indicate which series are relatively more useful at forecasting the unemployment rate. As I considered multiple models with the same leading indicator but a varying number of lagged terms, I assessed the usefulness of an indicator by calculating the average forecast across models containing that leading indicator and then evaluating the accuracy of this average forecast. While I could have simply chosen the best-performing individual model, it is possible that individual models perform well by chance and hence looking at 'average performance' is likely to offer more robust results. It is also useful to compare the models' performance to that of a simple benchmark model, such as an autoregressive (AR) model of the percentage change in the unemployment rate with one lag of itself (an AR(1) model) or a white noise model where the expected percentage change in the unemployment rate is zero. The proposed leading indicator model should outperform the benchmark models if there is additional value from considering the information contained in those leading indicators.

Results

I first considered the indicators with the longest back histories – that is, the ABS measure of vacancies, ANZ–Indeed job advertisements, the WMI measure of unemployment expectations and the summary leading indicator. Of these, the summary leading indicator and ANZ–Indeed job advertisements perform the best; models containing only the summary leading indicator or only ANZ–Indeed job advertisements have lower RMSEs than models containing other leading indicators and the benchmark models (Graph 6). Moreover, this outperformance is statistically significant, on average, over the first six quarters of the forecast period for models containing only the summary leading indicator and over the first three quarters of the forecast period for models with only ANZ–Indeed job advertisements.[8] This suggests that we should use these models to inform our near-term forecasts for the unemployment rate, but need to rely on other forecasting models or techniques to inform the unemployment rate forecasts further out.

Graph 6
RMSEs of the Average Model*
Models containing only the specified variable



* Forecasting performance evaluated over 1989–2019; initial estimation period begins in 1981; RMSEs are calculated using the level of the unemployment rate.

Sources: ABS; ANZ-Indeed; RBA; Westpac-Melbourne Institute.

While models containing only ABS vacancies also significantly outperformed the benchmark models, they performed significantly worse than models with only the summary leading indicator or only ANZ–Indeed job advertisements. Finally, models containing the WMI measure of unemployment expectations alone perform only as well as the benchmark models. That said, information contained in both ABS vacancies and the WMI measure of unemployment expectations will still be captured in models containing the summary leading indicator.

I also considered how useful other indicators, such as measures of employment intentions, are at forecasting the unemployment rate. However, I found that models containing employment intentions only do as well as the benchmark models. This may partly reflect the tendency for these measures to capture developments in the market sector while the unemployment rate will also be affected by conditions in the non-market sector. Importantly, while these measures may not appear in the preferred forecasting models based on this out-of-sample forecast evaluation exercise, they still aid our understanding of developments in the labour market and interactions between different segments of the labour market.[9]

I also tested whether including other economic and labour market indicators in these models can help to improve their forecasting performance. These indicators include: measures of economic activity; survey-based indicators of tightness in the labour market, such as the share of firms reporting labour as a constraint on output and measures of capacity utilisation; and growth in real unit labour costs, which attempts to capture firms' decisions to substitute away from labour when it becomes a relatively more expensive input. However, performing a similar forecast evaluation exercise suggests that including these additional variables does not materially improve forecasting performance beyond a model that only contains the leading indicators.[10]

Conclusion

Leading indicators of labour demand tend to be timely indicators of the labour market that can offer information on how the unemployment rate is likely to evolve going forward. Using an out-of-sample forecast evaluation exercise, I investigated which leading indicator models are relatively better at forecasting the unemployment rate and can outperform simple benchmark models. I found that the preferred leading indicator models contain only a summary leading indicator or only ANZ–Indeed job advertisements. Models with these indicators significantly outperform the benchmark models over the first year or so. Accordingly, we now use models with only a summary leading indicator or only ANZ–Indeed job advertisements to inform our near-term unemployment rate forecasts. That said, when we form our forecasts for the unemployment rate, we also consider other suites of forecasting models as well as qualitative information, such as information from the RBA's liaison program, that may not be well captured in our models.

Endnotes

* The author is from Economic Analysis Department.

1 For further detail on the underlying dynamics of the labour market, see Hunter (2024).

2 For a more detailed discussion of the relationship between job vacancies and labour market variables, see Edwards and Gustafsson (2013).

3 The ABS' Job Vacancies Survey was suspended between May 2008 and November 2009. The analysis presented in this article uses estimates of the number of job vacancies from the Treasury Model of the Australian Economy (TRYM) for this period.

4 The SEEK Employment Index is another flow-based measure of job advertisements. Since information in SEEK job advertisements is also captured in the JSA Internet Vacancy Index, I focus on the JSA measure in this article.

5 I also considered whether a summary leading indicator that averages over a greater number of leading indicators would help forecast the unemployment rate. However, I found that these expanded versions of the summary leading indicator tend to perform about as well as the simpler summary leading indicator (which only captures information in ABS vacancies, ANZ–Indeed job advertisements and WMI unemployment expectations). I therefore focus on the simpler summary leading indicator.

6 Generating forecasts for the unemployment rate requires forecasts for the underlying leading indicator inputs. The forecasts for the latter are constructed using simple autoregressive integrated moving average (ARIMA) models that consider the historical properties of each series.

7 The models aim to produce forecasts for the percentage change in the unemployment rate, which subsequently imply forecasts for the *level* of the unemployment rate. I then calculated RMSEs by comparing the implied forecast for the *level* of the unemployment rate to the realised unemployment rate outcomes.

8 I used a Diebold-Mariano test to check whether there were statistically significant differences in forecasting performance between models. Note that there is no significant difference in performance between models with only the summary leading indicator and models with only ANZ–Indeed job advertisements.

9 While I did consider the JSA job advertisements series in a sample starting from 2006, the results are less reliable as the forecast evaluation period is very short as a result.

10 Similarly, including lags of the percentage change in the unemployment rate does not materially improve the forecasting performance of a model with only ANZ–Indeed job advertisements or only the summary leading indicator.

References

Ballantyne A, T Cusbert, R Evans, R Guttmann, J Hambur, A Hamilton, E Kendall, R McCririck, G Nodari and D Rees (2019), 'MARTIN Has Its Place: A Macroeconometric Model of the Australian Economy', RBA Research Discussion Paper No 2019-07.

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

Edwards K and L Gustafsson (2013), 'Indicators of Labour Demand', RBA *Bulletin*, September.

Hunter S (2024), 'Understanding the Journey to Full Employment', Keynote Address to the Barrenjoey Economic Forum, Sydney, 11 September.

Lancaster D and P Tulip (2015), 'Okun's Law and Potential Output', RBA Research Discussion Paper No 2015-14.

Monetary Policy Transmission through the Lens of the RBA's Models

Jack Mulqueeney, Alexander Ballantyne and Jonathan Hambur*

Photo: IBEX.Media – Adobe Stock

Abstract

Understanding how changes in the cash rate affect economic activity and inflation – so-called monetary policy transmission – is important for the RBA in pursuing its objectives of price stability and full employment. This article explains how the RBA uses its core models of the Australian economy to estimate the overall effects of policy, explore the different channels through which monetary policy transmits, and consider the economic outlook under alternative paths for monetary policy. The findings highlight that: the peak effect of policy is likely to occur after around one to two years; the exchange rate acts as an important transmission channel for policy; housing is a sensitive part of economic activity; and although individual households' cashflow can be sensitive to changes in the cash rate, in aggregate it plays a smaller role in transmission.

Introduction

The new Monetary Policy Board (and previously the Reserve Bank Board) sets monetary policy to achieve low and stable inflation and full employment. In doing so, the Board considers information from the RBA staff about current and future economic conditions, along with analysis about how different policy options might affect the economy. For the RBA staff to provide this advice, it is important to understand how much a given change in interest rates will influence economic activity and inflation. It is also important for the RBA to understand the various channels through which monetary policy transmits to economic outcomes, how important each is, and what parts of the economy they affect. This allows the RBA to better monitor and communicate the effects of policy on people's lives, and to assess whether these effects could change over time as the economy changes.

An RBA Explainer describes monetary policy transmission as having two stages:

1. changes in monetary policy affect interest rates in the economy
2. changes in interest rates affect economic activity and inflation (RBA 2025).

The RBA uses various models to understand the transmission of policy. This is because different models make different assumptions about how the economy works, which lead to different conclusions about the effects of policy on economic activity and inflation. This diversity supports more robust policymaking.

In this article, we first start by providing an overview of a few models that the RBA considers, and their predictions of how changes in monetary policy affect inflation and economic activity. We then focus on the RBA's two main macroeconomic models – its macroeconometric model MARTIN, and its dynamic stochastic general equilibrium (DSGE) model DINGO.[1] These models assume that the first stage of transmission from the cash rate into short-term interest rates faced by households and firms is roughly one-to-one, and so we focus on the second stage of transmission in this article, highlighting which channels they suggest are more and less prominent. We then conclude by showing how these models can be used to assess alternative paths for monetary policy and what they would mean for the economy. This can help the Board to consider what different policy choices might imply for the outlook.

Consistent with previous work, we find that different models have somewhat different predictions for the overall effects of policy, but that the effects on GDP and inflation tend to peak around one to two years after policy changes. We also show that across both MARTIN and DINGO, the exchange rate channel tends to be very important – especially for inflation – while the cash-flow channel is less important in aggregate, despite it having an obvious effect on individual households through changes in mortgage repayments.

How much does monetary policy affect the economy?

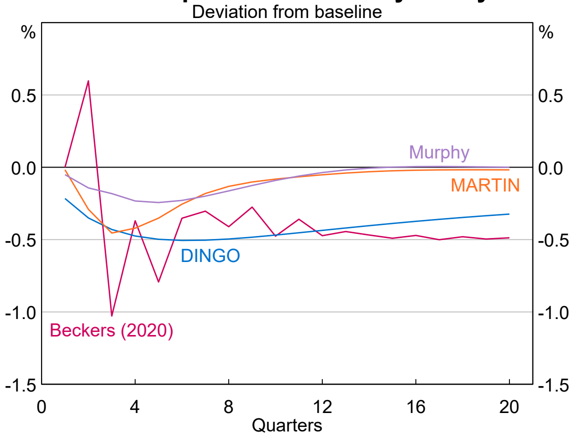
There are a range of ways to model the economy and they all make different assumptions about how the economy works and how we can learn about economic relationships from data. Broadly speaking, models vary in how much they rely on economic theory or simply take the observed historical relationships between variables as given. On one end of the spectrum are models known as vector autoregressions (VARs), such as those used in Beckers (2020) and Read (2023).[2] These models primarily aim to capture observed relationships in the data and make fewer and/or weaker assumptions about how the economy works. They are very flexible and data-driven, but may not provide much insight into the underlying structure of how monetary policy transmits to the economy. On the other hand, DSGE models rely heavily on economic theory to specify how individual people and businesses make decisions that determine overall economic activity. These models tend to assume people think about both the future and the past when making these choices. Somewhere between these two are 'semi-structural' models like the RBA's MARTIN.[3] These models draw on theory to specify economic relationships that are assumed to hold in the long run, while being more flexible in capturing patterns in the data in the short run. Semi-structural models can capture whether people make decisions based on the past or the future, but they tend to capture decision-making at the aggregate level, rather than embedding it in the model using economic theory of individual agents, as in DSGE models. All of these classes of models are commonly used in central banks around the world, and are often used to complement each other for different purposes.

Different model structures produce different predictions for how much the economy responds to changes in monetary policy. This is commonly illustrated by the 'impulse response function' (IRF) of a model, which shows the response of economic variables over time to a change in the cash rate. Graph 1 and Graph 2 show the responses of real GDP and year-ended inflation to a 100 basis point increase in the cash rate across a range of models. We use three different RBA models that span the different classes, and include an external benchmark labelled 'Murphy'.[4] We can see that most models estimate the peak impact of policy occurs after around one to two years. But the estimates of the peak effect range from ¼ to 1 per cent for GDP, and ⅛ to ½ percentage points for inflation. Since these results come from models that are estimated from the data, there is also uncertainty around each model's IRF that is not shown on the graphs. The considerable differences in responses across models emphasises the importance of maintaining and using a suite of models when deliberating the effect of a change in monetary policy.

Graph 1

GDP Response to Monetary Policy*

Deviation from baseline



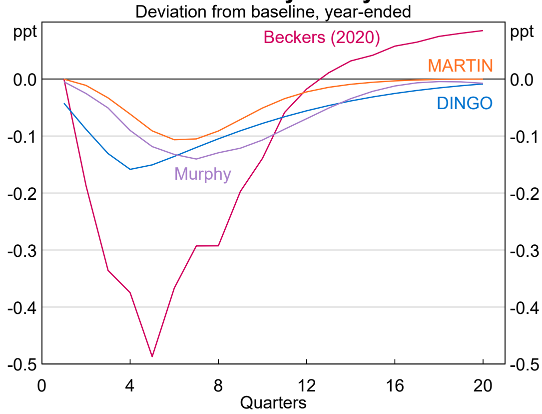
* Response after the cash rate increases by 100 basis points for one quarter and follows the path of interest rates implied by each model's policy rule after that.

Sources: Beckers (2020); Chris Murphy; RBA.

Graph 2

Inflation Response to Monetary Policy*

Deviation from baseline, year-ended



* Response after the cash rate increases by 100 basis points for one quarter and follows the path of interest rates implied by each model's policy rule after that.

** MARTIN, DINGO and the Beckers (2020) model use trimmed mean inflation, while the Murphy model uses the implicit price deflator for Household Final Consumption Expenditure.

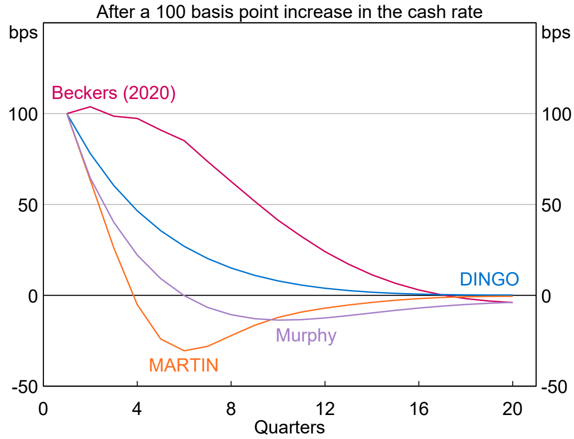
Sources: Beckers (2020); Chris Murphy; RBA.

In trying to understand some of these differences, it is important to note that in DINGO people tend to make decisions based on what they expect to happen in the future, whereas in MARTIN expectations are not modelled in such an explicit way.[5] So changes in the cash rate pass through to the economy quicker in DINGO and this is likely because people react to the fact that rates will be higher for a period into the future – the entire future path of interest rates matters. But the path of interest rates matters even beyond the role of expectations; each model predicts that the cash rate evolves differently following the initial increase.[6] This can be seen in Graph 3, which shows the path of the cash rate in the years after the initial increase in monetary policy. Some models assume rates return to normal slowly, while others assume a much quicker return.

Graph 3

Cash Rate Paths

After a 100 basis point increase in the cash rate



Sources: Beckers (2020); Chris Murphy; RBA.

These dynamics play an important role in the response of the economy to monetary policy in the models, which can make it hard to interpret differences in the overall effects. For example, on face value it looks like MARTIN implies a relatively small effect of policy on inflation outcomes. But this largely reflects the fact that MARTIN predicts the cash rate would fall more quickly and even drop below its original level before stabilising. A way to resolve this issue is to conduct policy simulations using the same *path* for policy (rather than the same initial increase). This is how we conduct policy simulations at the RBA – we provide an example in the section below on 'What does this mean for monetary policy?'.

Decomposing the channels, according to MARTIN and DINGO

RBA (2025) presents a common way of decomposing the transmission of monetary policy into four key channels:

- **The exchange rate channel:** an increase in interest rates increases the return on Australian assets, and so foreign demand for the Australian dollar to buy them, pushing up the exchange rate. A higher exchange rate means imported goods are cheaper, weighing on inflation. It also makes imports more competitive, and exports less competitive, leading to lower net exports and weaker growth.
- **Asset prices and wealth:** an increase in interest rates tends to weigh on asset prices. This means that people and businesses will have less equity to use to borrow, and household wealth will decline, which may make them less willing to spend or invest. As a result, lower demand weighs on economic activity.
- **Savings and investment:** an increase in interest rates raises the return people earn on their savings and increases the cost of borrowing. As such they will tend to save more, and invest and consume less.
- **Cash flow channel:** higher interest rates mean borrowers pay more to service their debt, and savers earn more on their deposits. The two effects partially offset, but household debt exceeds deposits so on net higher interest rates reduce household cashflow; the resulting decrease in demand is amplified by different spending behaviour across borrowers and savers.

However, there are other ways to think about the transmission of policy to the economy.[7] RBA (2025) uses the same channel framework as Atkin and La Cava (2017), whereas Kent (2023) identifies a fifth channel – the 'credit channel' – that emphasises how changes in monetary policy can affect the supply of credit provided by the financial sector. While taxonomies differ, we proceed with the four channels discussed in this article, since they are better suited to the models we are considering.[8]

As discussed above, we can use the MARTIN and DINGO models to help quantify the channels through which monetary policy transmits to the economy. Nevertheless, such an exercise is challenging, in large part because the transmission channels often overlap or interact. For example, if rates rise asset prices will tend to fall, decreasing household spending via a wealth effect. At the same time, higher interest rates also make households less credit worthy – directly due to higher repayments and indirectly due to lower asset prices reducing net worth of some households – limiting their access to credit and further lowering their consumption. In this case, it is not obvious by how much the asset price channel or the credit channel decreased household consumption. These difficulties are reinforced by second round effects, where the overall weaker economy leads to lower incomes, and so consumption. Although identifying specific channels is challenging, models can still be used to get some sense of which mechanisms might be most important for the transmission of monetary policy.

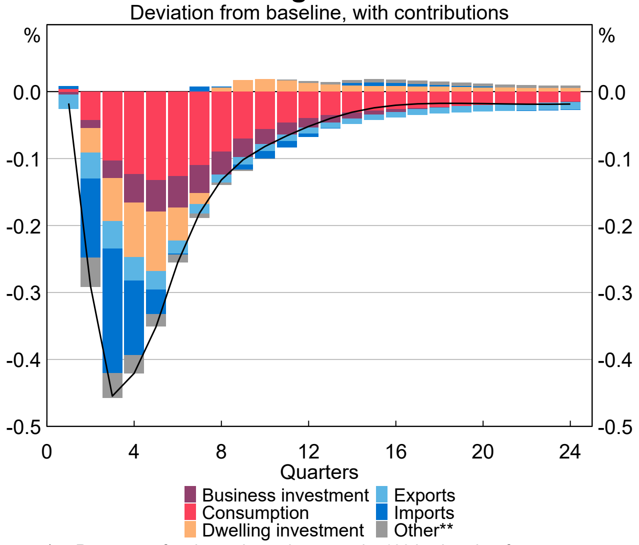
One simple way to understand the transmission channels is to look at how the expenditure components of GDP evolve after a change in monetary policy (Graph 4 for MARTIN's decomposition; Graph 5 for DINGO's).[9] This exercise shows that net trade explains most of the decline in GDP over the first year following an increase in the cash rate in MARTIN, which suggests that the exchange rate channel is likely to be important. Imports are predicted to *rise* in the short term (weighing on GDP) due to a strong response to lower import prices. By contrast, imports *fall* following an increase in interest rates in DINGO (supporting GDP) as weaker overall demand more than offsets the fact that imports are now cheaper. This exercise shows a clear tension between the models, and highlights the benefits of using a suite of models with different assumptions in trying to get a range of predictions and support robust policymaking.[10]

In both models, household consumption responds slowly, but accounts for a sizeable share of the change in GDP and shows quite a persistent decline. The strong but delayed response suggests that indirect channels may play an important role in the consumption effect, rather than a change in household cash flows that affects consumption relatively quickly (La Cava, Kaplan and Hughson 2016). The asset prices and wealth channel is likely to be important, where the higher cash rate flows through to household balance sheets via falling housing and equity prices, which decreases net worth and consumption. Dwelling investment and business investment also play an important role in both models, with the former being relatively more important in MARTIN. The strong response of investment suggests that the savings and investment channel is important; however, the asset price and wealth channel may also play a role here, particularly if dwelling investment responds to a fall in house prices.

Graph 4

GDP Response According to MARTIN*

Deviation from baseline, with contributions



* Response after the cash rate increases by 100 basis points for one quarter and follows the path of interest rates implied by MARTIN's policy rule after that.

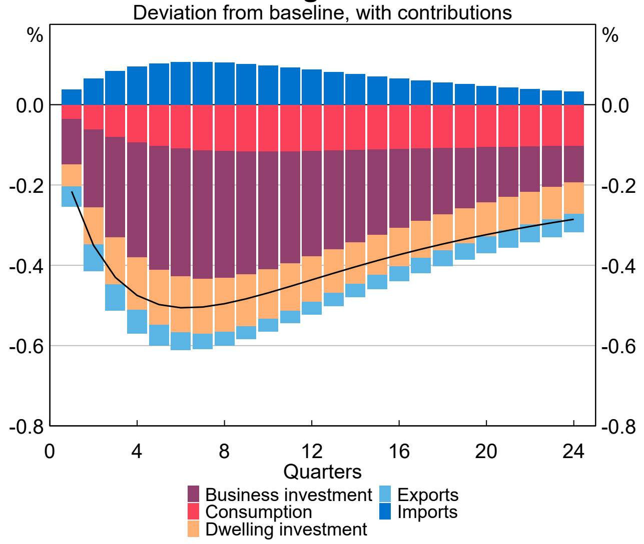
** 'Other' category includes ownership transfer costs and changes in inventories.

Source: RBA.

Graph 5

GDP Response According to DINGO*

Deviation from baseline, with contributions



* Response after the cash rate increases by 100 basis points for one quarter and follows the path of interest rates implied by DINGO's policy rule after that.

Source: RBA.

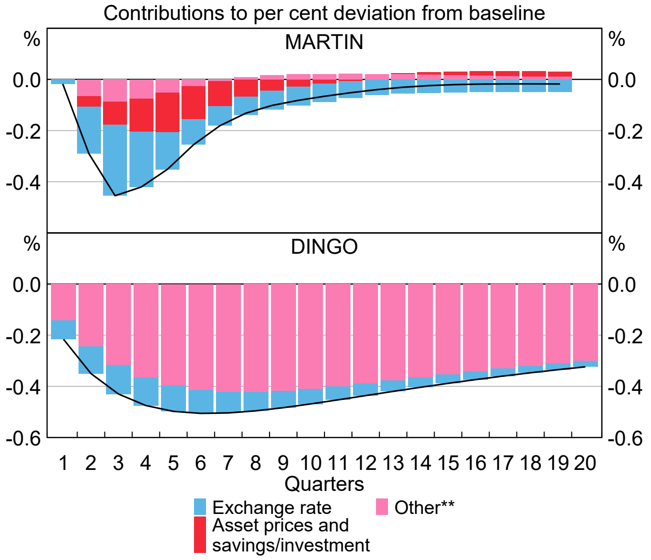
While this simple exercise reveals several important features about the Australian economy, an alternative is to try to directly isolate each of the channels in the models. To do this, we 'turn off' the response of certain variables in the models to approximately isolate one channel at a time.[11] We discuss the results for each channel below, but our key takeaways are:[12]

- According to MARTIN, the cash flow channel plays a relatively small role in how monetary policy affects the economy (Graph 6; Graph 7). This is consistent with the small initial decline in consumption noted above.
- Instead, the exchange rate is an important channel of monetary policy, particularly for inflation (Graph 7). This is consistent with the strong trade response discussed above.
- The other channels are also important, but are harder to isolate in the models.

Graph 6

GDP Response to Cash Rate Shock*

Contributions to per cent deviation from baseline



* Response after the cash rate increases by 100 basis points for one quarter and follows the path of interest rates implied by each model's policy rule after that.

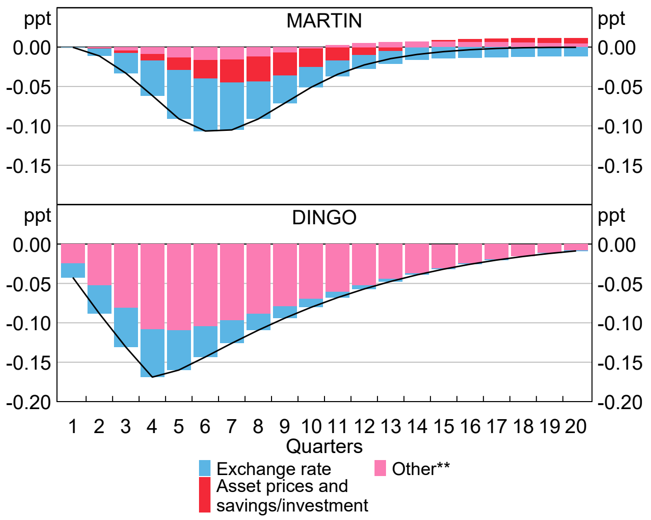
** The 'other' channel represents all other transmission channels in each model. For MARTIN, this includes the cash-flow channel. For the DSGE, it includes the asset prices and savings and investment channel.

Source: RBA.

Graph 7

Underlying Inflation Response to Cash Rate Shock*

Contributions to percentage point deviation from baseline



* Response after the cash rate increases by 100 basis points for one quarter and follows the path of interest rates implied by each model's policy rule after that.

** The 'other' channel represents all other transmission channels in each model. For MARTIN, this includes the cash-flow channel. For the DSGE, it includes the asset prices and savings and investment channel.

Source: RBA.

Exchange rate channel

For the exchange rate response, the important feature of the change in monetary policy is that it changes the cash rate *relative* to interest rates in other economies. If other economies were to change monetary policy in tandem with Australia, the observed effect on the exchange rate would be very small. For example, during much of the 2022–2023 tightening cycle, the real trade-weighted index was quite stable because interest rate increases were also occurring across many other countries at the same time. It is important to emphasise that the exchange rate channel was still operating at this time – it is very likely the Australian dollar would have depreciated if the cash rate had remained lower.

At the peak of the GDP response, the exchange rate channel accounts for **around one-quarter to two-thirds of the GDP response in DINGO and MARTIN**, and around one-third to two-thirds of the response of inflation. While MARTIN and DINGO agree that the exchange rate is an important channel of monetary policy transmission, this exercise shows that it is particularly important in MARTIN.

Asset prices and savings/investment channel

For the asset prices channel and the savings and investment channel, the important feature of the change in monetary policy is that it changes the relative attractiveness of saving versus spending. That is because the interest rate tells us how much savings income we have to forgo in a year's time so that we can spend money now. Economists call the decision to change how much we consume or save now versus the future 'intertemporal substitution'. This feature of interest rates provides the underlying 'structural' driver of both the asset prices channel and the savings and investment channel. Households' and firms' savings and investment decisions are directly affected by interest rates, whereas the asset price channel can be thought of as the indirect effect of these same decisions. That is, asset prices adjust to bring the expected rate of return on the asset into line with interest rates, with further adjustments in decisions resulting from this price response. The indirect effect relies on additional behaviours, such as the tendency for households to consume more when their wealth increases.[13]

The asset prices channel and savings and investment channel also overlap significantly in MARTIN, and so it is difficult to quantify the channels separately. As such, we group these two channels together. According to MARTIN, the asset prices channel and the savings and investment channel account for **about one-quarter of the peak GDP response** but account for a larger share later on (Graph 6). As discussed above, these channels are likely to be particularly important for business and dwelling investment, and consumption; however, the role of dwelling investment stands out. An alternative way of isolating the housing price and dwelling investment effect suggests it accounts for a little less than one-quarter of the GDP response in MARTIN, and most of the asset prices channel and the savings and investment channel. The housing sector also notably increases the duration of the GDP response to monetary policy in DINGO (Gibbs, Hambur and Nodari 2018). The smaller response of business investment in MARTIN is consistent with businesses having high and sticky investment hurdle rates (Lane and Rosewall 2015). However, Nolan, Hambur and Vermeulen (2023) find that despite high and sticky hurdle rates, changes in interest rates still affect business investment decisions.

Cash flow and other channels

The cash flow channel captures how changes in interest rates flow through to households' interest income and debt repayments. As this is the most obvious effect of monetary policy for households to observe, it often gains considerable public attention. The strength of this channel will be a function of the relative size of households' holdings of interest-sensitive assets and debt, and how different these households' consumption responses are to a change in their income. So the distribution of assets and liabilities across households with different characteristics is an important factor in the transmission of monetary policy.

However, MARTIN does not directly model the distribution of households and only captures the aggregate effect of changes in interest income and repayments. In addition, it is very difficult to isolate just the cash flow channel in MARTIN since household income is affected by many factors. So we label the rest of the effect left over after accounting for the exchange rate, asset prices and savings/investment channels as the 'cash flow and other channels'.

MARTIN suggests that **the cash flow and other channels are small, but occur faster than the savings and investment and the asset prices channels**. Most of this channel's contribution to GDP comes through consumption, which decreases by about 0.15 per cent. In MARTIN, the decrease in consumption largely reflects lower non-labour income, which is consistent with a fall in interest-sensitive cash flows.

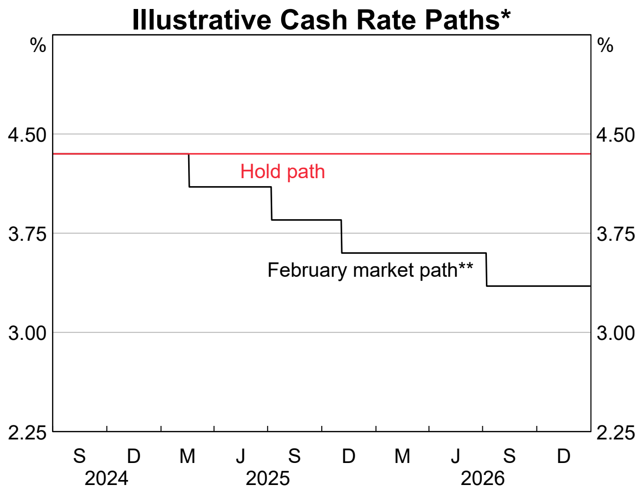
Still, MARTIN's estimates of the cash flow channel are broadly similar to other estimates of the size of the cash flow channel. For example, La Cava, Hughson and Kaplan (2016) found that a 100 basis point increase in the cash rate for one year leads to a 0.1–0.2 per cent fall in aggregate household expenditure.[14] Additionally, updated RBA staff estimates suggest that the cash flow effect is unlikely to have changed substantially of late (Jennison and Miller 2025). One reason why we might see a small overall effect on the economy is that the cash flow channel works in opposite directions depending on whether the household is a net saver or a borrower. While aggregate cash flows for these two groups could be large, they partially offset each other and so the net economic effect is smaller.

What does this mean for monetary policy?

How do these results affect the way the RBA staff think about monetary policy? Since the models build in the relationships between important economic variables and the cash rate and how long they take to transmit to the economy, we often use them to examine how different alternative policy settings affect the outlook. This helps the Board evaluate how different policy options fit into their broader monetary policy strategy and communicate how policy settings might need to respond if the economic outlook unfolds differently to the RBA's central forecast (Hunter 2024). This is particularly important given the 'long and variable lags' of monetary policy, which means that policymaking needs to be forward-looking and consider the future path of interest rates, rather than meeting-by-meeting decisions (Hunter 2025).

We provide an illustrative example of this below, which compares how an alternative path of the cash rate affects the outlook for GDP and inflation. The baseline path – called the 'February market path' – represents how financial markets expected the cash rate would evolve as of February 2025 (Graph 8). The RBA uses the prevailing market path to create the forecasts released every quarter in the *Statement on Monetary Policy*, and so it provides a useful benchmark. An alternative 'hold' path assumes the cash rate remained at 4.35 per cent from the February Board meeting until the end of 2026. An important question for the Board is how this different path for the cash rate might affect the outlook, which can be answered using MARTIN and DINGO.

Graph 8

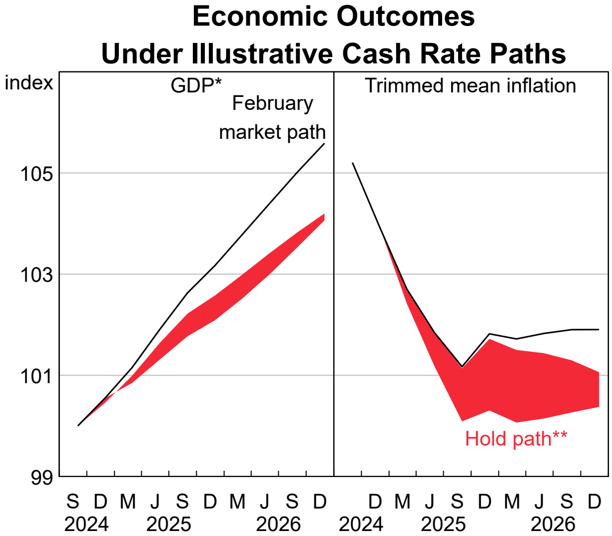


* Cash paths reflect a daily interpolation of quarterly profiles consistent with Board meeting dates.
** Cash rate assumption underlying the February 2025 SMP forecast.
Source: RBA.

As published in the February *Statement*, following the February market path saw GDP grow by about 2¼ per cent on average per year from the beginning of 2025 to the end of 2026. The growth in GDP over the forecasts broadly matched the RBA's assessment of growth in economic capacity. Therefore, the level of demand continued to modestly exceed supply. As a result of the mismatch between demand and supply, inflation was expected to remain above the midpoint of the 2–3 per cent target range at about 2.7 per cent at the end of 2026. However, under the 'hold' path, the models predict GDP would grow by about 1½ per cent on average per year from the start of 2025 to the end of 2026.[15] This results in demand and supply being more balanced. As a result, inflation decreases to be around or below the midpoint of the RBA's 2–3 per cent target range by the end of 2026.

The results from the two models under the 'hold' path are moderately different. The lower bound estimates suggest that underlying inflation would fall below the middle of the target band by 2026. However, the undershoot is small, providing some comfort that such a path would not lead to a significant fall in inflation. This highlights how using a range of models can provide a more robust view of different policy alternatives. This illustrative example applies to the February *Statement*, and so does not incorporate any information received since then about the economic outlook.

Graph 9



* Indexed so that September 2024 equals 100.
** The shaded area shows a range of outcomes from DINGO and MARTIN. DINGO implies faster monetary policy transmission.
Sources: ABS; RBA.

Conclusion

Understanding the pass-through of monetary policy to economic activity and inflation is crucial for the RBA in achieving its policy objectives of price stability and full employment. Models enhance our understanding by providing estimates of the aggregate effects of policy, allowing us to explore transmission channels, and allowing us to consider the economic outlook under alternative policy paths. By mapping out various transmission channels, we have highlighted some key considerations for understanding the effects of monetary policy.

The RBA's core models, MARTIN and DINGO, are primarily used for these exercises. The models highlight that the peak effect of policy is likely to occur after around one to two years. They also show that the exchange rate acts as a core transmission channel for policy, while housing is a sensitive part of economic activity. Although the cash flow channel gains a lot of public attention and can have a large effect on individual households, it has a smaller role in aggregate transmission.

While useful for policy purposes, both models have shortcomings and make specific assumptions. At times, the models can provide conflicting predictions. As such, the RBA is continuing to invest in improving these models, as well as exploring new models such as Heterogenous Agent New Keynesian (HANK) models that can better account for the diversity of financial positions across households. This will allow the RBA to continue to build a richer understanding of the effects of monetary policy, and therefore support policymaking.

Appendix A: Tempering monetary policy expectations in DINGO

In the Bank's DSGE model, decisions by households and firms depend on not just the current level of the cash rate, but also on what they expect the path of the cash rate to be in the future. Therefore, the effect of a change in the path of the cash rate depends on how much people anticipate this change.

We can use the alternative 'hold path' from Graph 8 as an example. At one extreme, suppose that all households and firms fully anticipate the Board to implement the 'hold path'. This means that changes expected to occur even far in the future, say near the end of 2026, have potentially powerful effects on current decisions (and therefore on output and inflation).[16] But this may be an unrealistic assumption: households might be somewhat uncertain about whether the Board would hold rates higher to the end of 2026.

At the other extreme, we can assume that all future changes in the cash rate are completely unanticipated. This means that households and firms would expect the interest rate to revert and keep being surprised that rates had stayed where they were. As a result, households would not adjust their behaviour as much. However, this extreme is also unlikely. If policymakers chose an alternative policy path like the 'hold path', they would likely seek to communicate it to the public, rather than repeatedly surprising them as they acted that path out.

When modelling the effect of alternative cash rate paths, we assume something in the middle. We assume that, at any point in time, the future 'shocks' generating the constant cash rate path are partly anticipated, with households placing less and less weight on those further into the future. Specifically, we assume that they put less weight and focus on a future shock set to occur in quarters, giving it only a weight of for some 'discount' parameter that is less than one.[17] The rationale is that changes in the near future (e.g. next quarter) are likely anticipated by more people than changes in the distant future (e.g. in 10 years).[18]

We set $\lambda=0.8$. This means that a shock occurring next quarter, in one year, and in two years are 80 per cent, 41 per cent, and 17 per cent anticipated, respectively. This calibration is somewhat ad hoc; we are trying to strike a balance between allowing the expectations channel of policy to operate, while toning down its strength relative to full anticipation. Future research will seek to calibrate or estimate this parameter more rigorously.[19]

Endnotes

* Jack Mulqueeney and Alexander Ballantyne are from Economic Analysis Department and Jonathan Hambur is from Economic Research Department. The authors would like to thank Meredith Beechey Österholm, Anthony Brassil, Irene Cam, Matt Read, Callum Ryan, Tim Taylor and Nick West for their comments and contribution to the analysis, and Michaela Haderer and Callum Ryan for their work on tempering the expectations dynamics in the DSGE model (explained in Appendix A).

1 MARTIN is detailed in Cusbert and Kendall (2018) and Ballantyne *et al* (2019). DINGO, or the Dynamic Intertemporal New-Keynesian General-Equilibrium Optimisation model, is detailed in Gibbs, Hambur and Nodari (2018), which builds on Rees, Smith and Hall (2015).

2 A range of papers have used VARs to estimate the effects of monetary policy, often with additional structure intended to aid identification. Read (2023) explores a set of relatively weak assumptions to identify the effects of monetary policy using a structural VAR; the estimates are difficult to compare against the other models for methodological reasons, but the results are consistent with the output response lying towards the upper end of the range of existing estimates. Hartigan and Morley (2020) combine information from a large number of economic variables to estimate a factor-augmented VAR and find that the transmission of monetary policy appears to have changed since the introduction of inflation targeting. Dungey and Pagan (2009) use a structural VAR that also accounts for long-run relationships between economic variables (cointegration) and find that the response to monetary policy is smaller than in a model that does not account for these long-run relationships.

3 These types of models have a long history in Australia and globally and continue to be a focus of active development across academia and policy institutions. Some examples of models that have been used in Australian policy institutions are Treasury's EMMA model (see Bullen *et al* 2021) and former TRYM model, Outlook Economics' AUS-M, and Oxford Economics' Global Economic Model. See Pagan (2019) for a full history.

4 For the external benchmark, we use a model built by Chris Murphy (ANU). His model takes a hybrid approach, which means its structure lies somewhere in between MARTIN and DINGO. See Murphy (2020) and Murphy (2024).

5 MARTIN features long-term inflation expectations in the model, which is estimated from a range of financial market and survey data, but changes in interest rates do not affect these expectations in the model. The future path of interest rates is modelled through two- and 10-year government bond yields, which respond to the cash rate contemporaneously.

6 This reflects differences in how the models assume the RBA will respond to changes in economic conditions (i.e. inflation, unemployment and GDP) and the inertia inherent in setting policy, often referred to as the central bank's 'reaction function'.

7 The categorisation and emphasis of different channels varies across research on monetary policy transmission. See also Mishkin (1996), Ireland (2006) and Burr and Willems (2024).

8 We choose not to focus on the credit channel because the models used in this article do not have well developed financial sectors. However, Brassil, Major and Rickards (2022) develop a banking-augmented version of MARTIN and show how this affects monetary policy transmission, including showing how the overall size of effects can vary depending on the state of the economy.

9 For all following MARTIN and DSGE exercises, we assume public demand does not respond to the increase in the cash rate.

10 The difference is discussed in Ballantyne *et al* (2019). Some other Australian models also predict that imports fall following an increase in the interest (for a structural VAR example, see Lawson and Rees 2008). The difference between MARTIN and DINGO does not appear to reflect the choice between a DSGE and semi-structural model. For example, ECB-BASE, a semi-structural model of the Euro area, also predicts that imports fall (Angelini *et al* 2019).

11 This is implemented by forcing the exchange rate to remain at baseline throughout the exercise, while keeping the path of the cash rate the same as in the initial monetary policy shock exercise. In the DSGE we assume people 'expect' the exchange rate to remain unchanged. In MARTIN, we then run a further exercise to further force house prices, dwelling investment, the earnings yield on equities and the business lending rate to remain at baseline to separate the asset prices and savings/investment channel.

12 Note that we only focus on the exchange rate channel for DINGO. This reflects the fact that the other channels are more interlinked and so harder to 'turn-off' individually in DINGO.

13 This behaviour is consistent with the life-cycle theory of consumption (see Ando and Modigliani 1963) and is found as a feature of Australian households in empirical research (see May, Nodari and Rees 2020; Gillitzer and Wang 2016); although, the observed behaviour may also be due to interactions with credit (see Windsor, Jääskelä and Finlay 2015).

14 They construct this estimate using household-level data on interest-sensitive cash flows and estimated marginal propensities to consume. They find the response entirely reflects changes in durables consumption. Non-durables consumption does not respond to changes in interest-sensitive cash flows.

15 The magnitude of the decrease in GDP growth and subsequent fall in inflation depends on the degree to which people expect interest rates to be higher in the future. See Appendix A for more details about how we constructed this range of estimates.

16 This is a well-known feature of full-information rational-expectations models; it is known as the 'forward guidance puzzle' (see e.g. Del Negro, Giannoni and Patterson 2023).

17 This approach is one of several suggested in Groot *et al* (2021). The 'discounting' of future shocks by $\lambda<1$ can be thought of as representing, in a reduced-form way, many reasons why the effect of a future policy shock may be weaker than in the full-information rational-expectations model. These include: imperfect policy communication or credibility; inattention or information frictions (e.g. Angeletos and Lian 2018); deviations from rational expectations (Gabaix 2020; Farhi and Werning 2019; García-Schmidt and Woodford 2019); borrowing constraints (McKay, Nakamura and Steinsson 2016); and finite lifetimes (Del Negro, Giannoni and Patterson 2023).

18 In addition to the shocks potentially being anticipated (at least for λ>0), the shocks themselves are also expected to have a persistent effect on the cash rate, because the model's policy rule has an autoregressive term. Therefore, even if λ=0 and all shocks were unanticipated, cash rate expectations would still adjust towards the alternative policy strategy once the cash rate started deviating from the baseline.

19 Our approach is similar to the modelling approach taken by some other central banks. For example, in an evaluation of policy strategies, Federal Reserve staff 'discounted' expectations terms in their DSGE model by multiplying them by 0.9 or 0.95 (Arias *et al* 2020).

References

Ando A and F Modigliani (1963), 'The "Life Cycle" Hypothesis of Saving: Aggregate Implications and Tests', *American Economic Review*, 53(1), pp 55–84.

Angeletos G-M and C Lian (2018), 'Forward Guidance without Common Knowledge', *American Economic Review*, 108(9), pp 2477–2512.

Angelini E, N Bokan, K Christoffel, M Ciccarelli and S Zimic (2019), 'Introducing ECB-BASE: The Blueprint of the New ECB Semi-structural Model for the Euro Area', ECB Working Paper Series No 2315.

Arias J, M Bodenstein, H Chung, T Drautzburg and A Raffo (2020), 'Alternative Strategies: How Do They Work? How Might They Help?', Federal Reserve Board Finance and Economics Discussion Series No 2020-068.

Atkin T and G La Cava (2017), 'The Transmission of Monetary Policy: How Does It Work?', RBA *Bulletin*, September.

Ballantyne A, T Cusbert, R Evans, R Guttmann, J Hambur, A Hamilton, E Kendall, R McCririck, G Nodari and D Rees (2019), 'MARTIN Has Its Place: A Macroeconometric Model of the Australian Economy', RBA Research Discussion Paper No 2019-07.

Beckers B (2020), 'Credit Spreads, Monetary Policy and the Price Puzzle', RBA Research Discussion Paper No 2020-01.

Brassil A, M Major and P Rickards (2022), 'MARTIN Gets a Bank Account: Adding a Banking Sector to the RBA's Macroeconometric Model', RBA Research Discussion Paper No 2022-01.

Bullen J, B Conigrave, A Elderfield, C Karmel, L Lucas, C Murphy, H Ruberl, N Stoney and H Yao (2021), 'The Treasury Macroeconometric Model of Australia: Modelling Approach', Treasury Paper No 2021-09.

Burr N and T Willems (2024), 'About a Rate of (General) Interest: How Monetary Policy Transmits', BoE *Quarterly Bulletin*, July.

Cusbert T and E Kendall (2018), 'Meet MARTIN, the RBA's New Macroeconomic Model', RBA *Bulletin*, March.

Del Negro M, MP Giannoni and C Patterson (2023), 'The Forward Guidance Puzzle', *Journal of Political Economy Macroeconomics*, 1(1), pp 43–79.

Dungey M and A Pagan (2009), 'Extending a SVAR Model of the Australian Economy', *Economic Record*, 85(268), pp 1–20.

Farhi E and I Werning (2019), 'Monetary Policy, Bounded Rationality, and Incomplete Markets', *American Economic Review*, 109(11), pp 3887–3928.

Gabaix X (2020), 'A Behavioral New Keynesian Model', *American Economic Review*, 110(8), pp 2271–2327.

García-Schmidt M and M Woodford (2019), 'Are Low Interest Rates Deflationary? A Paradox of Perfect-Foresight Analysis', *American Economic Review*, 109(1), pp 86–120.

Gibbs C, J Hambur and G Nodari (2018), 'DSGE Reno: Adding a Housing Block to a Small Open Economy Model', RBA Research Discussion Paper No 2018-04.

Gillitzer C and JC Wang (2016), 'Housing Wealth Effects: Cross-sectional Evidence from New Vehicle Registrations', *Economic Record*, 92(S1), pp 30–51.

Groot O, F Mazelis, R Motto, A Ristiniemi and A Ristiniemi (2021), 'A Toolkit for Computing Constrained Optimal Policy Projections (COPPs)', ECB Working Paper No 2021/2555.

Hartigan L and J Morley (2020), 'A Factor Model Analysis of the Australian Economy and the Effects of Inflation Targeting', *Economic Record*, 96(314), pp 271–293.

Hunter S (2024), 'Shedding Light on Uncertainty: Using Scenarios in Forecasting and Policy', Speech at the University of Adelaide South Australian Centre for Economics Studies (SACES) Lunch, Adelaide, 13 December.

Hunter S (2025), 'Monetary Policy: Forward Looking and Data Dependent in the Face of Uncertainty', The Australian Financial Review Banking Summit, Sydney, 18 March.

Ireland P (2006), 'The Monetary Transmission Mechanism', Federal Reserve Bank of Boston Working Paper No 06-1.

Jennison S and M Miller (2025), 'An Update on the Household Cash-flow Channel of Monetary Policy', RBA *Bulletin*, January.

Kent C (2023), 'Channels of Transmission', Address to Bloomberg, Sydney, 11 October.

La Cava G, H Hughson and G Kaplan (2016), 'The Household Cash Flow Channel of Monetary Policy', RBA Research Discussion Paper No 2016-12.

Lawson J and D Rees (2008), 'A Sectoral Model of the Australian Economy', RBA Research Discussion Paper No 2008-01.

Lane K and T Rosewall (2015), 'Firms' Investment Decisions and Interest Rates', RBA *Bulletin*, June.

May D, G Nodari and D Rees (2020), 'Wealth and Consumption in Australia', *Australian Economic Review*, 53(1), pp 105–117.

McKay A, E Nakamura and J Steinsson (2016), 'The Power of Forward Guidance Revisited', *American Economic Review*, 106(10), pp 3133–3158.

Mishkin F (1996), 'The Channels of Monetary Transmission: Lessons for Monetary Policy', NBER Working Paper No 5464.

Murphy CW (2020), 'Decisions in Designing an Australian Macroeconomic Model', *Economic Record*, 96, pp 252–270.

Murphy CW (2024), 'An Evaluation of the Macro Policy Response to COVID', ANU Tax and Transfer Policy Institute Working Paper No 11/2024.

Nolan G, J Hambur and P Vermeulen (2023), 'Does Monetary Policy Affect Non-mining Business Investment in Australia? Evidence from BLADE', RBA Research Discussion Paper No 2023-09.

Pagan A (2019), 'Australian Macro-Econometric Models and Their Construction – A Short History', CAMA Working Paper No 50/2019.

RBA (Reserve Bank of Australia) (2025), 'The Transmission of Monetary Policy', Explainer.

Read M (2022), 'Estimating the Effects of Monetary Policy in Australia Using Sign-restricted Structural Vector Autoregressions', RBA Research Discussion Paper No 2022-09.

Rees D, P Smith and J Hall (2015), 'A Multi-sector Model of the Australian Economy', RBA Research Discussion Paper No 2015-07.

Windsor C, J Jääskelä and R Finlay (2015), 'Housing Wealth Effects: Evidence from an Australian Panel', *Economica*, 82(327), pp 552–577.

Bank Funding in 2024

Duke Cole, Venura De Zoysa and Christopher Schwartz[*]

Photo: AlejandroMCB photo & film/Stocksy – Adobe Stock

Abstract

Bank funding costs are important in the transmission of monetary policy as they are a key determinant of the rates that households and businesses pay on loans. Bank funding costs increased only modestly in 2024, largely because the cash rate remained unchanged. The composition of banks' funding shifted towards deposits over the same period, continuing a trend seen since the global financial crisis. Banks also managed the final maturities of the Term Funding Facility, issuing wholesale debt into favourable funding conditions. This article updates previous research published by the RBA on developments in the composition and costs of banks' funding.

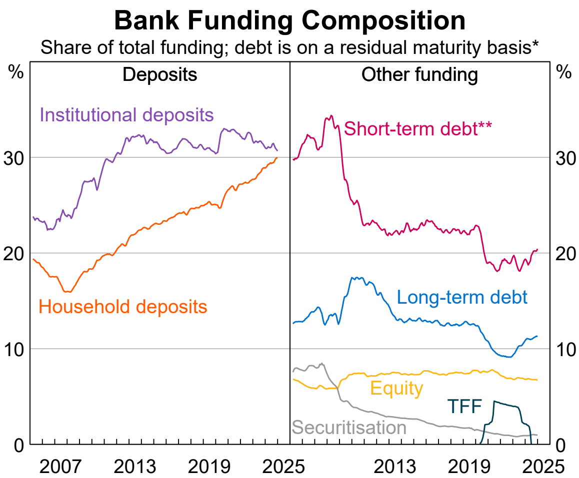
Introduction

Banks fund their assets – such as loans – with a combination of debt, deposits and equity. Bank funding costs are important in the transmission of monetary policy because they are affected by the path of the cash rate and because they are a key determinant of the rates that banks charge households and businesses on loans (RBA 2017). This article examines trends in the composition and cost of banks' funding over 2024.[1]

In Australia, banks' assets and liabilities tend to be related to short-term variable rates such as bank bill swap rates (BBSW) (Brassil, Cheshire and Muscatello 2018). These rates are, in turn, significantly influenced by the level of the cash rate and expectations of its future path. Funding costs increased by 20 basis points over 2024 as the cash rate target remained at 4.35 per cent and short-term market interest rates moved in a fairly tight range. Banks also managed the repayment of the final tranche of the Term Funding Facility (TFF) during this period, which contributed a little to the increase in funding costs.

Bank funding costs have risen by somewhat less than the cash rate since May 2022. This has contributed to lending rates also being lower relative to the level of the cash rate compared with recent history. The share of funding from wholesale debt remains well below levels observed prior to the global financial crisis (GFC), although banks have issued higher volumes of short and long-term debt since the COVID-19 pandemic (including to replace funding from the TFF) (Graph 1).

Graph 1



* Three-month rolling average except for the TFF; debt is adjusted for movements in foreign exchange rates.
** Includes deposits and intragroup funding from non-residents.
Sources: ABS; APRA; Bloomberg; LSEG; RBA.

Funding composition

The composition of banks' funding has shifted more towards deposits since the GFC (RBA 2023). Much of this growth has been in household deposits. The share of funding from institutional deposits increased sharply following the GFC but has been relatively stable since 2012. Since the pandemic, banks have returned to issuing higher volumes of short- and long-term debt, including to replace funding from the TFF that had rolled off by mid-2024. However, the share of funding from short- and long-term debt remains well below levels observed prior to the GFC.

Deposits

The total deposit share of bank funding increased by around ¾ percentage point over 2024, continuing the post-GFC trend increase in deposits as a share of funding. The shift towards deposits in the years following the GFC was driven by a significant repricing of the liquidity risk associated with wholesale debt funding and the structural decline in the securitisation market after the crisis (Debelle 2010; ACCC 2023). It was also further incentivised by prudential regulations that consider deposits to be a more stable source of funding.

Banks substantially increased the interest rates they offered following the GFC to attract more deposit funding (Edey 2010). Household deposits accounted for most of the increase in deposits, which have risen 14 percentage points as a share of total funding since the GFC. The share of institutional deposits has been more stable in recent years after rising by 10 percentage points in the years following the GFC. The lower growth relative to household deposits may be partly due to institutional depositors having a broader range of market-based cash investment alternatives that also earn interest.

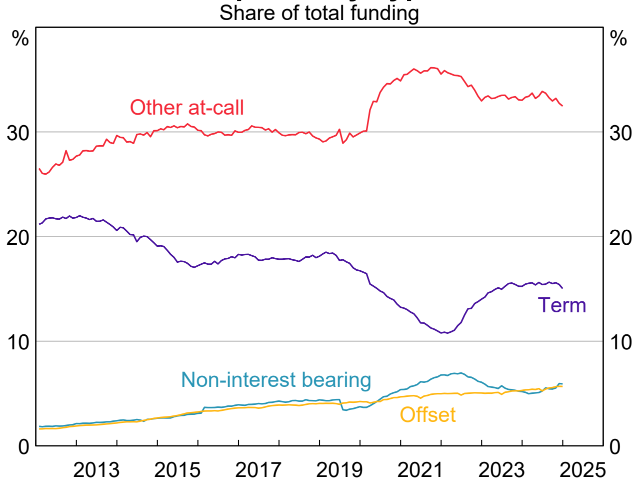
The increase in the deposit share of funding was supported by deposit creation. Growth in credit, including over the pandemic period, expanded bank balance sheets (Kent 2018).[2] Deposits were also created during the pandemic period by government bond purchases by the RBA and the decline in the stock of banks' outstanding wholesale debt (RBA 2020; Carse, Faferko and Fitzpatrick 2023). Much of the deposit creation from this period was concentrated in at-call deposits (including non-interest-bearing accounts and offset accounts), which collectively made up almost half of total bank funding at their peak in early 2022 (Graph 2).

Conversely, the term deposit share of funding decreased during the pandemic as the cash rate fell and the spread between rates on new term deposits and at-call deposits narrowed. Term deposit volumes increased over the recent tightening phase alongside higher term deposit rates, reflecting increases in longer term interest rates and banks seeking more stable deposit funding ahead of their TFF maturities. Household deposits continued to grow strongly, supported by credit growth (RBA 2024a) and population growth.

Graph 2

Deposits by Type

Share of total funding



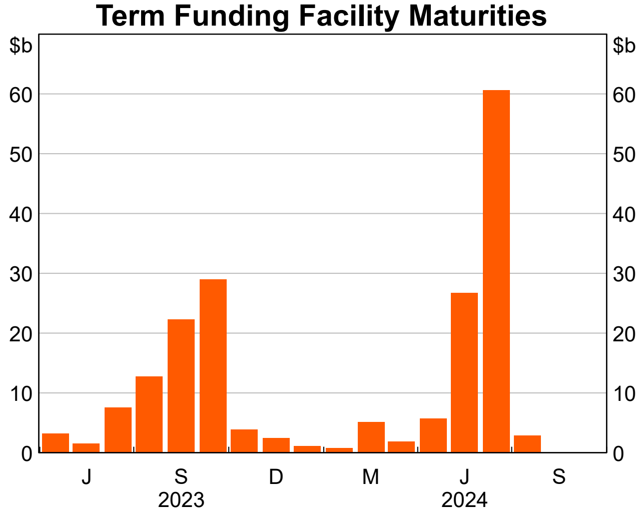
Sources: ABS; APRA; Bloomberg; LSEG; RBA.

The Term Funding Facility

The RBA introduced the TFF in March 2020 to provide low-cost three-year funding to banks as part of a broader package of other pandemic policy measures. This helped to reinforce the benefits of the lower cash rate and reduced the funding costs of banks, in turn helping to reduce interest rates for borrowers (RBA 2024b). Banks faced a sizeable task replacing TFF funding as it matured, with large repayments concentrated in late 2023 and mid-2024 (Graph 3). Banks responded by issuing wholesale debt and attracting more term deposits. Banks were able to take advantage of favourable conditions in wholesale markets over 2022 and 2023 and returned to issuing wholesale debt well ahead of scheduled TFF maturities, following subdued issuance over the pandemic period.

Graph 3

Term Funding Facility Maturities



Source: RBA.

Wholesale funding

Debt securities are an important funding source for banks, though they have comprised a smaller share of their liabilities since the GFC. Banks can use these instruments to diversify their funding mix, including through longer tenors and offshore markets, supporting their lending and liquidity management.

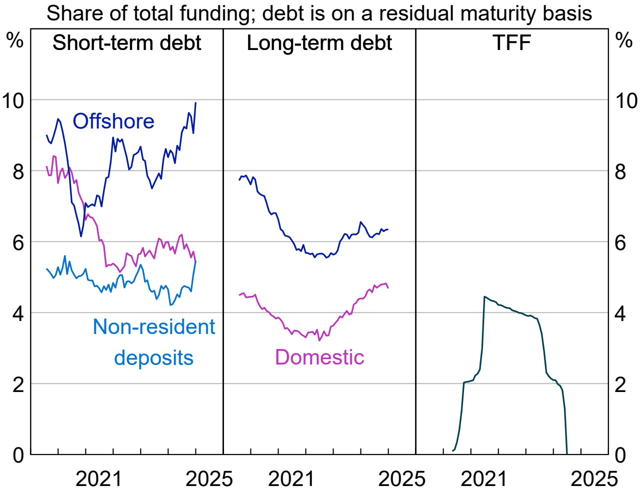
Banks reduced their use of short-term debt (those maturing within 12 months) in the wake of the GFC, and after the introduction of the Net Stable Funding Ratio (NSFR) in 2018, which encouraged more stable funding sources (Johnson 2022). There was a modest pick-up in banks' offshore short-term debt issuance over 2024, partly due to the final maturities of the TFF; banks used short-term debt to help manage their flow of funds around the times of the TFF maturities. In addition to issuing short-term debt instruments (such as certificates of deposit) domestically, large banks accessed deep, liquid overseas money markets to meet their needs through instruments such as US commercial paper.

Long-term debt issuance (those maturing in more than 12 months) by banks remained strong in 2024, following record issuance in 2023. Issuance was high in both nominal terms and relative to GDP, supported by strong investor demand and narrow credit spreads. Banks seeking to replace TFF funding also added to issuance volumes. Around half of all bank bond issuance in 2024 was domestic, which is above the post-GFC average of around 40 per cent (Graph 4). The domestic market deepened over 2024 as stronger investor demand supported larger issuance volumes and at longer tenors.[3] The long-term debt share of bank funding has increased by around 2 percentage points since early 2022.

Graph 4

Wholesale Debt by Type

Share of total funding; debt is on a residual maturity basis



Sources: ABS; APRA; Bloomberg; LSEG; RBA.

In September 2024, the Australian Prudential Regulation Authority (APRA) proposed that Additional Tier 1 (AT1) capital be replaced with more reliable and effective forms of capital (APRA 2024). AT1 securities are a type of hybrid security that have some features of equity and debt; they comprised less than 1 per cent of total funding in December 2024.[4] APRA has proposed that AT1 capital be replaced with a mix of common equity and Tier 2 subordinated debt (with differing approaches for small and mid-sized banks compared with large banks). Subject to consultation on prudential standards in 2025, these changes would apply from 2027. The effect on banks' overall funding costs is likely to be small.

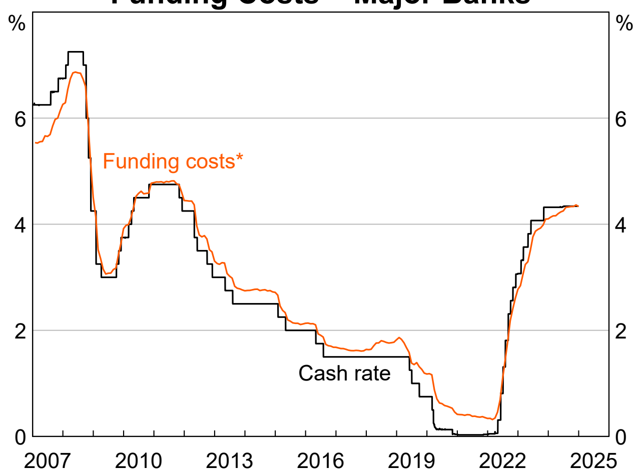
Funding costs

Major banks' funding costs increased only modestly over 2024, reflecting a small increase in the average rate paid on at-call deposits and fixed-rate term deposits and wholesale debt rolling over to higher rates (Graph 5). However, the effect of moving away from earlier low fixed-rate funding had largely passed through to bank funding costs prior to 2024 because much of this funding was hedged to short-term variable interest rates.

Overall, since May 2022, deposit rates have increased more slowly than the cash rate. Hence, funding costs were somewhat lower relative to the cash rate in 2024 than observed in the period since the GFC. This partly reflected the abundance of deposits (as discussed above), which are typically cheaper than wholesale debt.

Graph 5

Funding Costs – Major Banks



* RBA estimates of the overall outstanding hedged debt and deposit costs for the major banks.

Sources: ABS; AFMA; APRA; ASX; Bloomberg; LSEG; major bank liaison; major banks' websites; RBA; Securitisation System; Tullett Prebon; US Federal Reserve.

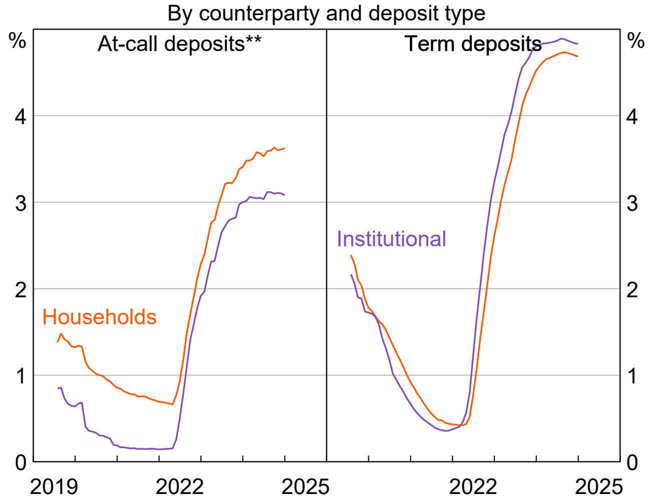
The cost of all non-equity funding sources increased a little over 2024:

- **At-call deposit** rates increased by around 15 basis points over 2024. Banks offer a variety of at-call deposit accounts: some accounts such as those used for regular transactions pay very little or no interest, while others may pay relatively high rates but place restrictions or conditions on depositors accessing their funds. Advertised rates on at-call accounts were little changed over the year, although some banks reduced the base interest rate on conditional savings accounts while keeping the (higher) bonus rate of interest unchanged. For households, the higher average rate paid could reflect households shifting into higher paying accounts, or more households receiving the bonus rate of interest. The share of balances meeting the conditions required to receive the bonus rate increased a little at some banks over the past 12 months – roughly four-fifths of funds held in conditional savings accounts received the bonus rate in 2024. Households receive higher rates overall on at-call accounts than institutional depositors, although this is primarily due to mortgage offset accounts receiving a high rate of implicit interest (Graph 6).[5] Excluding offset accounts, the average rate on household at-call deposits is a little under 3 per cent, which is around 20 basis points lower than for institutional depositors.
- Outstanding **term deposit** rates increased modestly over 2024, although by December were a little below their peak in mid-2024. The spread between new term deposit rates and BBSW rates declined over 2024, reducing the relative cost of new term deposits for banks, in line with commentary in banks' profit reporting that competition for deposits lessened somewhat over the year. Banks offer institutional depositors higher rates on their term deposits than household depositors on average, in part because institutional depositors have access to alternative market-based products to manage their short-term liquidity.

Graph 6

Outstanding Deposit Rates*

By counterparty and deposit type



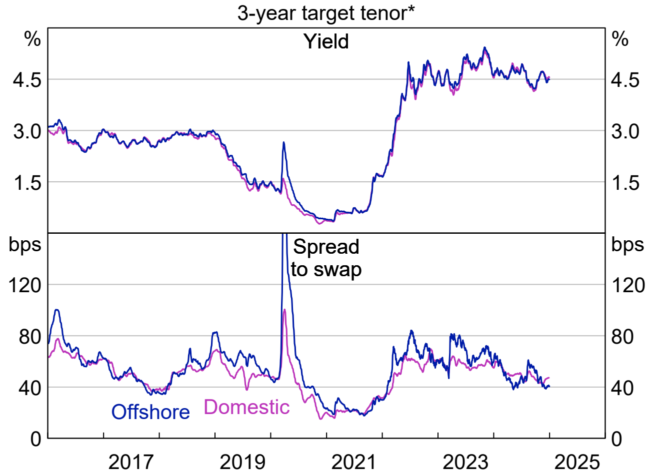
* All banks with more than $4 billion in deposits.
** Includes deposits in loan offset accounts and non-interest bearing deposits.
Sources: APRA; RBA.

- **Wholesale debt** continued to roll over to higher rates in 2024, although some of the effect would have already passed through to banks' funding costs via hedging.[6] Despite the absolute higher rates, the spread between bond yields and the three-year swap rate declined by around 10 basis points, implying debt became relatively more attractive to issue over 2024 (Graph 7). As discussed above, banks issued significant volumes of wholesale debt into favourable funding markets in 2024, particularly in Australia.

Graph 7

Major Bank Bond Pricing

3-year target tenor*



* Smoothed seven-day moving average; offshore spread to swap truncated in early 2020 when it peaked at 210 basis points.
Sources: Bloomberg; RBA.

- The repayment of the final tranche of the **TFF** in 2024 also contributed to the increase in funding costs, as banks replaced the TFF with higher cost sources of funding such as wholesale debt. It is estimated that the replacement of all TFF funding contributed around 15 basis points to the rise in total funding costs over 2023 and 2024 (RBA 2024b). However, some banks had hedged at least a part of the TFF into floating rates, so they already faced higher costs when the cash rate increased.

The Council of Financial Regulators (CFR), in consultation with the Australian Competition and Consumer Commission (ACCC), is undertaking a review into the state of the small and medium banking sector, with a focus on competition.[7] The Issues Paper released in December 2024 noted that there has been little difference in the average level of outstanding funding costs of major banks and smaller banks in recent years (CFR and ACCC 2024). Historically, the major banks had lower funding costs than other banks, though this gap closed around 2017. However, funding costs vary significantly within the small and medium banking sector: some smaller banks have funding costs similar to larger banks, while others face funding costs 100–150 basis points higher. Smaller banks tend to face higher costs for issuing new wholesale debt, because investors demand higher returns to compensate for the additional risk as reflected in smaller banks' lower credit ratings. Smaller banks also typically spend a greater share of their income on operating expenses than the major banks, which partially accounts for the generally higher returns of larger banks.

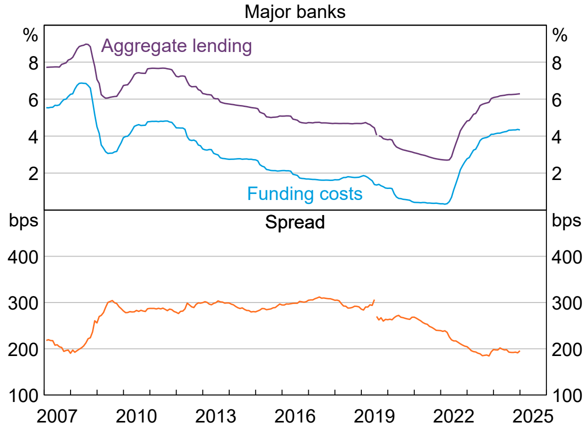
Lending spreads and net interest margins

Banks' lending spreads – the difference between lending rates and funding costs – were little changed in 2024, after declining in recent years (Graph 8). Spreads compressed during the period of very low interest rates as banks could not reduce rates on all liabilities while rates on assets declined (Brassil 2022). The lending spread declined a little further over the tightening phase as competition in mortgage lending put downward pressure on mortgage rates (Ung 2024). Lending spreads stabilised at this lower level in 2024, in line with mortgage rates remaining little changed.

Graph 8

Lending Rates and Funding Costs*

Major banks



* Average outstanding lending rates; series break at July 2019, data thereafter is from the EFS collection; spread is the month-end difference in aggregate lending and funding costs.

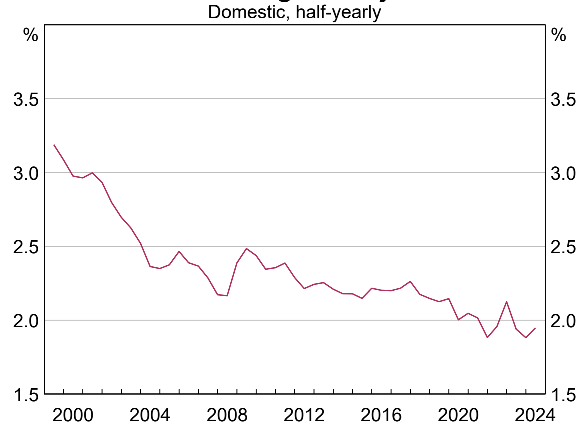
Sources: ABS; AFMA; APRA; ASX; Bloomberg; CANSTAR; LSEG; major bank liaison; major banks' websites; RBA; Securitisation System; Tullett Prebon; US Federal Reserve.

Alongside the decline in lending spreads, banks' net interest margins (NIMs) – which measure the difference between interest income and interest expenses, divided by interest-earning assets – have also declined (Graph 9). Although major bank NIMs increased modestly in 2022, they have more recently declined to around their pre-pandemic level. Market commentary suggests that competition remains a headwind, although some banks have noted they are prioritising margin preservation over loan growth.[8] The long-term decline in the level of interest rates has likely had a small negative impact on NIMs. However, the effect in Australia has been less than in peer economies. This follows from the fact that interest rate risk on banks' assets is typically well matched to interest rate risk on liabilities for Australian banks, including because of their hedging (Windsor, Jokipii and Bussiere 2023).[9]

Graph 9

Net Interest Margin – Major Banks*

Domestic, half-yearly



* Data for a given period relate to banks' public profit reports released in that half; IFRS basis from 2006, AGAAP prior; excludes St George Bank and Bankwest prior to the first half of 2009.

Source: RBA.

Conclusion

In 2024, banks' funding mix continued to shift towards deposits, which is a lower cost source of funding on average than wholesale debt. Banks replaced funding from the TFF without difficulties and this process only added a little to banks' non-equity funding costs. Overall, banks' funding costs increased only modestly over 2024, with the cash rate target unchanged and market interest rates remaining within a tight range. Banks' lending spreads were also little changed in 2024 after declining in recent years.

Endnotes

* Duke Cole is from Domestic Markets Department and Venura De Zoysa and Christopher Schwartz completed this work while in Domestic Markets Department. The authors would like to thank Tekla Bastian and Peter Wallis for their assistance.

1 For a discussion of funding costs and composition as the cash rate increased over 2022 and 2023, see De Zoysa, Dunphy and Schwartz (2024).

2 Lending by banks creates deposits as the funds made available to the borrower are deposited in the banking system, either in the borrower's account or in another account when those funds are used by the borrower. The other transactions also tend to create deposits if the government bond or wholesale debt is ultimately sourced from a non-bank investor. For more information on the creation of deposits and money, see Kent (2018).

3 Following the GFC, banks mainly issued offshore because those markets offer a greater capacity to absorb large issuance and a deeper pool of investors looking for funding at longer tenors than is available domestically (Johnson 2022).

4 AT1 securities are categorised as either short- or long-term debt throughout this article.

5 The implicit interest earned on offset accounts is the mortgage rate linked to the product and does not attract income tax, unlike interest received on other deposit accounts. This makes offset accounts a highly attractive place to store savings for households with mortgages. Offset accounts have largely replaced overdraft facilities secured by residential property as the primary tool for mortgagors to manage their short-term liquidity needs (Jennison and Miller 2025).

6 For more information on Australian banks' hedging practices, see Box A in De Zoysa, Dunphy and Schwartz (2024).

7 Small and medium banks include all authorised deposit-taking institutions (ADIs) except the major banks and branches of foreign banks. The Issues Paper uses a different measure of funding costs to this article. The measure in this article is more timely and allows for more detailed disaggregation but is only available for the four major banks. The trends in the two series are broadly similar, although there is a levels difference.

8 While the lending spread is typically the primary driver of NIMs, they also include interest earned on non-loan assets such as securities. Banks' reported NIMs also capture the actual cost of hedging, while the lending spread measure in Graph 8 uses the RBA's model estimate of hedging costs.

9 Australian banks typically seek to align the repricing profile of their assets and liabilities. This means changes in gains or losses on one side of the balance sheet when interest rates change are mostly offset by opposite moves on the other side of their balance sheet. Larger banks would then typically hedge any residual interest rate risk using derivatives.

References

ACCC (Australian Competition and Consumer Commission) (2023), 'Retail Deposit Inquiry', Final Report, December.

APRA (Australian Prudential Regulation Authority) (2024), 'A More Effective Capital Framework for a Crisis', Discussion Paper, September.

Brassil A (2022), 'The Consequences of Low Interest Rates for the Australian Banking Sector', RBA Research Discussion Paper No 2022-08.

Brassil A, J Cheshire and J Muscatello (2018), 'The Transmission of Monetary Policy through Banks' Balance Sheets', RBA Annual Conference, Sydney, 12–13 April.

Carse V, A Faferko and R Fitzpatrick (2023), 'Developments in Banks' Funding Costs and Lending Rates', RBA *Bulletin*, March.

CFR (Council of Financial Regulators) and ACCC (Australian Competition and Consumer Commission) (2024), 'Review into Small and Medium-sized Banks', Issues Paper, December.

Debelle G (2010), 'Bank Funding and Capital Flows', 23rd Australasian Finance and Banking Conference, Sydney, 15 December.

De Zoysa V, J Dunphy and C Schwartz (2024), 'Bank Funding and the Recent Tightening of Monetary Policy', RBA *Bulletin,* April.

Edey M (2010), 'Competition in the Deposit Market', Remarks at the Australian Retail Deposits Conference, Sydney, 19 May.

Jennison S and M Miller (2025), 'An Update on the Household Cash Flow Channel of Monetary Policy', RBA *Bulletin*, January.

Johnson C (2022), 'Trends in Australian Bank Bond Issuance', RBA *Bulletin*, September.

Kent C (2018), 'Money – Born of Credit?', Remarks at the Reserve Bank's Topical Talks Event for Educators, Sydney, 19 September.

RBA (Reserve Bank of Australia) (undated), 'The Transmission of Monetary Policy', Explainer.

RBA (2020), 'Box D: Recent Growth in the Money Supply and Deposits', *Statement on Monetary Policy*, August.

RBA (2023), *Financial Stability Review*, October.

RBA (2024a), 'Box A: The Pick-up in Housing and Business Credit Growth', *Statement on Monetary Policy*, November.

RBA (2024b), 'Review of the Term Funding Facility', October.

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

Windsor C, T Jokipii and M Bussiere (2023), 'The Impact of Interest Rates on Bank Profitability: A Retrospective Assessment Using New Cross-country Bank-level Data', RBA Research Discussion Paper No 2023-05.