RESERVE BANK OF AUSTRALIA

How might a global recession impact Australia?

2nd September AIME
& SAMM

Overview

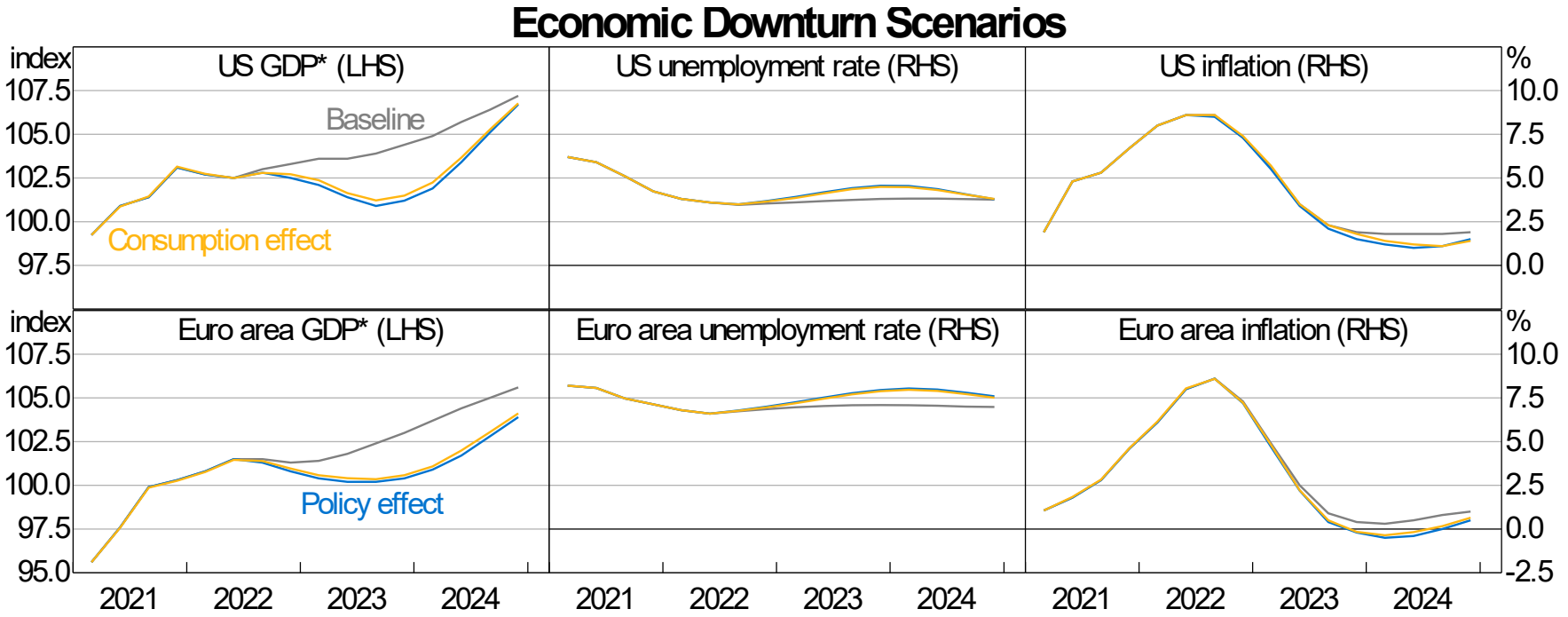
- Global scenario: Advanced economy downturn
- Domestic impacts
- Conclusions

Advanced economy downturn

- Consumer confidence falls due to lower real wages
  - Savings rates increase and consumption falls
  - Faster rebalancing from goods to services consumption
  - Goods imports fall as domestic capacity is freed up

- Monetary policy responds more aggressively to high inflation
  - Financial conditions tighten, leading to capital outflows from Asia
  - Exchange rates in middle-income Asia depreciate

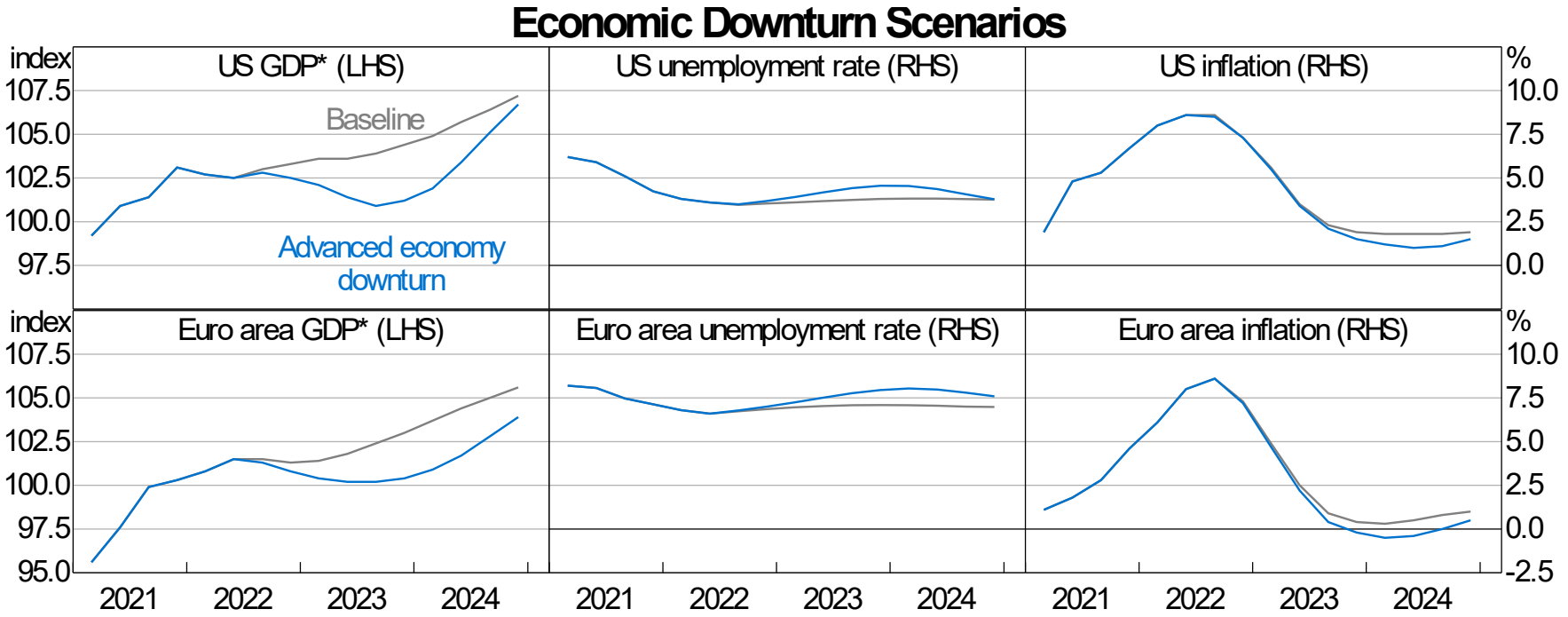
The consumption shock is the main driver…



* December quarter 2019 = 100.

Sources: Oxford Economics; RBA

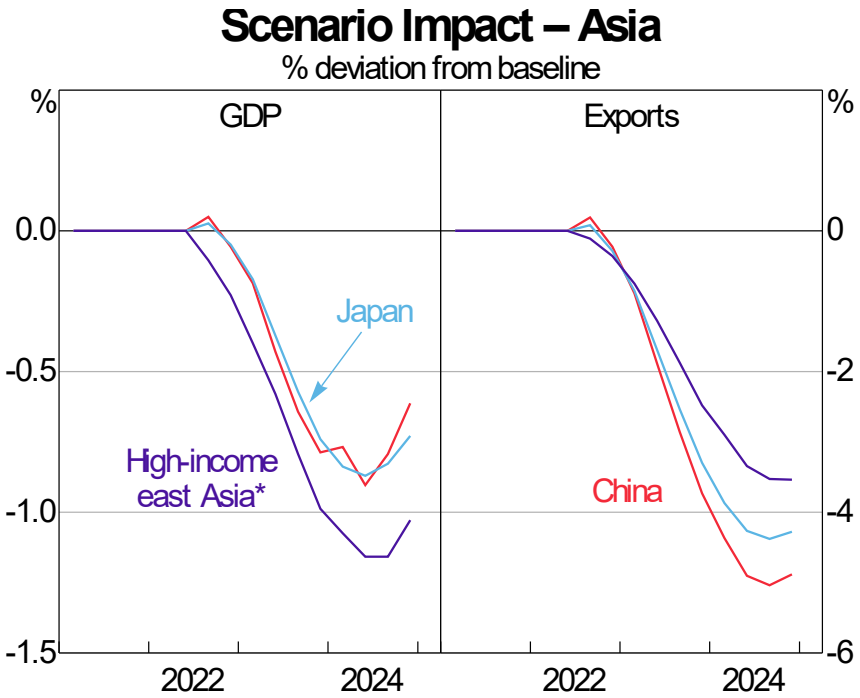
…and strongly impacts advanced economies…



* December quarter 2019 = 100.

Sources: Oxford Economics; RBA

…but flow through to Asia is limited



* Hong Kong, Singapore, South Korea and Taiwan.

Sources: Oxford Economics; RBA

Domestic impacts using MARTIN

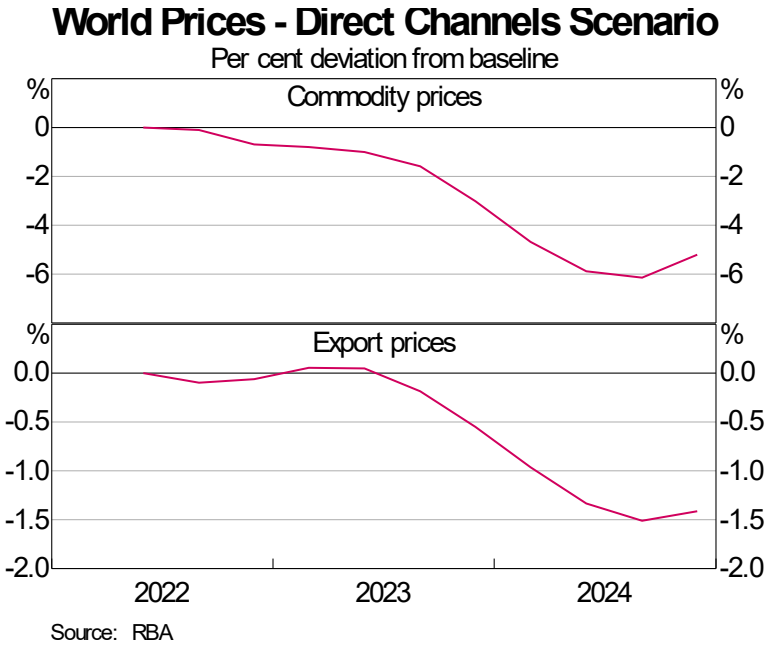
- Direct effects
  - Minimal effects on activity
  - Reflects limited spillover to Asian economies

- Amplifiers
  - Much more severe
  - Mostly reflects consumer confidence shock

- Shock absorbers
  - Allowing the exchange rate to respond
  - Small offsetting effect

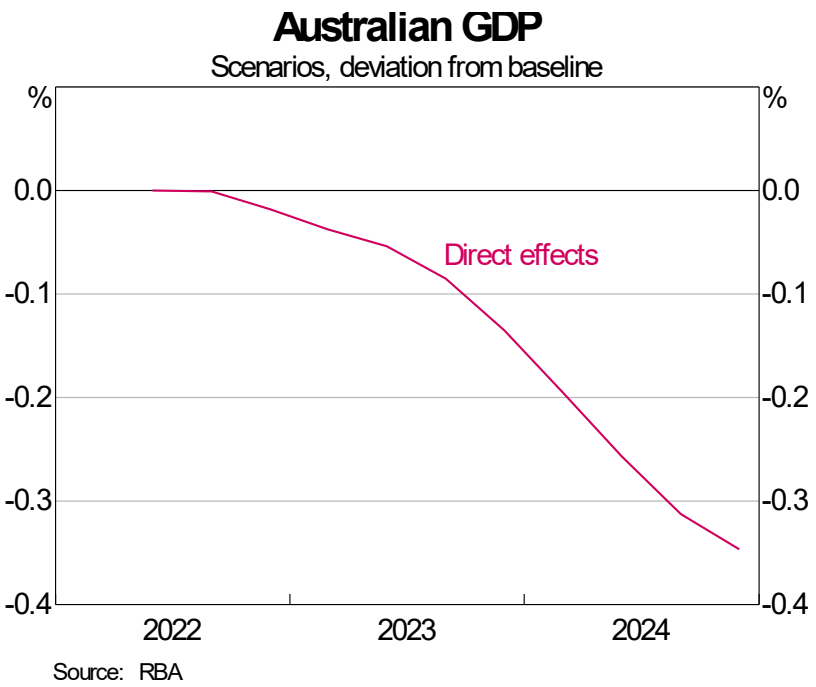
Direct effects

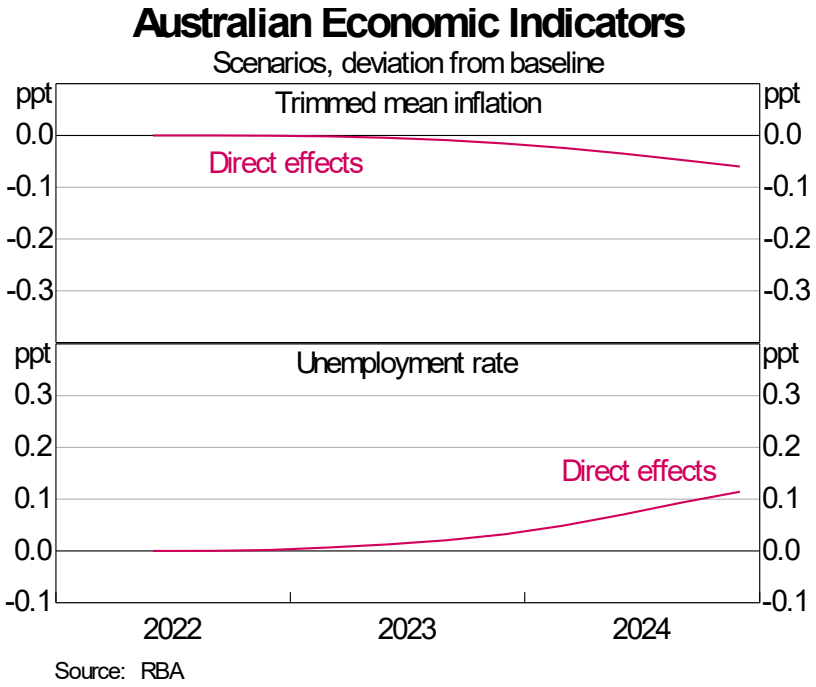
We shock world GDP and prices…



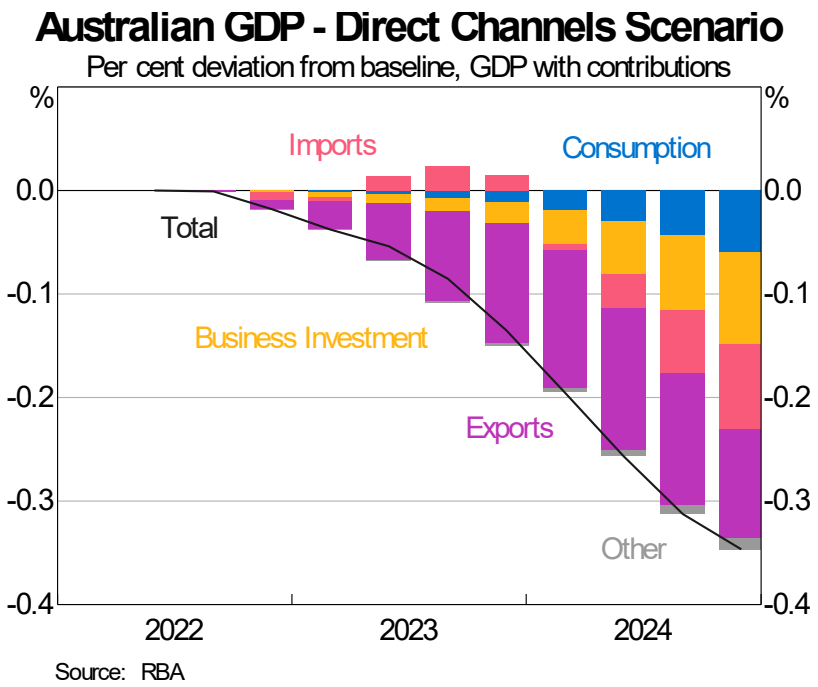
Exchange rate and cash rate fixed at baseline

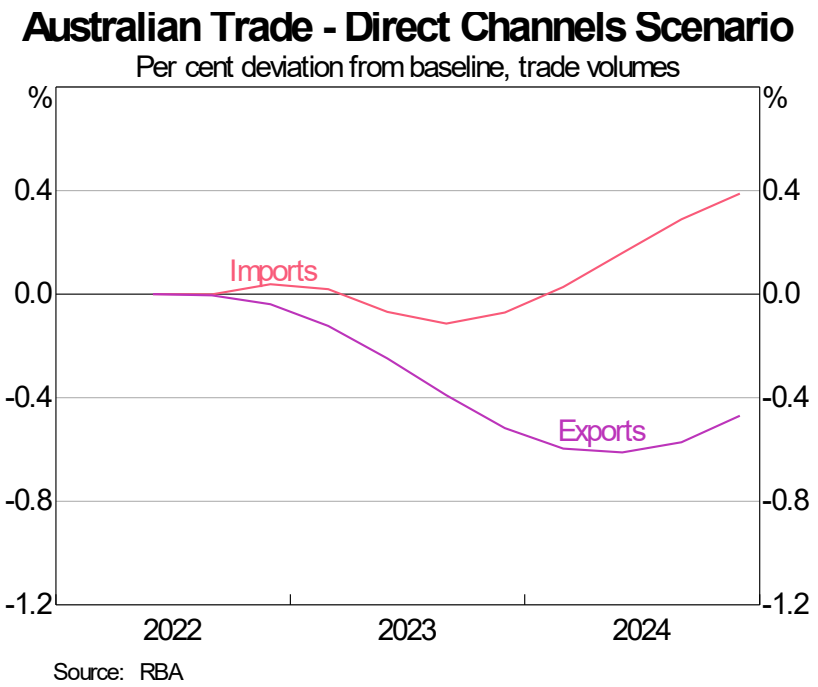
…causing a small decline in activity…





…mostly due to lower net exports





Amplifier Scenario

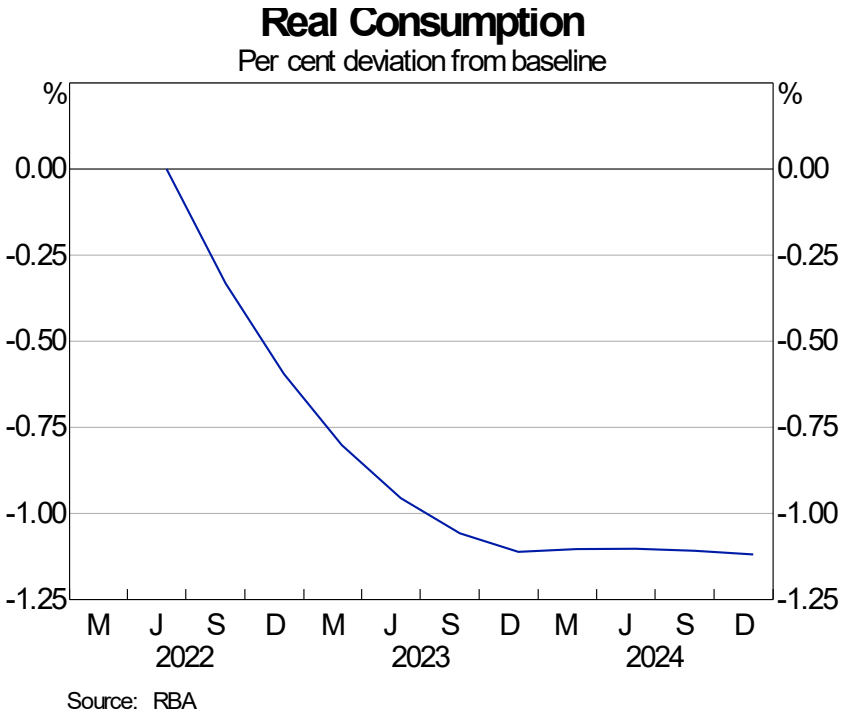
Introducing two amplifiers…

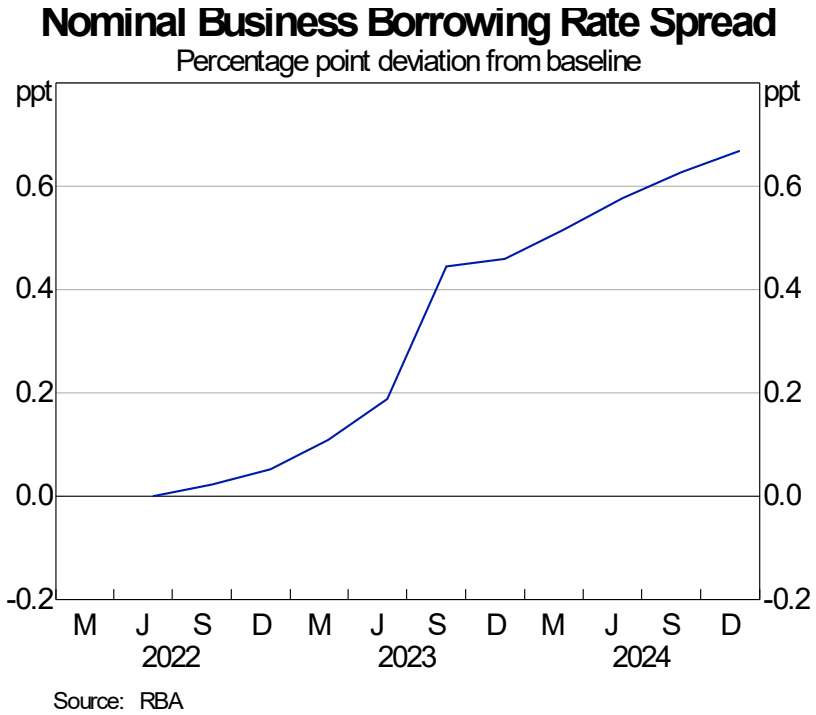
- **Consumer confidence**
  - Negative shock to domestic consumption

- **Financial market uncertainty + risk**
  - Positive shock to corporate borrowing spreads

Size = 50% of model residuals during the GFC
Informed by Australia's relative falls in equity prices

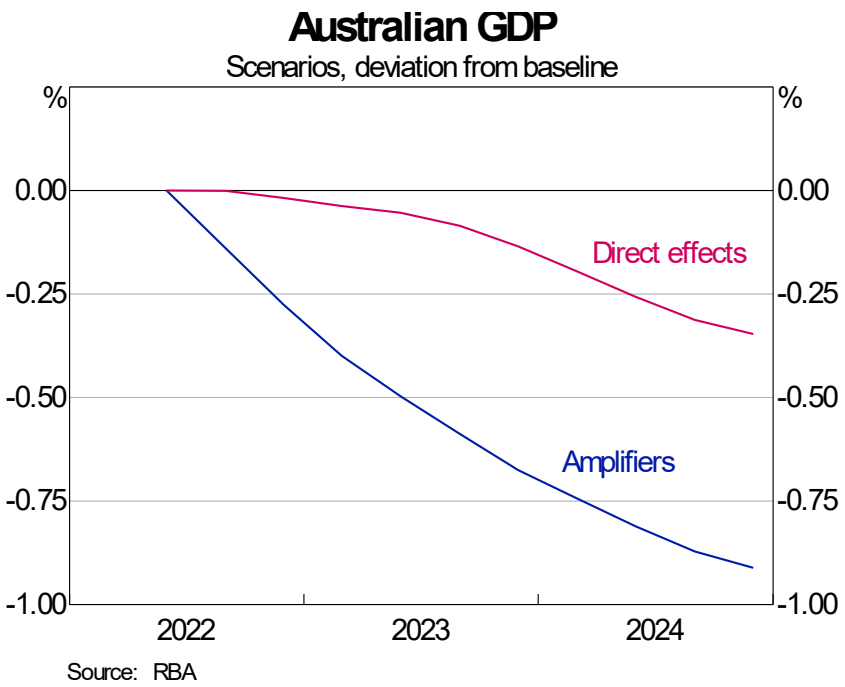
…consumption and corporate spreads…

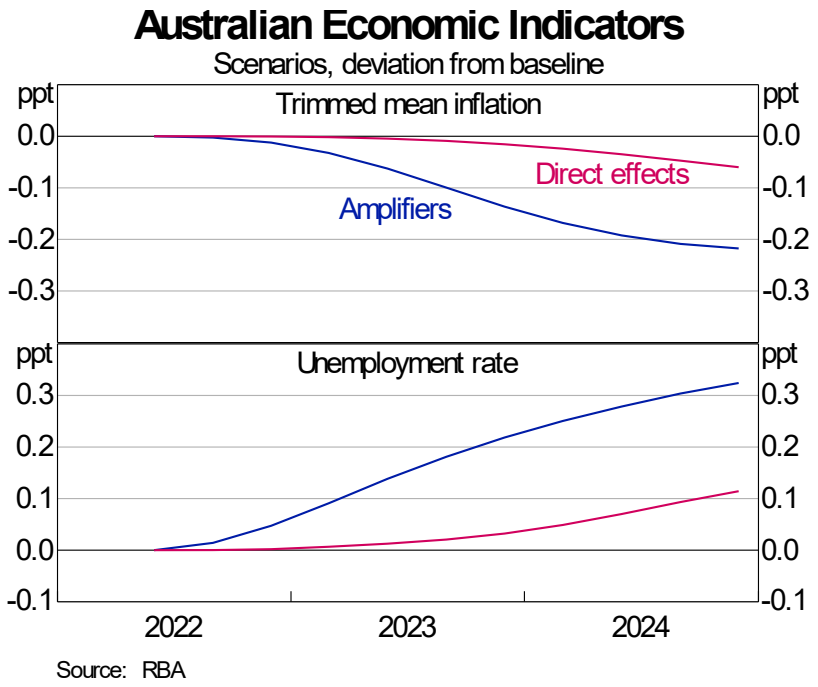




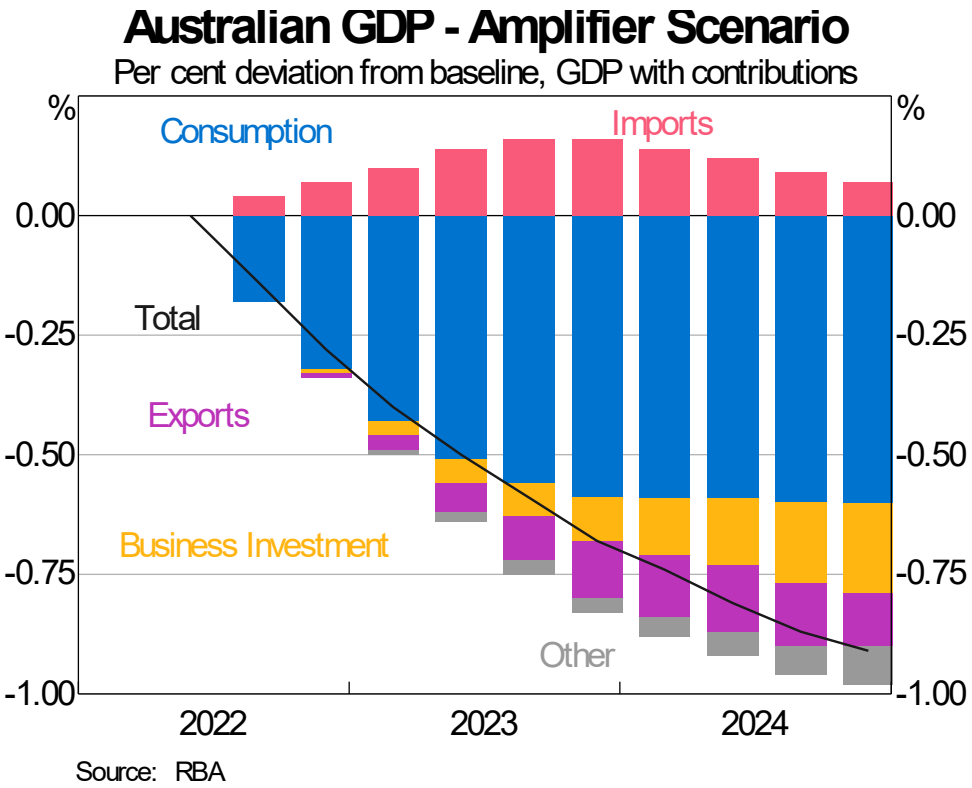
Exchange rate and cash rate fixed at baseline

…which have a larger effect on activity…



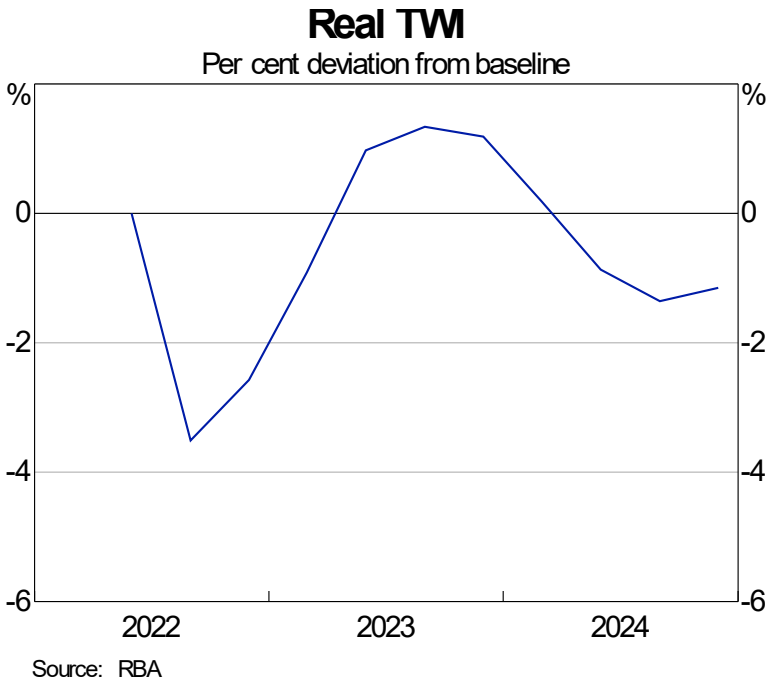


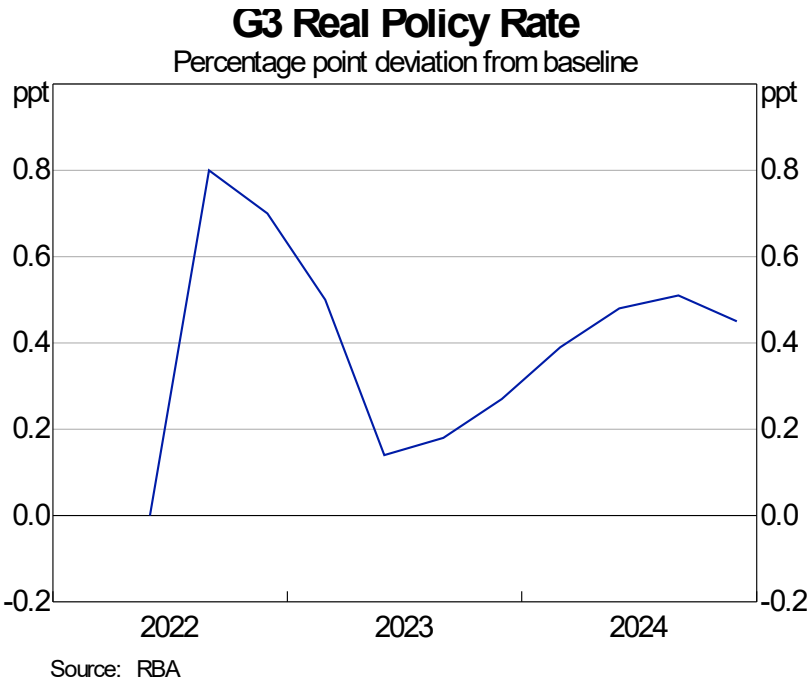
…mostly due to consumption



Shock Absorber Scenario

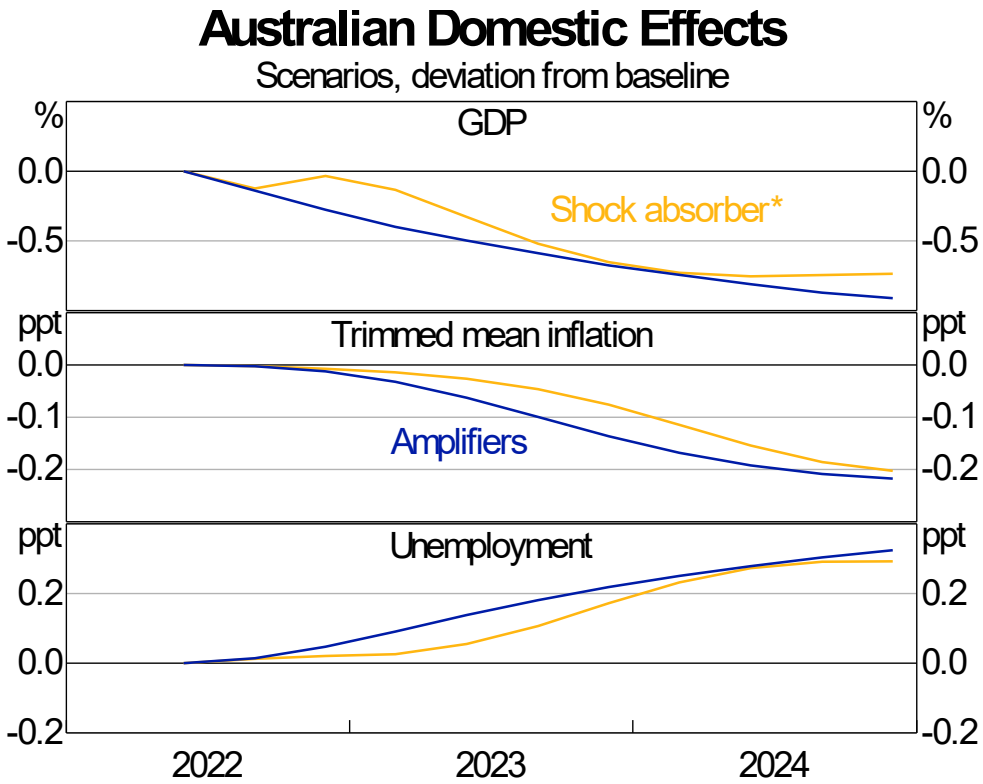
The exchange rate is allowed to respond…





Australia's cash rate fixed at baseline

…which slightly offsets the decline in activity



* The exchange rate responds endogenously and the cash rate is kept at its baseline in this scenario.

Source: RBA

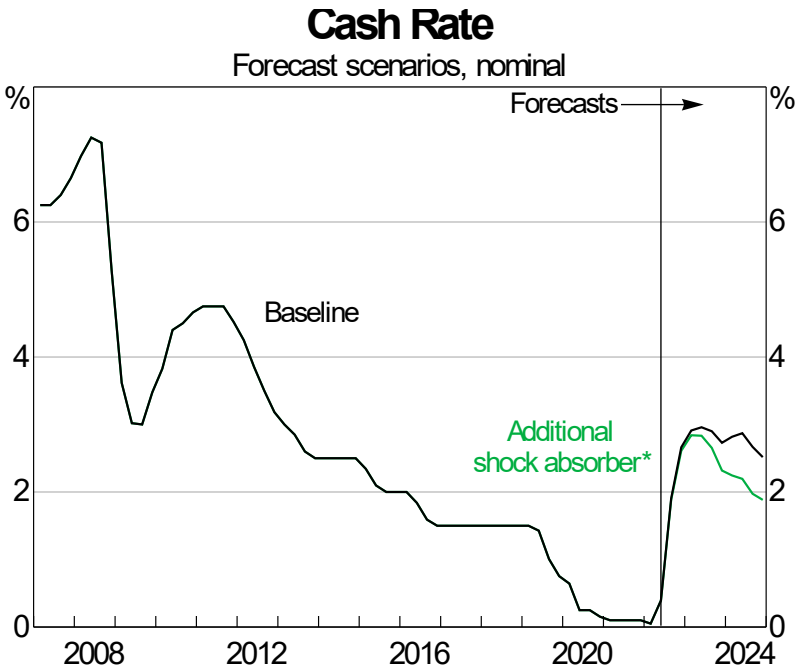
Concluding thoughts

- Large impact on advanced economies overseas + smaller spillovers to Asia

- Effect on Australia is small

→ have we missed anything?

- The exchange rate can work against near-term objectives of cooling the economy



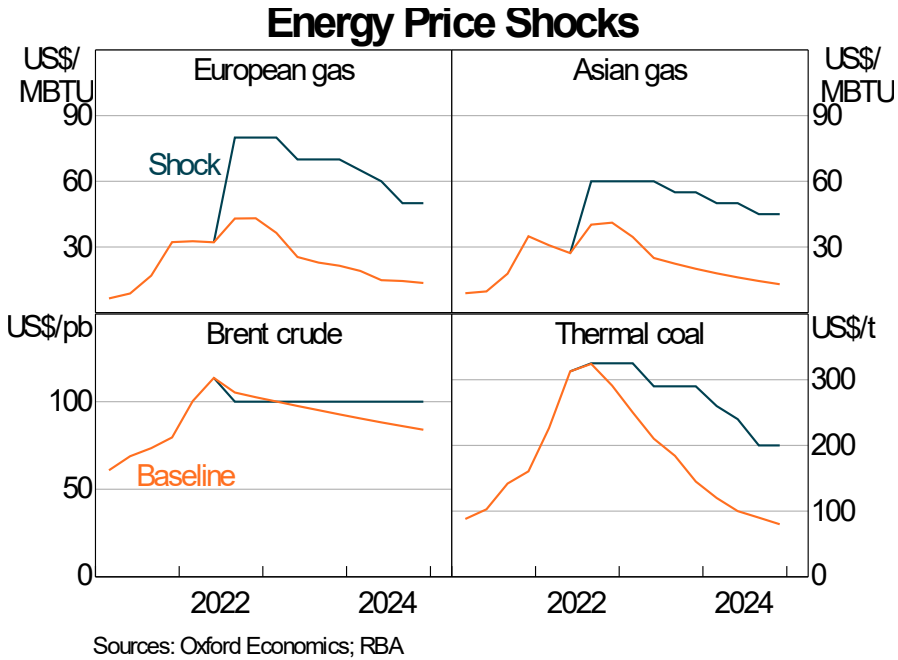
* The exchange rate and cash rate respond endogenously.

Source: RBA

Spare graphs

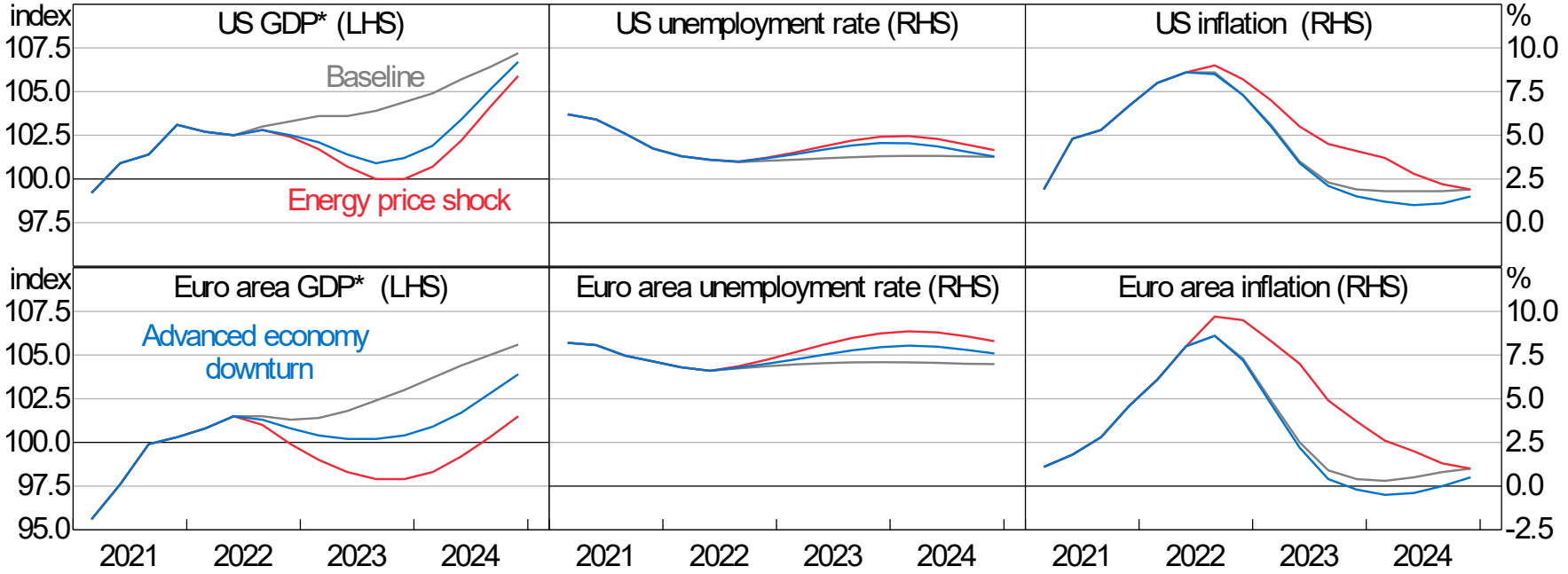
Energy price shock

- Gas prices stay at current levels in 2023
  - Oil and thermal coal prices are higher due to substitution
  - Business confidence in Europe and Asia falls



Sources: Oxford Economics; RBA

Economic Downturn Scenarios

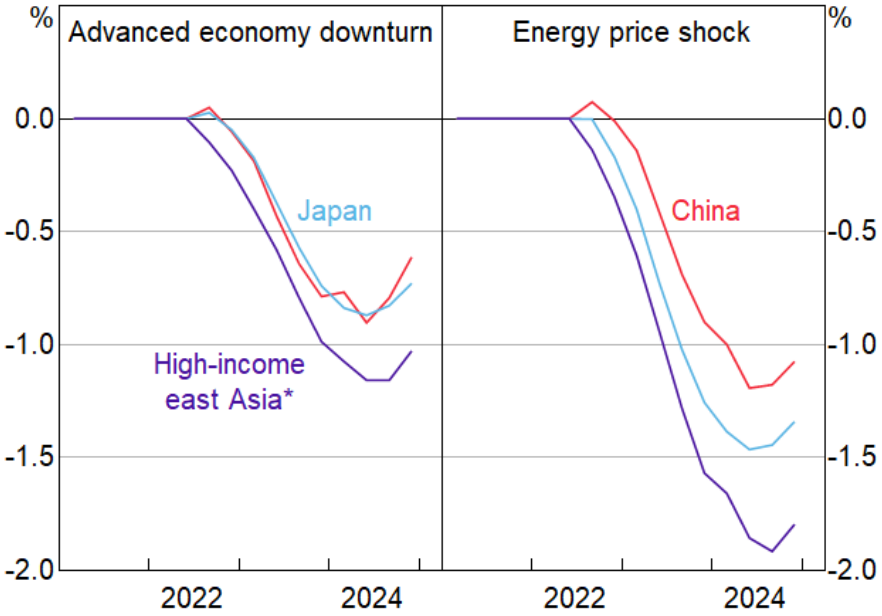


* December quarter 2019 = 100.

Sources: Oxford Economics; RBA

Impact on GDP – Asia

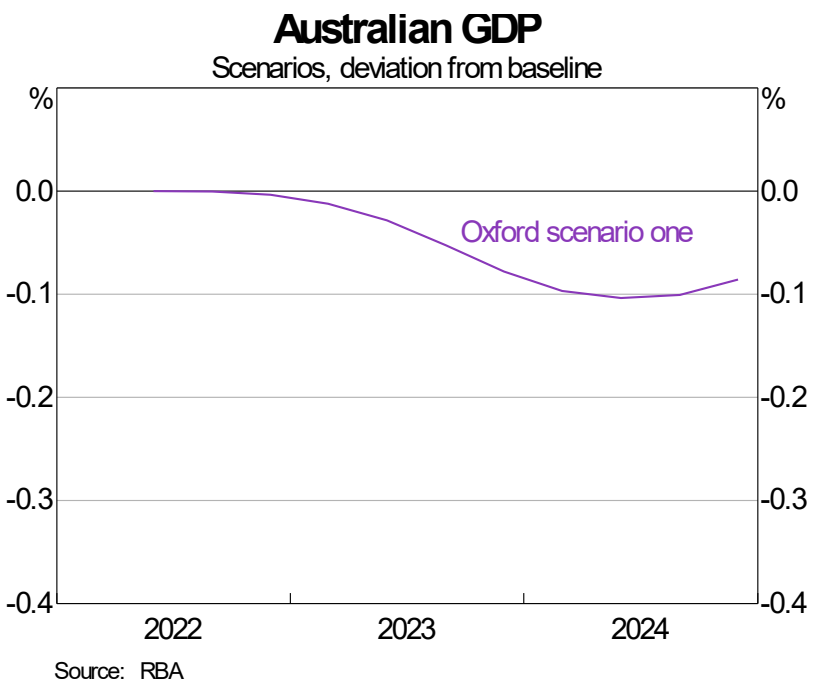
% deviation from baseline

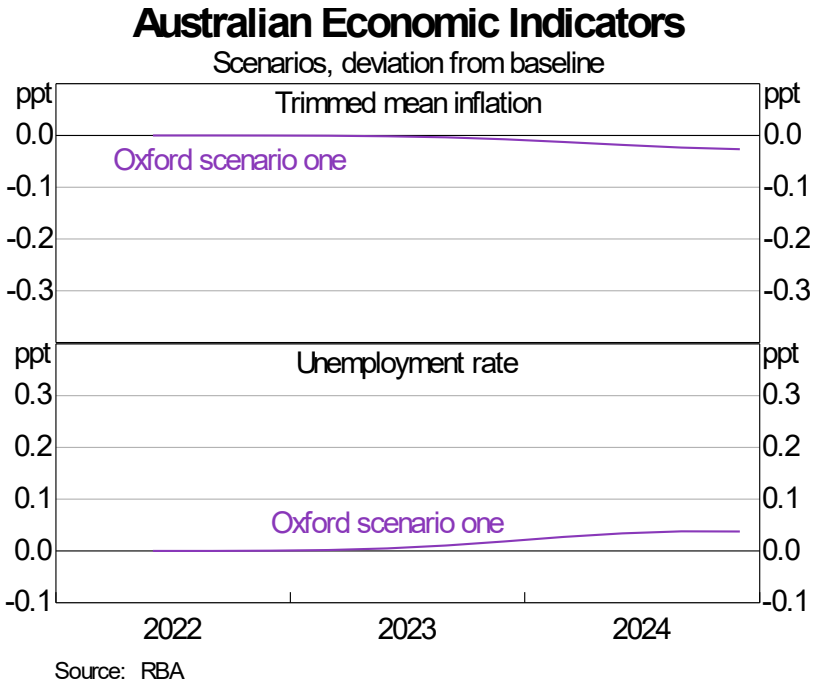


* Hong Kong, Singapore, South Korea and Taiwan.

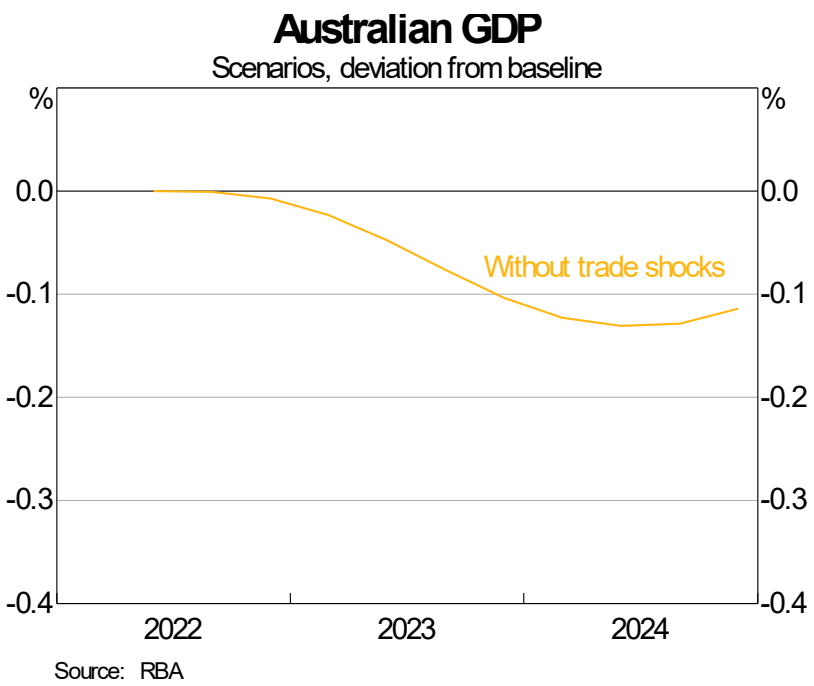
Sources: Oxford Economics; RBA

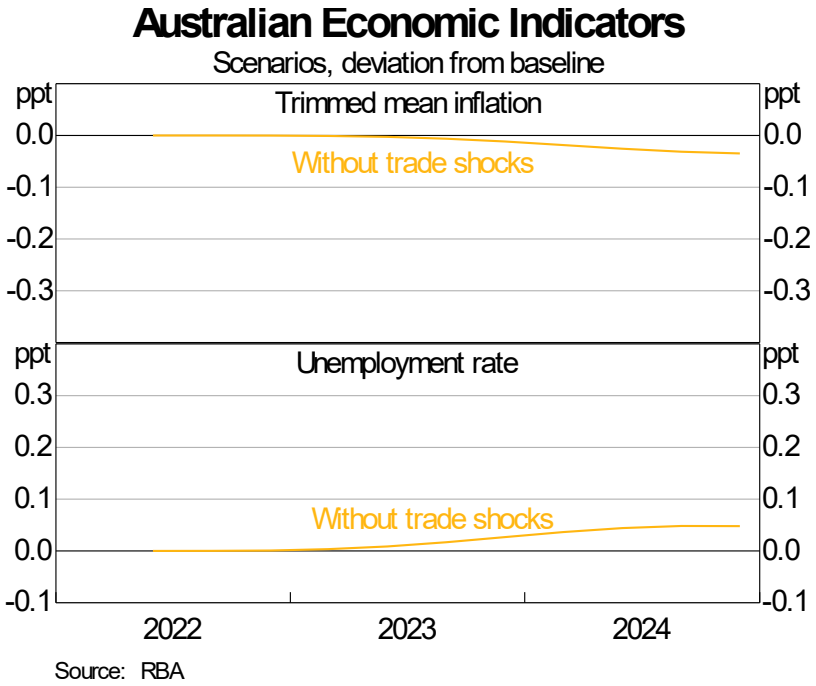
Oxford scenario one



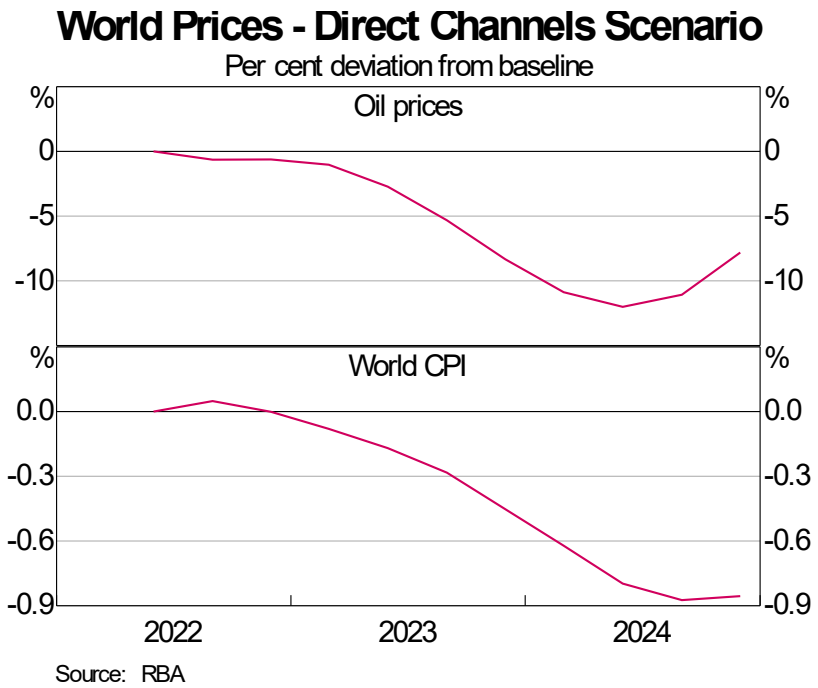


Without trade shocks

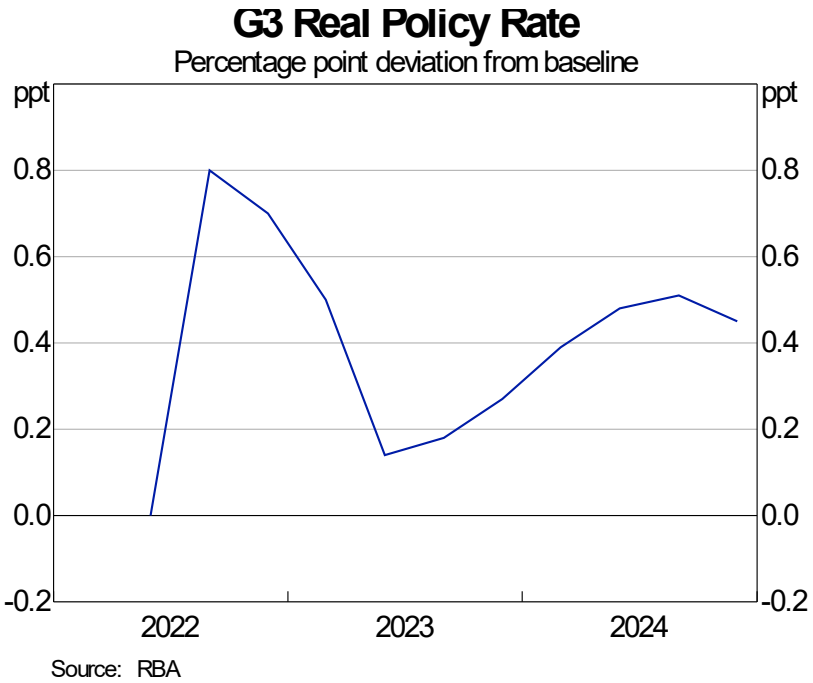




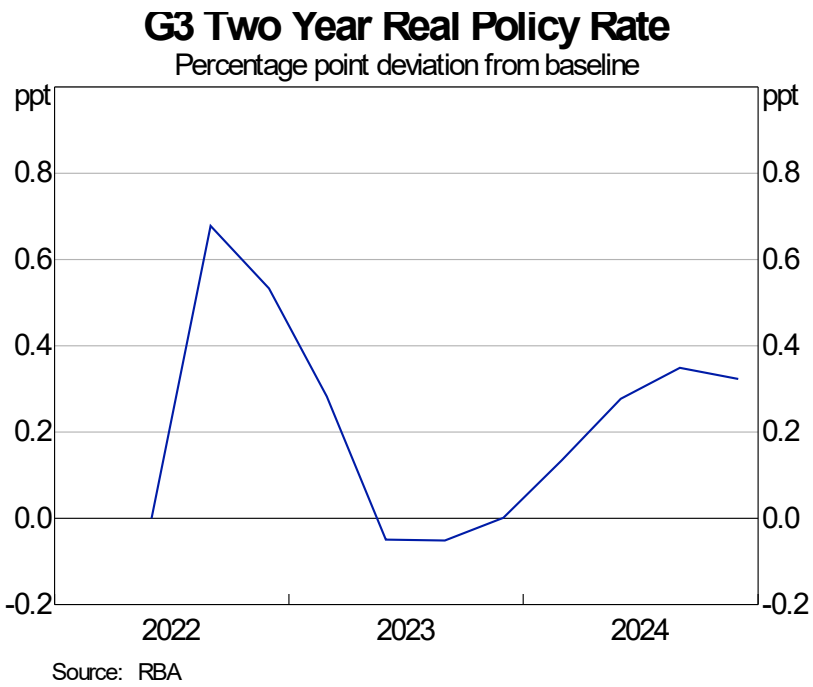
Oil and world price shocks

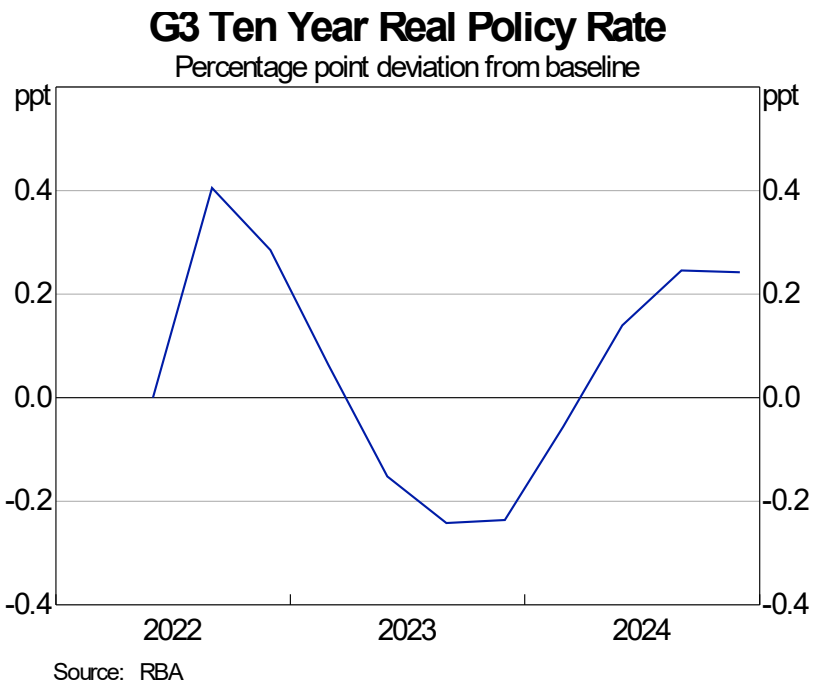


World rate shock

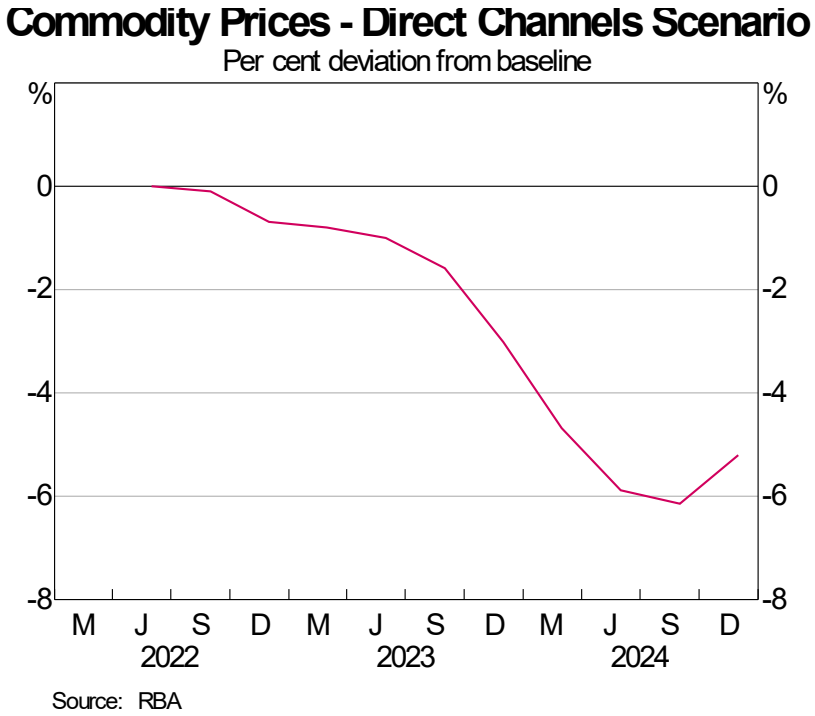


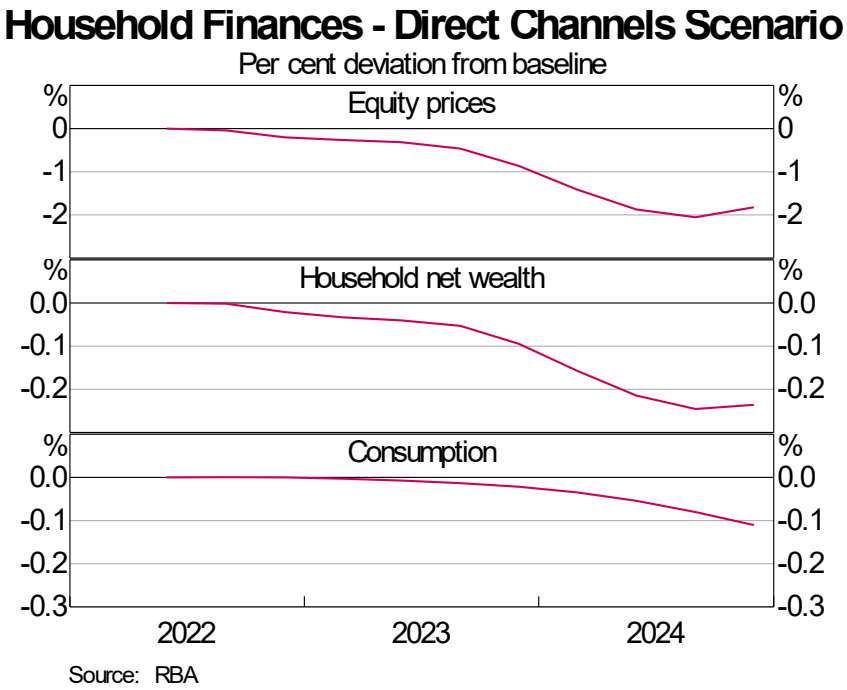
World rate shock





Lower commodity prices reduce consumption

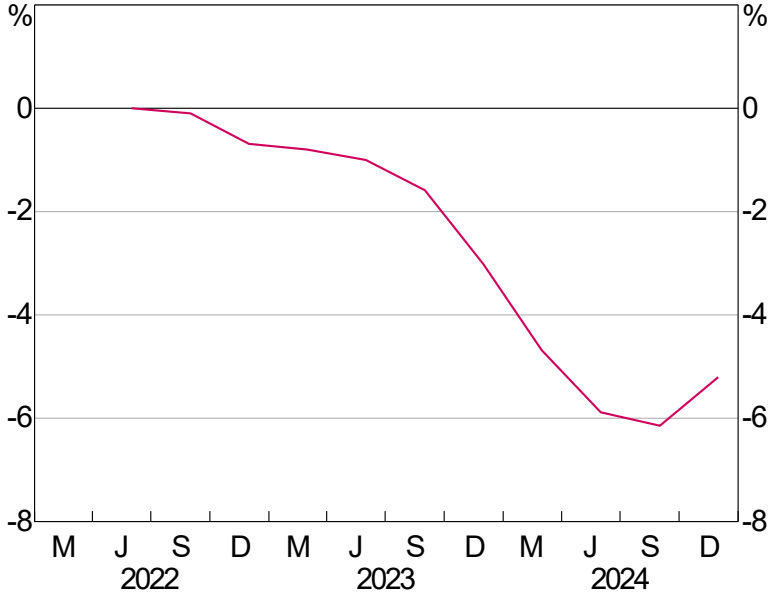




Lower commodity prices reduce investment

Commodity Prices - Direct Channels Scenario

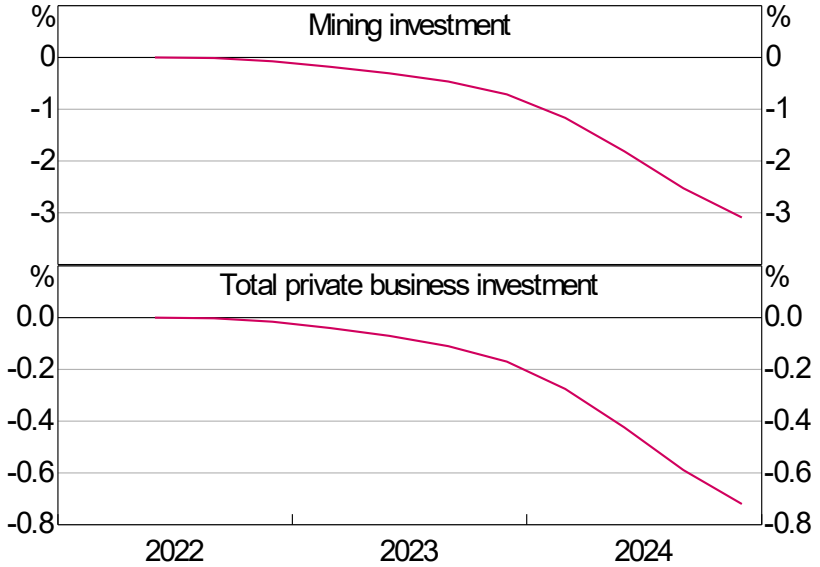
Per cent deviation from baseline



Source: RBA

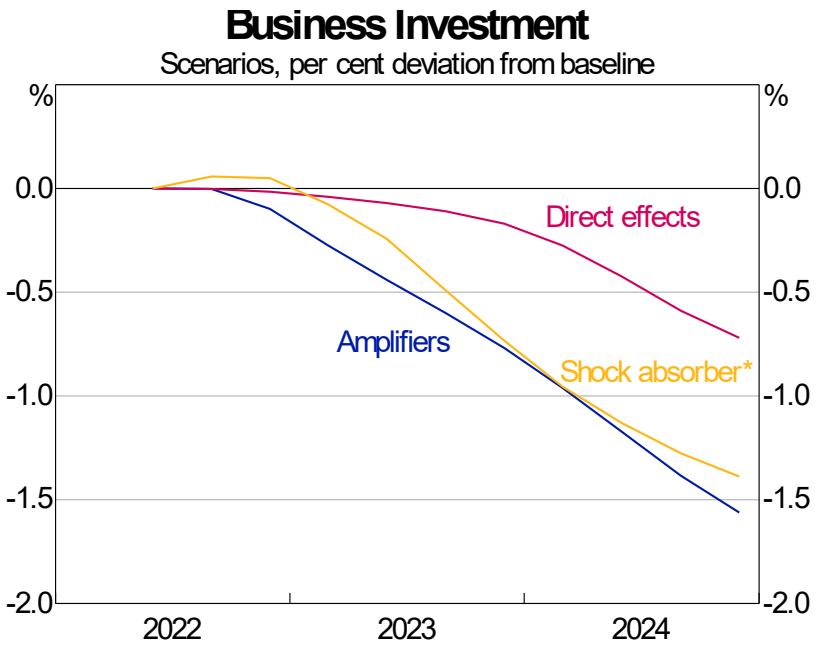
Business Investment - Direct Channels Scenario

Per cent deviation from baseline



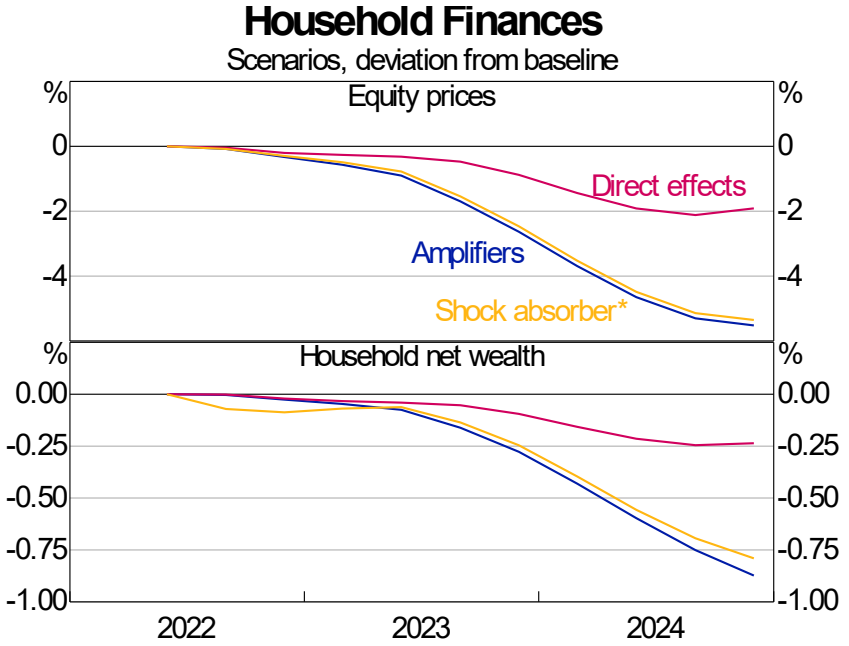
Source: RBA

Amplifier scenario



* The exchange rate responds endogenously and the cash rate is kept at its baseline in this scenario.

Source: RBA



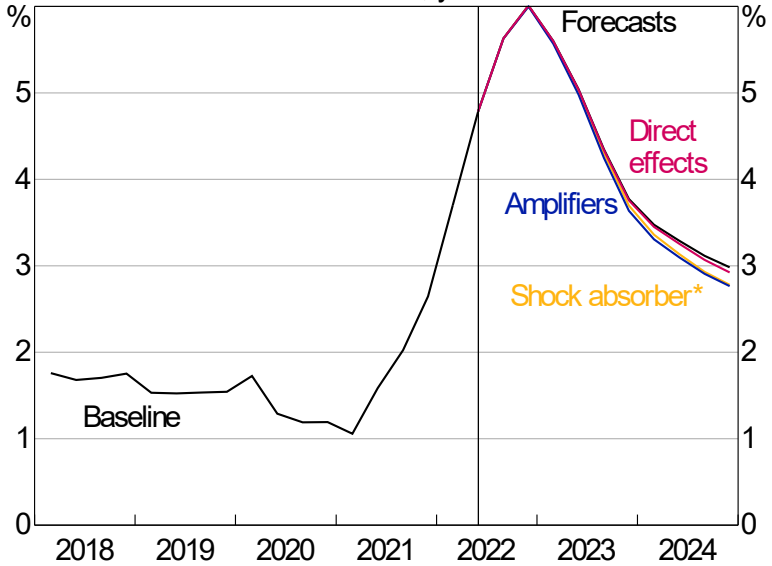
* The exchange rate responds endogenously and the cash rate is kept at its baseline in this scenario.

Source: RBA

Amplifier scenario

Trimmed Mean Inflation

Forecast scenarios, year-ended

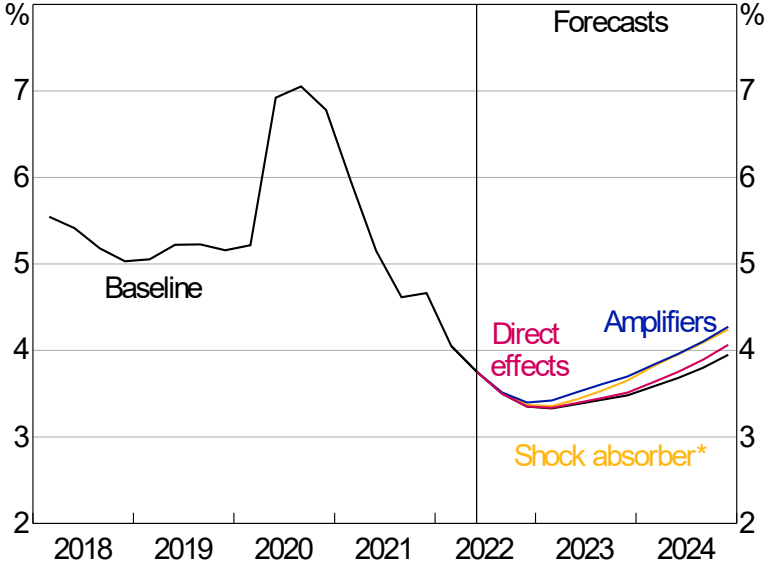


* The exchange rate responds endogenously and the cash rate is kept at its baseline.

Sources: ABS; RBA

Unemployment Rate

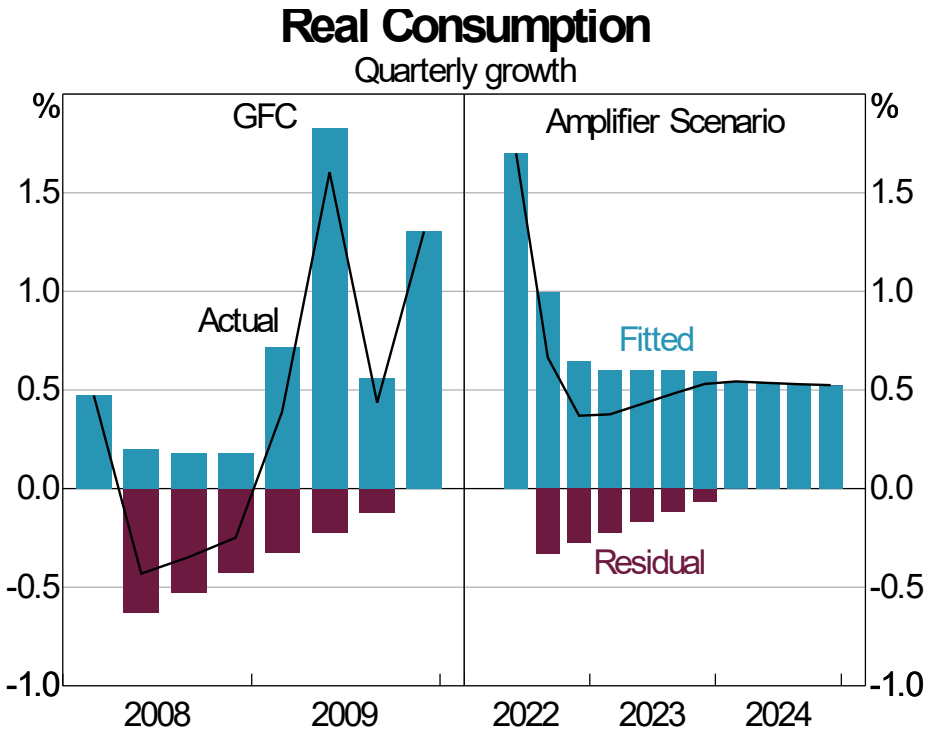
Forecast scenarios



* The exchange rate responds endogenously and the cash rate is kept at its baseline.

Sources: ABS; RBA

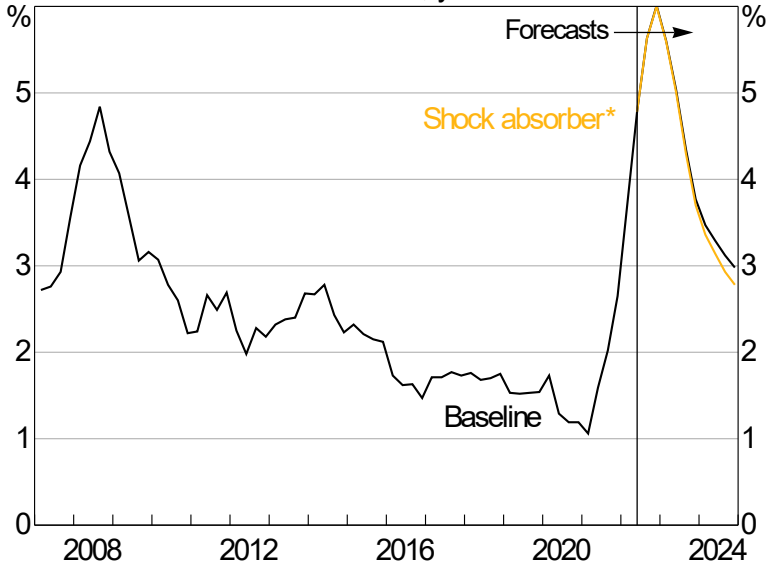
Amplifier scenario – consumption residuals



1st shock absorber scenario (exchange rate on)

Trimmed Mean Inflation

Forecast scenarios, year-ended



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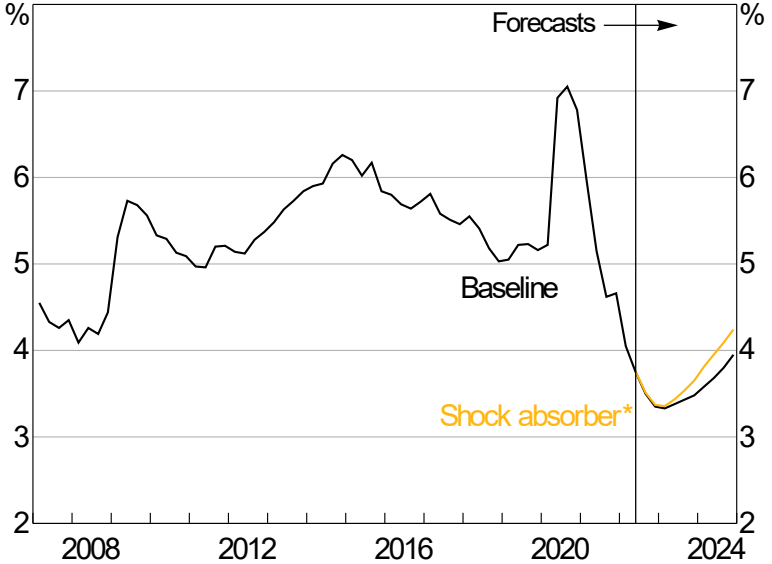
Sources: ABS; RBA

Unemployment Rate

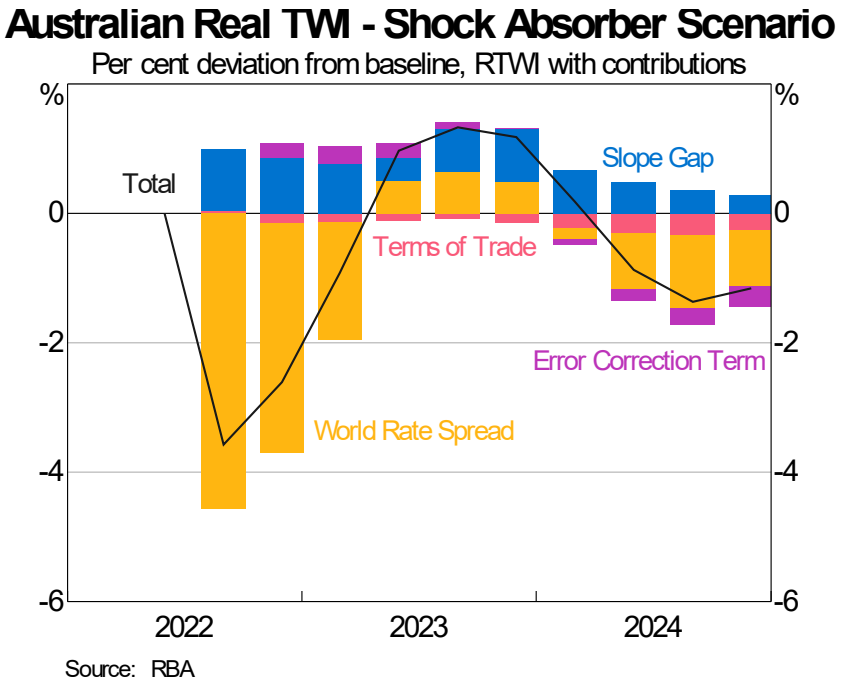
Forecast scenarios



* The exchange rate responds endogenously and the cash rate is kept at its baseline.

Sources: ABS; RBA

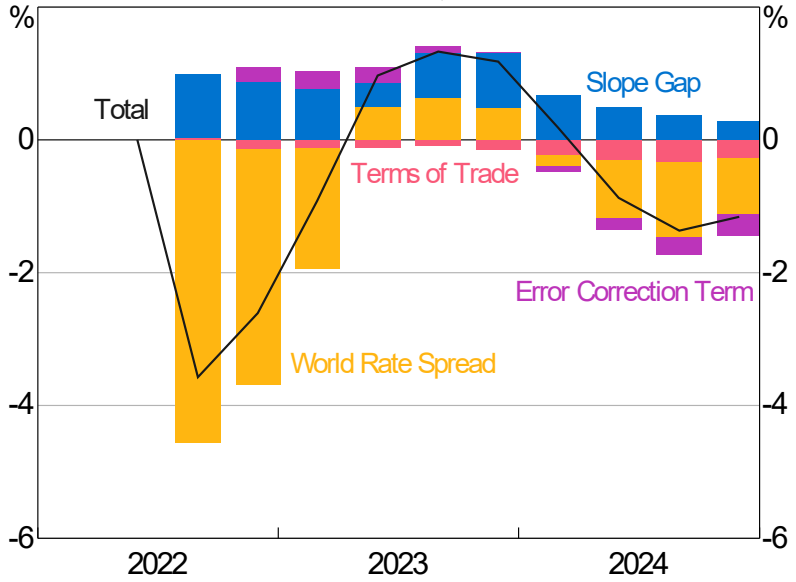
Mostly driven by world rate movements…



…which boosts net exports

Australian Real TWI - Shock Absorber Scenario

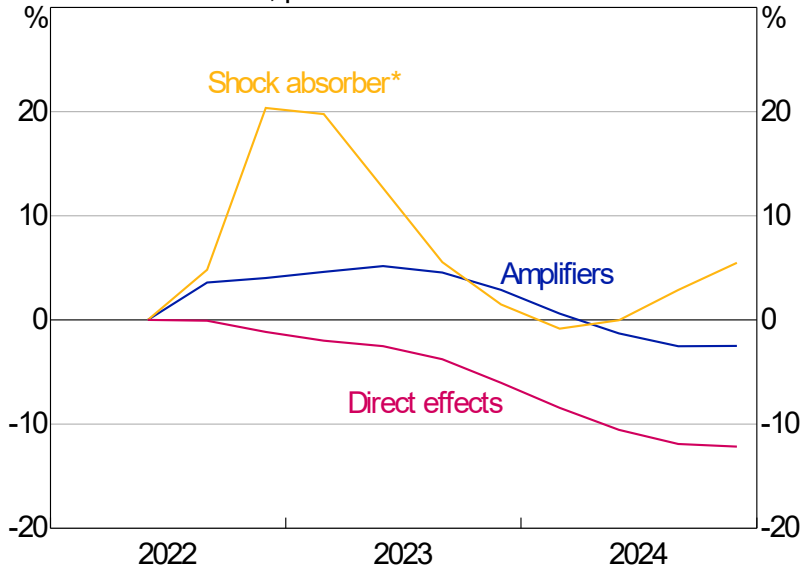
Per cent deviation from baseline, RTWI with contributions



Source: RBA

Net Exports

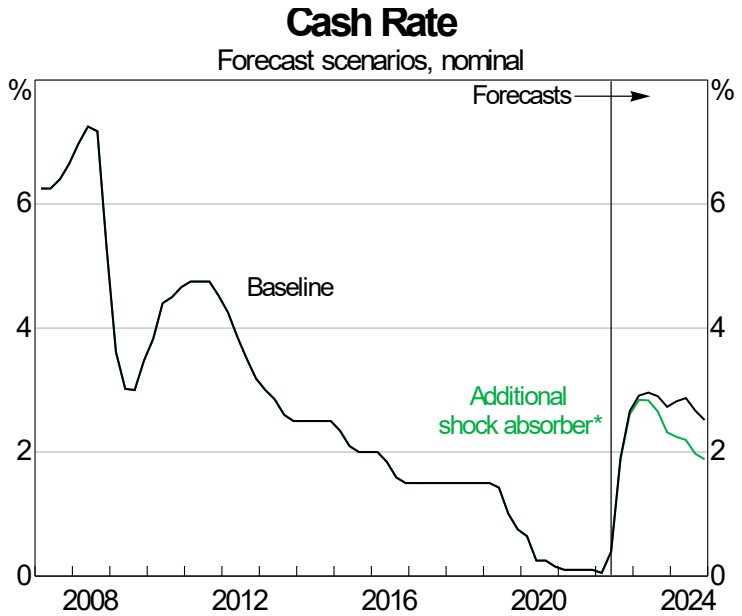
Scenarios, per cent deviation from baseline



* The exchange rate responds endogenously and the cash rate is kept at its baseline in this scenario.

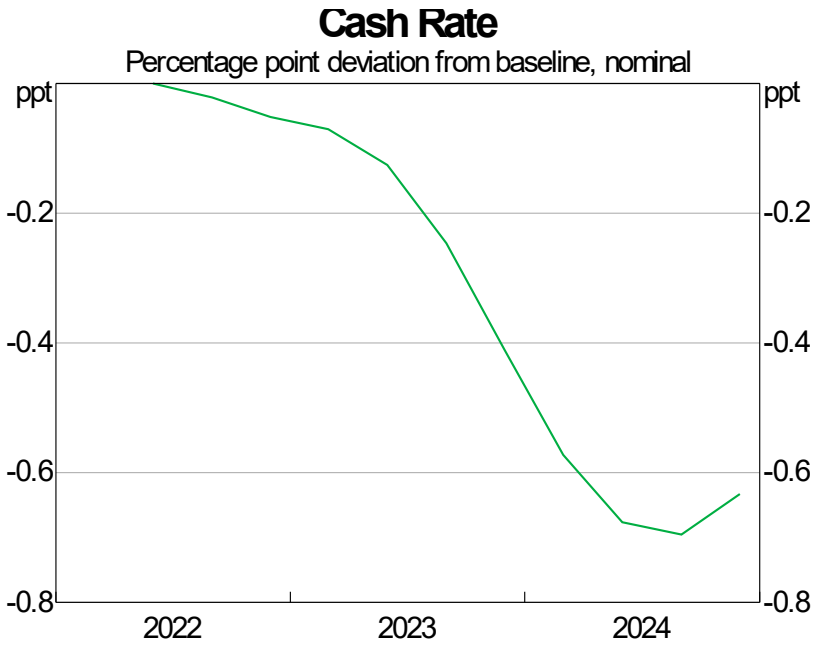
Source: RBA

2nd shock absorber scenario (with cash rate on)



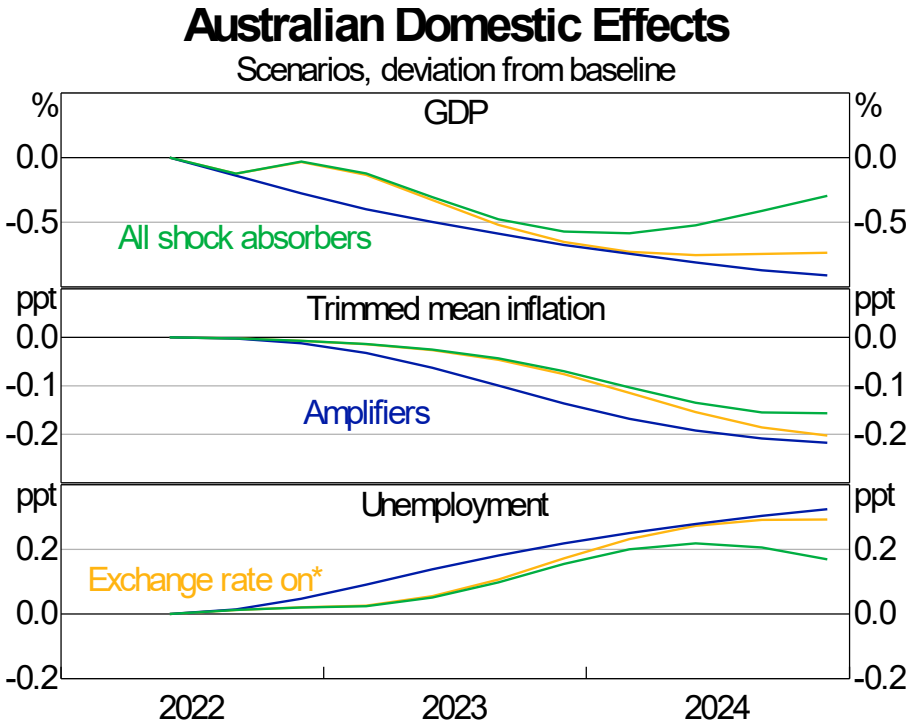
* The exchange rate and cash rate respond endogenously.

Source: RBA



Source: RBA

2nd shock absorber scenario (with cash rate on)



* The exchange rate responds endogenously and the cash rate is kept at its baseline.

Source: RBA

SOME HOUSING PRICE SCENARIOS[1]

Housing prices have declined in Sydney and Melbourne since the start of 2022, and have started declining in other capital cities and regional areas in recent months. Market economists generally expect prices to continue declining until late 2023, with total declines of 15 to 25 percent from peak to trough. I show that in the Saunders and Tulip (2019) model, one of EA's main models for forecasting housing prices, the current size and variation of market expectations are difficult to explain with different cash rate assumptions alone. However, user cost models such as the Saunders and Tulip model are sensitive to changes in the expected future capital appreciation rate (i.e. expected housing price growth), where the model currently uses a long-run expectation assumption of 2.6 per cent growth annually. Considering an alternative range of capital appreciation rates (a 3 per cent decline to no change) more consistent with data on short-term expectations, the model's outputs are similar to market forecasts.

Motivation

Housing prices have declined in Sydney and Melbourne since the start of 2022, and have started declining in other capital cities and regional areas in recent months. With the cash rate expected to increase further over the next year or so, the decline in housing prices is expected to continue. Forecasts by market economists point to declines of 15 to 25 per cent from peak to trough, and for prices to trough in late 2023. The size and variation in market expectations are difficult to explain in the Saunders and Tulip (2019) model – a user cost model of housing – with different cash rate assumptions alone. However, the user cost model is sensitive to changes in the expected capital appreciation rate (i.e. expected housing price growth). In the second half of this note, I explore a range of assumed capital appreciation rates that appear to be more reflective of short-term expectations at present.

Cash rate scenarios

I consider three different cash rate paths (Graph 1):

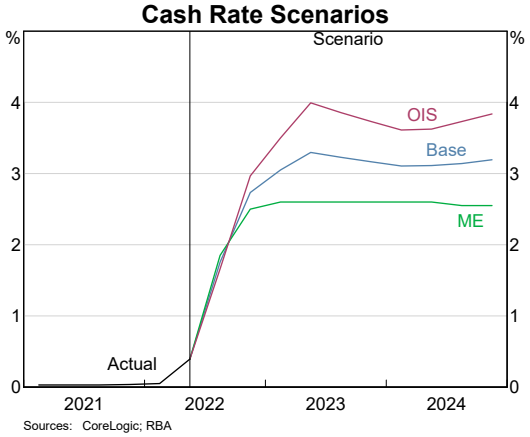
- the OIS implied cash rate (OIS scenario) from 23 June 2022.[2] Since then the OIS curve has flattened a little in the second half of 2023, which would likely result in smaller declines for housing prices later on;
- the market economists' expected path (ME scenario) from the same date; and,
- the average of the two paths (baseline scenario), which was our assumption for the August 2022 SMP forecast.

I run these scenarios in the user cost model. In the model, an individual's choice is between buying and owning a house and renting. In equilibrium it is assumed that the user cost of owning a house is equal to the cost of renting. The user cost of owning a house accounts for the real mortgage rate, depreciation, running and transaction costs, and expected capital appreciation. The cost of renting appears in the model as the real rental yield, which is measured as the quarterly CPI rents series divided by real housing prices. A higher cash rate flows into the real mortgage rate in the user cost, which makes owning a house less attractive relative to renting. This results in lower demand for buying a home, and thus lower housing prices.

1 I would like to thank Tom Rosewall and for their assistance and feedback with the note.

2 23 June 2022 corresponds with the first round of assumptions in the August 2022 SMP forecast round. Updates to the cash rate assumption later in the round were not materially different from the first round assumption.

Graph 1
Cash Rate Scenarios

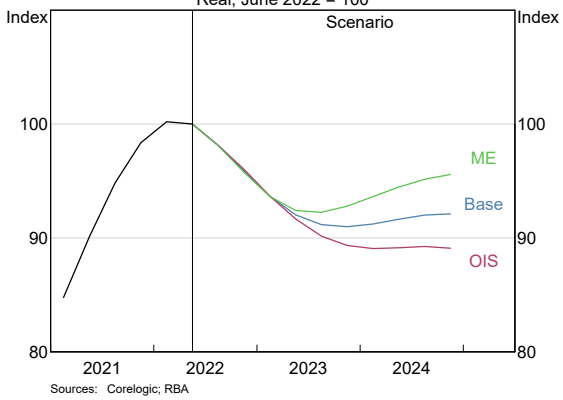


Results

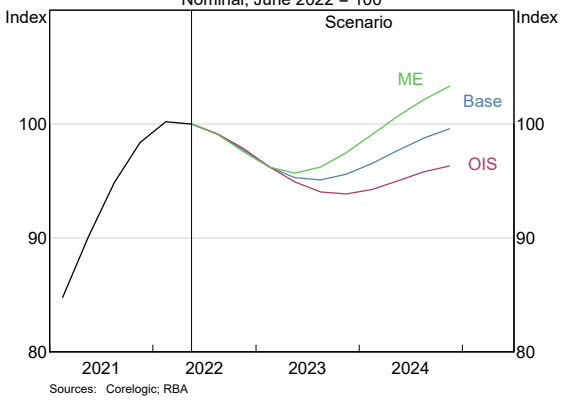
The housing price declines produced under the cash rate scenarios above are modest compared with the forecasts from market economists mentioned above. In real terms, which is what the model estimates, the price declines suggested by these scenarios are in line with the more optimistic market expectations – ranging from 9 to 12 per cent from peak to trough (Graph 2).

The decline in nominal housing prices is much smaller – only around 5 per cent in the baseline scenario (Graph 3). This is in part because the model adds estimates of trimmed mean inflation to real prices to arrive at nominal housing prices. As estimates of future inflation are currently high, this supports the estimates of nominal housing prices from the user cost model. Similarly, as the Bank's inflation forecasts lower the real mortgage rate included in the model this reduces the user cost of housing and supports prices in real terms, all else equal. In any case, in nominal terms the scenarios are overly optimistic compared with market expectations and when taking into account that housing prices have already declined by 3 per cent since the peak in April this year.

Graph 2
Housing Prices
Real, June 2022 = 100



Graph 3
Housing Prices
Nominal, June 2022 = 100



What's driving the difference between market expectations and the scenarios from the user cost model?

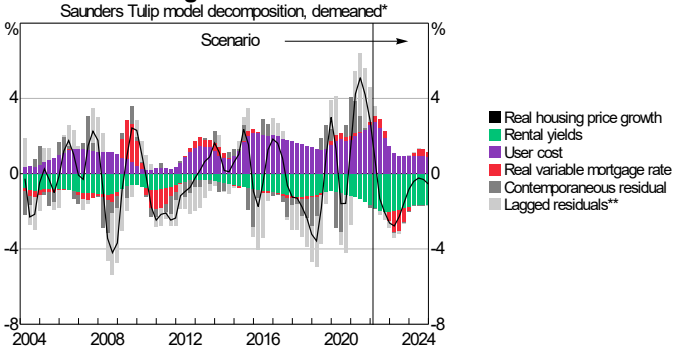
To examine what is driving the difference between the model's outputs and market forecasts, I decompose the model's estimated quarterly real housing price growth under the baseline scenario into its demeaned components from 1983 onwards (thus removing the constant term; Graph 4). The effect of interest rates via the user cost of housing is a long-run adjustment mechanism to achieve equilibrium, and it is represented by the purple bars. The change in the mortgage rate also appears directly in the housing price equation, which is intended to capture the strong short-term effect of changes in interest rates. For instance, when real mortgage rates increase (represented by red bars), such as in 2011, growth in housing prices has been below average and sometimes negative.

The contributions of rental yields are represented by the green bars. Growth in CPI rents has been subdued since 2015, reflecting factors such as the apartment boom over the mid-2010s. This has dragged on housing

price growth by making renting relatively cheaper. However, the return of immigration and other factors is expected to support a pickup in rents over the coming years, providing support for housing prices.

Around turning points a significant proportion of the change in housing prices cannot be explained by the user cost model (dark and light grey bars). One possible omitted variable that could drive this pattern of residuals is housing market sentiment. Specifically, self-fulfilling expectations for changes in housing prices may amplify the peaks and troughs of the price cycle (2022). While the user cost model does account for expected real capital appreciation rate, it is calibrated to be the post-1955 average annualised growth rate (currently 2.6 per cent per annum). In other words, expectations are backwards looking and longer-term.

Graph 4
Housing Price Growth
Saunders Tulip model decomposition, demeaned*



* Contribution of each variable reflects the cumulative effect over time. This is because the model has autoregressive components, which have been decomposed.
** The lagged residuals component is the effect of past residuals via the autoregressive components.
Source: RBA

The inclusion of expected real capital appreciation rates that are more in line with measures of short-term expectations results in the user cost model's predictions being similar with market economists' forecasts, as well as our momentum-based mortgage VAR (MVAR) model (2020; Graph 7).[3] For instance, survey data from Westpac and Melbourne Institute (WMI) implies that a majority of surveyed individuals are expecting nominal housing prices to fall over the next year, which is inconsistent with the model's current assumption (Graph 6).[4] Assuming that real housing prices are expected to remain unchanged (E[hp] = 0%) results in an estimated nominal price decline of around 15 per cent – 10 percentage points more than in the baseline scenario (E[hp] = 2.6%). Assuming that real prices are expected to decline by 1.5 per cent annually (E[hp] = -1.5%) results in an estimated nominal price decline of around 20 per cent.

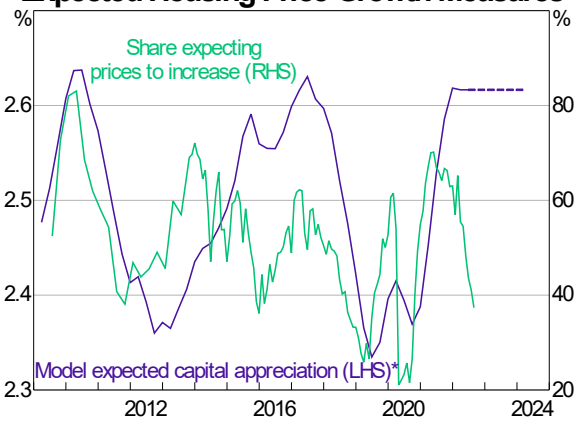
This reflects the sensitivity of the model's output to this assumption, as the expected annual housing price growth rate over the scenario horizon is fixed as the last calibrated value in the sample. Indeed, holding all else constant, a 1 per cent decline in real price growth expectations leads to an additional 4 to 5 per cent decline in nominal housing prices.[5]

3 Incorporating some measure of short-term expectations of housing price growth might better incorporate the effect of market sentiment on housing prices in the user cost model. However, the user cost of housing is part of a long-run equilibrium condition, meaning that short-term expectations may not fit the conceptual framework.

4 An expected decline in nominal prices would imply expectations of a decline in real prices, given that inflation is positive and expected to remain positive. We are unable to use the WMI survey measure as a proxy for expected capital appreciation in the user cost because the series only starts in 2008.

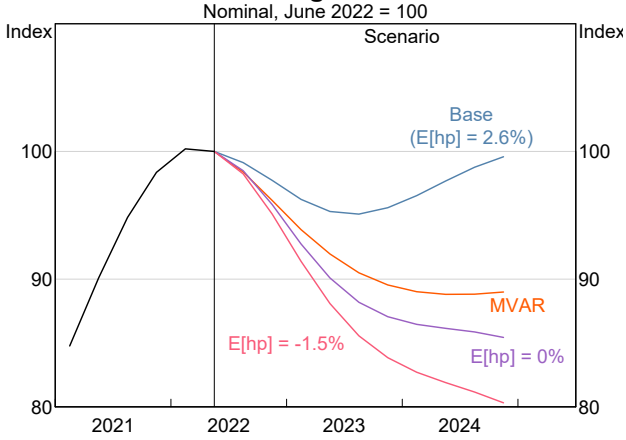
5 As the model is non-linear this result is conditional on the starting level and the paths of exogenous variables.

Graph 5
Expected Housing Price Growth Measures



* Dashed line represents model scenario.
Sources: RBA; Westpac & Melbourne Institute of Applied Economic and Social Research

Graph 6
Housing Prices
Nominal, June 2022 = 100



Sources: Corelogic; RBA

Assessment

Market economists are forecasting price declines of 15 to 25 per cent from peak to trough. In the user cost model, under a range of plausible cash rate assumptions the model's outputs are benign in comparison. One possible reason for this is the model's assumption of future real housing price capital appreciation, which takes a longer term perspective. The model outputs are more consistent with market forecasts once we allow for expectations that are more in line with survey measures of short-term expectations and housing price movements. In the near term, we judge that less weight should be placed on the outputs of the user cost model when producing our housing price forecasts. Future work could assess alternative approaches for estimating housing price expectations in the user cost model.

Domestic Activity and Trade
Economic Analysis Department
20 September 2022

From:
Sent: Tuesday, 27 September 2022 2:42 PM
To:
Subject: RE: Note EA: How Likely is a Recession in Australia? [SEC=OFFICIAL]

Again, super interesting note We should probably grab a coffee and chat at some point, but I thought I'd send through some thoughts and comments.

Will lead off by saying though in no way do I think your results are wrong directionally or materially! Mainly I'm just that I'm interested to see to what degree they're driven by certain specifications/assumptions – in the back of my mind is just how much of these are linked to central tendencies like the nature of the band, economic or econometric model.

Conditional Probabilities of No Recession

As I mentioned the similarity of Graph 5 to the one in my blog post made me question just how much of this result is driven by the probability of us returning to being within the band – which over the sample period is a very strong probability after only being within the band for one period given how few times we materially departed from the target since 1993.

Combining this with MARTIN's apparent tendency to run home to the target band I'm thinking it may be possible these results are somehow biased (though no idea in which direction – can equally make a case for overstating the conditional probability given MARTIN, or understating given the sample).

To sum these (unhelpful) thoughts up into a question, is it more likely that the conditional probabilities are overstating/understating risks of recession – and how much of the risk is driven by the inflation probability?

Probit

A probit model is a more flexible approach for exploring recession probabilities, as it is less dependent on the central forecasts and can make greater use of historical information. Applying the Sahm Rule to quarterly unemployment rate data allows me to extend the sample back to the 1970s, capturing periods more relevant to today's economic outlook (Graph 2). Using this expanded dataset, I estimate a quarterly model similar to Summers (2022) (Graph 7):

$$\Pr(rec_{t+k}) = \beta_{0,k} + \beta_{1,k} IT_t + \beta_{3,k}\pi_t + \beta_{4,k}\overline{UR}_t + \beta_{5,k} rec_{t-1} + \beta_{6,k}\frac{cash\ rate_{t-6}}{\overline{cash\ rate}_{t-6}} + \beta_{7,k}\frac{\Delta cash\ rate_{t-6}}{cash\ rate_{t-6}}$$

I haven't read Summers (2022), but this approach also seems similar to Schularick & Taylor (2012) who use a Logit model looking at probability of financial crisis and also do a cumulative probability over a number of years (see below – and also if any questions message me about it since I know about it since I did a form of replication for my honours thesis).

$$\text{OLS Linear Probability:} \quad p_{it} = b_{0i} + b_1(L)D\log CREDIT_{it} + b_2(L)\mathbf{X}_{it} + e_{it},$$

$$\text{Logit:} \quad \text{logit}(p_{it}) = b_{0i} + b_1(L)D\log CREDIT_{it} + b_2(L)\mathbf{X}_{it} + e_{it},$$

where $\text{logit}(p) = \ln(p/(1-p))$ is the log of the odds ratio and L is the lag operator. The *CREDIT* variable will usually be defined as our total bank loans variable deflated by the CPI. The lag polynominal $b_1(L)$, which contains only lag orders greater than or equal to one, will be the main object of study and the goal will be to investigate whether the lags of credit growth are informative. The lag polynominal $b_2(L)$ will, if present, allow us to control for other possible causal factors in the form of additional variables in the vector $\mathbf{X}$. The error term e_{it} is assumed to be well behaved.

The actual question on this front is two-fold:

a) Have you seen if these results are robust to using a logit model and looking at the marginal effects at the means (to the econometricians this is apparently important when considering some results of logit/probit frameworks),

b) Have you tried adding time fixed effects to see how they alter the probabilities?

Cash Rate Variable

Additional point somewhat relate to the econometric model – did you consider looking at thresholds instead of a level or change in the rate. Namely I'm thinking if you tighten to a significant degree very quickly (say increasing 200bps over 6 months – arbitrary figure) does this have any material change?

Conclusion/Apology

Apologies for what turned from a minor thing into a really drawn out inquisition – if you don't think these are really material points feel free to just ignore them and let me know that it's not really value add to spend time on them.

Best,

From:
Sent: Tuesday, 27 September 2022 10:02 AM
To: Notes policy groups @rba.gov.au
Subject: Note EA: How Likely is a Recession in Australia? [SEC=OFFICIAL]

Like peer countries, Australia is in the midst of a historically rapid monetary policy tightening cycle in response to high inflation. Financial market commentators expect these rate rises to induce recessions in some economies. While the general view among private sector economists and financial markets is that recession in Australia is unlikely, it is nonetheless an important question to explore analytically. I assess the likelihood of a recession in Australia in the short term using two methods. Stochastic simulations using the MARTIN model and the August SMP forecasts suggest that there is a one in two chance Australia ends up on the 'narrow path' – where inflation returns to target without requiring a recession. In contrast, a probit model that incorporates longer-run historical data estimates recession risk to be much higher, at 65 to 80 per cent. While the median unemployment outcomes in this exercise are only modestly above the central forecast, large changes in the cash rate (as now) appear to greatly increase recession risk.

For more information, please see: D22/258533. *(i.e. document 4 released)*

Structural Analysis & Macroeconomic Modelling | Economic Group
RESERVE BANK OF AUSTRALIA | 65 Martin Place, Sydney NSW 2000
w: www.rba.gov.au | Working from

HOW LIKELY IS A RECESSION IN AUSTRALIA?[1]

Like peer countries, Australia is in the midst of a historically rapid monetary policy tightening cycle in response to high inflation. Financial market commentators expect these rate rises to induce recessions in some economies. While the general view among private sector economists and financial markets is that recession in Australia is unlikely, it is nonetheless an important question to explore analytically. I assess the likelihood of a recession in Australia in the short term using two methods. Stochastic simulations using the MARTIN model and the August SMP *forecasts suggest that there is a one in two chance Australia ends up on the 'narrow path' – where inflation returns to target without requiring a recession. In contrast, a probit model that incorporates longer-run historical data estimates recession risk to be much higher, at 65 to 80 per cent. While the median unemployment outcomes in this exercise are only modestly above the central forecast, large changes in the cash rate (as now) appear to greatly increase recession risk.*

Motivation

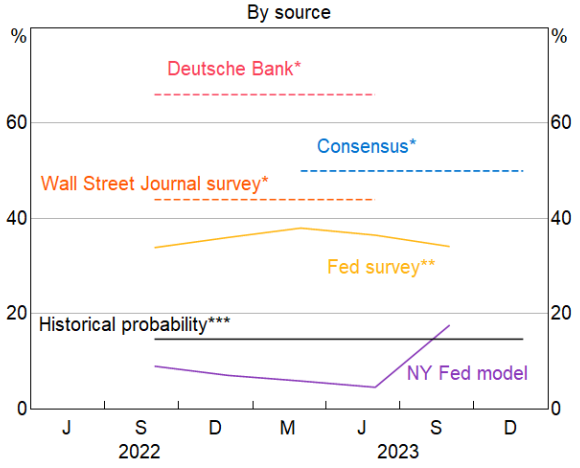
Australia, like many other countries, is currently experiencing high inflation. Central banks have begun tightening monetary policy and financial markets are pricing in further policy rate increases in the near term. Markets and some economists expect this rapid tightening will tip some economies into recession, notably the US (Graph 1). While a recession is still a tail risk in Australia, we face the same 'narrow path' between over- and under-tightening as other central banks.

This note explores the trade-off between inflation and activity outcomes over the forecast horizon using two methods. First, I run stochastic simulations using the MARTIN model to generate a probability distribution around the August 2022 *SMP* central forecasts. This uses historic shocks to explore possible alternative paths for the economy; I then look at the proportion of these outcomes that have inflation returning to target without inducing a recession. Second, I estimate a probit model predicting the chance of a recession over the next two years. This approach is able to use information content from earlier inflationary periods (whereas the MARTIN simulations use only post-inflation targeting data). These probabilities help quantify the trade-offs in policy decisions over the coming quarters.

Graph 1

Forecast US Recession Probabilities

By source



* Indicative only; probabilities reported as 'recession OVER next 12 months'.
** The Federal Reserve's Survey of Professional Forecasters.
*** Proportion of quarters with NBER-defined recessions since 1959.
Source: RBA

Defining a recession

The colloquial definition of a recession is two quarters of negative real GDP growth. The usefulness of this definition to policymakers is limited by the lags involved in National Account statistics. Plus, such technical recessions have been rare in recent Australian economic history.

A simple and timely alternative is the Sahm Rule, which signals a recession whenever the quarterly unemployment rate increases by ¾ percentage point or more above its minimum over the last 12 months (see & Rosewall (2020) for more). This has the benefit of capturing periods where unemployment was rising and GDP growth was low, but not persistently negative. In the US, the Sahm Rule has coincided with all NBER-defined recessions, but identified them more quickly.

Applying this rule to Australia's historical data results in more recessions than under the technical definition, particularly in recent decades (Graph 2). As a result, this note focuses on Sahm recessions. Importantly, our most recent *SMP* central forecasts do not involve a recession over the next two years.

1 I would like to thank for his guidance on this note. Thanks also to and , who wrote the code for calculating event probabilities from stochastic simulations. See the Appendix for replication files.

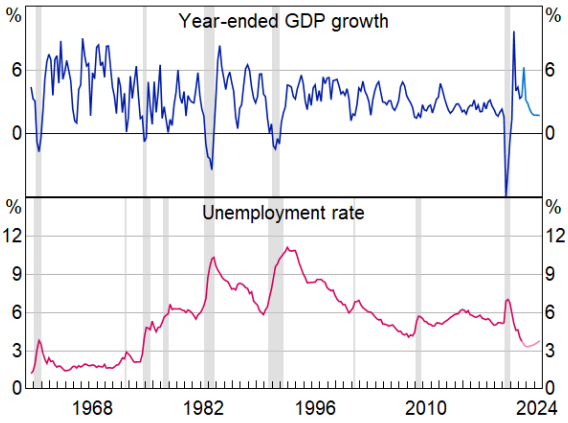
Evidence from the MARTIN model

The MARTIN model can be used to generate probability distributions around point forecasts by conducting 'stochastic simulations' – in other words, randomly sampling MARTIN's historical model residuals from 1998-2019 and solving MARTIN conditional on sequences of these sampled residuals (2019). Each sequence of residuals gives a simulated path for the forecast variables. This process is repeated 10,000 times to obtain a distribution of outcomes over the forecast period. Event probabilities can then be calculated as the share of simulations in which some threshold is reached (see 2021 for more).

Graph 2

Comparison of Recession Indicators*

Technical recession vs. Sahm Rule**



* Shaded regions indicate a recession according to specified indicator. Lighter lines represent forecasts.

** A technical recession is defined as two or more quarters of negative GDP growth. The Sahm Rule is defined according to & Rosewall (2020).

I look at two mutually exclusive inflation events: (i) year-ended trimmed mean inflation being 2-3 per cent ('within the target band'), without leaving this range; and (ii) year-ended trimmed mean inflation being 3 and 3.5 per cent ('above, but close to the target band'), without leaving this range.[2] I also look at the probability of recession, defined using the Sahm Rule above. Finally, I consider two sets of simulations: one in which the cash rate is fixed at the central forecast and a second in which it responds according to MARTIN's Taylor Rule. This allows me to compare the *SMP* central forecast path to one where policymakers respond to shocks hitting the economy.

Results

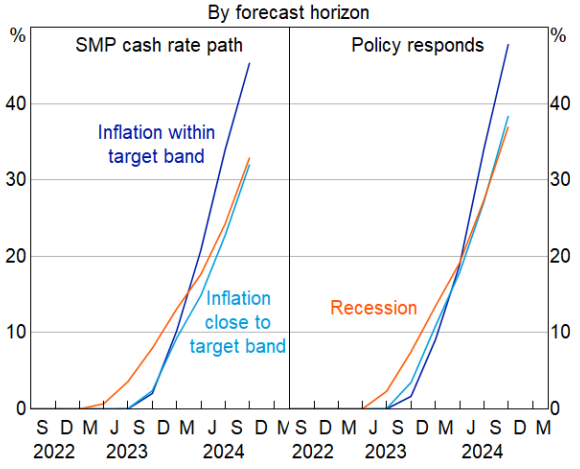
A recession occurs in around one-third of the simulations across both cash rate assumptions (Graph 3). This is much higher than the baseline historical probability of recession of 5 per cent observed in the quarters used for sampling (1998-2019) and 13 per cent of all quarters for which we have historical Australian data (Graph 2). The probability of a recession, but also of achieving inflation outcomes, is lower using the *SMP* cash rate assumption, reflecting its less aggressive tightening.

For both sets of simulations, around half have trimmed mean inflation returning to within the target band by the end of the forecast horizon. Inflation gets close to, but remains above, the target band an additional 30-40 per cent of the time. This suggests recessions are rare relative to 'good' inflation outcomes.

Graph 3

Probability of Outcomes*

By forecast horizon



* Based on 10,000 stochastic simulations of the MARTIN model around the August 2022 SMP central forecast.

Source: RBA

However, how these nominal and real outcomes interact is of greater relevance for policy decisions. **How likely is it that inflation comes down *and* we avoid a recession?** Across both sets of simulations, this joint probability is around 25 per cent for each inflation outcome (Graph 4). Adding these together, the **likelihood of ending up on the 'narrow path' is around one in two**. Allowing policy to respond increases this probability modestly, both because policymakers can tighten more aggressively to combat inflation *and* because they can cut rates to avoid a recession, when required.

These joint probabilities do not tell us much about the underlying dynamics of the events. Are joint probabilities driven by the rarity of recession events, inflation events, or both? Conditional probabilities can

2 This means, for example, that a simulation with inflation close to target in this quarter that subsequently falls to within the band next quarter, would be recorded as 'within target band'. Put another way, these inflation events measure when inflation reaches a threshold and *stays there*.

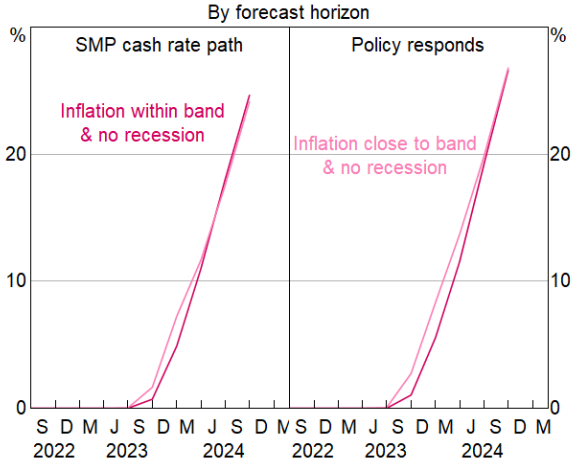
shed further light here. I look at the question: **what is the probability that a recession is avoided given that inflation gets (close) to target?** I calculate this conditional probability as:

$$\Pr(no\ recession \mid inflation\ event) = \frac{\Pr(inflation\ event\ \&\ no\ recession)}{\Pr(inflation\ event)}$$

For the Taylor Rule, there are some unusual estimated probabilities over the horizon (Graph 5, right panel). Out to mid-2023, no simulation has inflation even close to the target band. In the September 2023 quarter, there are two outturns where inflation gets close to the band. The high conditional likelihoods in September quarter 2023 reflect the fact that neither of these two (out of 10,000) simulations involve a recession, resulting in 100 per cent conditional likelihoods. This suggests this outcome is driven by random downside shocks to inflation, not policy, which is not that informative.

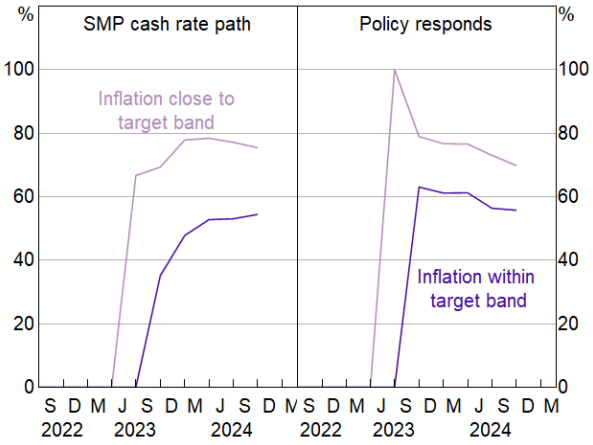
Around 70 per cent of all simulations where inflation returns to just above the target band by the end of the horizon do not involve a recession (Graph 5). The proportion with inflation getting inside the band without a recession is notably lower, at around 55 per cent. Surprisingly, the end-of-horizon probabilities are similar across both cash rate assumptions.

Graph 4
Joint Probability of Outcomes
By forecast horizon



Source: RBA

Graph 5
Conditional Probabilities of No Recession
Conditional on inflation outcome

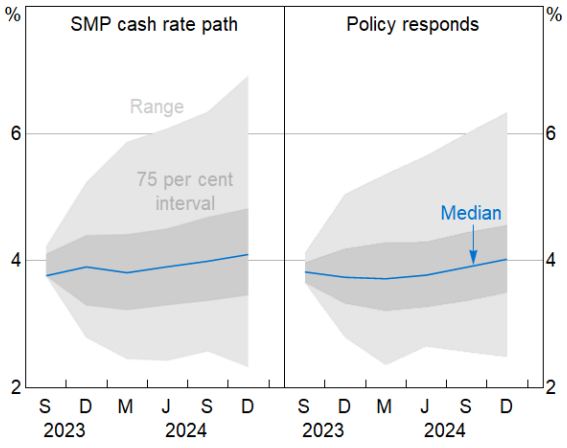


Source: RBA

Graph 6 shows the unemployment outcomes associated with inflation getting at least close to the target band. This helps quantify the kind of trade-off that may be needed to fulfil our mandate by the end of the forecast horizon. **The median unemployment rate outcomes are modest across both cash rate scenarios, reaching a bit over 4 per cent** by end-2024; this implies about 20,000 more unemployed people than in the central forecast.

Starker, however, are the upper halves of the unemployment rate distributions. Some of the simulations with inflation returning to target involve significant increases in the unemployment rate. The upper bound of the 75 per cent interval peaks at between 4½ and 5 per cent across both simulations. Under the Taylor Rule, the worst outcome has the unemployment rate two percentage points higher than in the central forecast. This suggests that returning inflation to target could involve significant job losses even when monetary policy responds to developments.

Graph 6
Unemployment Rate Outcomes with Near-Target Inflation*
At forecast horizon



* Based on simulations of the MARTIN model around the August 2022 SMP central forecasts, in which trimmed mean inflation was 3.25 per cent or lower.

Source: RBA

Limitations

These simulations are useful for generating probability distributions, but are ultimately anchored by the central forecasts. For example, given that the central inflation forecast reaches 3 per cent at end-2024 and these simulations are dispersions around this baseline, it is to be expected that around half the simulations have inflation returning to target. This means any changes to the baseline, such as an upgrade to inflation forecasts, will change the resulting probabilities.

The estimates are also conditional on the sample of shocks used. Sahm recessions occur in less than 5 per cent of the sample quarters (and those during the GFC are down-weighted). The sampling also excludes recent (post-COVID) quarters and may not include periods comparable to now, with high inflation and/or low unemployment (e.g. the 1970s). This means the sampled shocks may not be representative of the distribution of risks the economy currently faces. As a result, the exercise may understate the probability of adverse outcomes.

Because of these limitations, I also use a probit model as an alternative method, which allows me to draw upon a richer back history of data.

Evidence from a probit model

A probit model is a more flexible approach for exploring recession probabilities, as it is less dependent on the central forecasts and can make greater use of historical information. Applying the Sahm Rule to quarterly unemployment rate data allows me to extend the sample back to the 1970s, capturing periods more relevant to today's economic outlook (Graph 2). Using this expanded dataset, I estimate a quarterly model similar to Summers (2022) (Graph 7):

$$\Pr(rec_{t+k}) = \beta_{0,k} + \beta_{1,k} IT_t + \beta_{3,k}\pi_t + \beta_{4,k}\frac{UR_t}{\overline{UR}_t} + \beta_{5,k} rec_{t-1} + \beta_{6,k}\frac{cash\ rate_{t-6}}{\overline{cash\ rate}_{t-6}} + \beta_{7,k}\frac{\Delta cash\ rate_{t-6}}{cash\ rate_{t-6}}$$

where $k \in \{1, 4, 8\}$. This estimates the probability of a Sahm recession over the next k quarters, based on year-ended trimmed mean inflation (π_t); the deviation of the unemployment rate from its ten-year moving average ($\overline{UR}_t$); whether the economy was in recession in the previous quarter ($recession_{t-1}$); the six-quarter lag of the cash rate relative to its 10-year moving average (to proxy the stance of monetary policy); and the six-quarter lag of the change in the cash rate relative to its lagged level (to capture non-linearities in policy moves). To account for the decrease in volatility over time, I include a dummy indicating the inflation-targeting period (1993 onwards). I also interact this IT dummy with the inflation and unemployment rate variables.

I then extend the model by including an NBER-defined indicator variable for whether the US is currently in recession, reflecting Australia's status as a small open economy. I also tried adding the spread between the cash rate and 10-year AGS yield, but this was insignificant across all specifications.

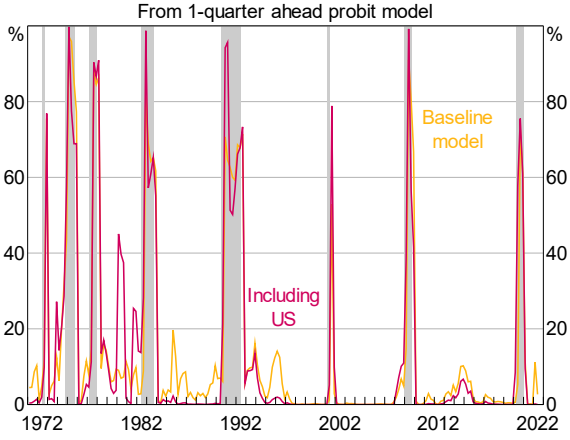
I estimate the model using data to 2022Q2 and then use the August *SMP* forecasts of the independent variables to create out-of-sample forecasts for recession probabilities. For the US variable, I use forecast likelihoods from the Fed's Survey of Professional Forecasters and calculate the total probability of a recession in Australia as:

$$\Pr(rec_{t+k}) = \Pr(US_{rec,\,t+k}) \cdot \Pr\left(rec_{t+k} \,\middle|\, US_{rec_{t+k}} = 1\right) + (1 - \Pr\left(US\_rec_{t+k}\right)) \cdot \Pr\left(rec_{t+k} | US_{rec_{t+k}} = 0\right)$$

Graph 7[3]

Predicted Probabilities*

From 1-quarter ahead probit model



* Shaded regions indicate Sahm recessions.

Source: RBA

3 See the Appendix for the 4- and 8-quarter models.

Results

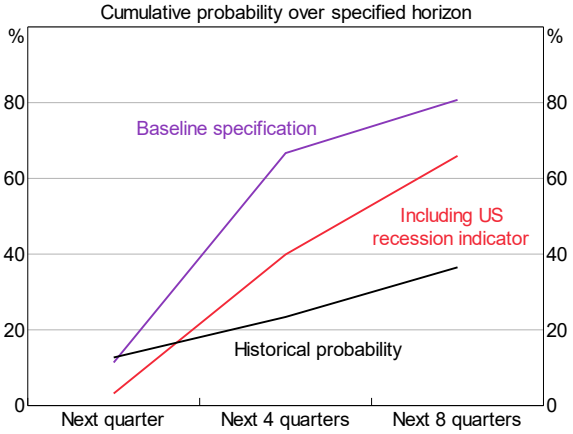
Estimates suggest the probability of a recession over the next two years could be as high as 80 per cent (Graph 8). If a recession does occur, it is most likely sometime over the next four quarters. This is in line with intensifying market commentary predicting a recession in the first half of 2023 (Nomura 2022). These probabilities are higher than in the stochastic simulations as they are less anchored by the central forecasts; account for the distribution of US economic outcomes; and incorporate information from more domestic recessionary periods.

Including the US variable improves model fit (see Graph 7) and decreases recession likelihoods across the horizon. This is because the forecast US recession probabilities from the Fed Survey of Professional Forecasters are relatively low (Graph 1). Increases in these forecast likelihoods would significantly increase the chances of a recession in Australia; the coefficient on the US indicator is a similar magnitude to the previous quarter domestic recession indicator, showing that US recession would have high likelihood of spillover to Australia (Table A1).[4]

Graph 8

Probability of a Recession*

Cumulative probability over specified horizon



* Out-of-sample probit model forecasts for 2022Q3.
Source: RBA

The cash rate level term is generally significant and negative across specifications. This implies a higher cash rate lowers the chance of a recession, possibly reflecting reverse causality. In contrast, the cash rate change term, which is more relevant for policy decisions, is consistently positive. This suggests large increases in the cash rate relative to its current level increase the likelihood of a recession. However, this term only reaches significance in the 4-quarter baseline model. In this specification, the coefficient is a similar magnitude to that on the previous quarter recession indicator.

Conclusion

Australia, like peer countries, is in the midst of a historically rapid monetary policy tightening cycle. Stochastic simulations using the most recent *SMP* forecasts suggest the probability of ending up on the 'narrow path' is around 50 per cent. This method puts the raw probability of a recession over the forecast horizon at around one-third. Meanwhile, a probit model approach that makes use of data from historical inflationary periods estimates the chance of a recession in the next two years at 65 to 80 per cent. The median outcomes for unemployment are only slightly above the central forecast, suggesting monetary policy faces only a modest trade-off. However, large proportional increases in the cash rate may significantly increase recession risk.

Senior Analyst
Structural Analysis & Macroeconomic Modelling
Economic Analysis Department
26 September 2022

Appendix

4 One caveat is that Australia's reliance on the US has likely changed over the sample with the rise of Asian trading partners. Results are similar whether a US or global recession indicator is used, though the global indicator generally results in lower probabilities.

SCENARIOS (SEMI) QUARTERLY – SEPTEMBER 2022 – PART 1: GLOBAL DOWNTURN [1]

There is heightened concern about the outlook for the global economy and how risks could materialise. In this note, we explore the transmission channels of a global downturn on the Australian economy. The scenario is constructed using the Oxford model and is driven by lower consumption and additional monetary policy tightening in advanced economies. Stronger-than-expected resilience in Asia leads to modest direct effects of the scenario, with a 1.2 per cent fall in MTP output in 2024, and a 0.35 per cent fall in domestic output relative to baseline. Incorporating additional domestic shocks to consumption and corporate borrowing spreads amplifies the downturn, with output falling by around 1 per cent relative to baseline. However, this may still understate the potential effects of spillovers that are not captured by the MARTIN model. Finally, allowing the exchange rate and cash rate to respond partially absorbs the shock, dampening the effect on output to around a 0.75 per cent fall relative to baseline.

A companion note will examine a scenario that builds higher energy prices on top of the downturn modelled here.

Global Scenario

The global scenario is based on a consumer-led economic downturn in advanced economies, coupled with aggressive monetary policy tightening by central banks to control high inflation. We assume households respond to the headwinds facing the economy by decreasing consumption and increasing saving. The reduction in consumption is more pronounced for goods than services, given goods consumption has been much more robust in recent years. This means that imports fall by more than consumption, which transmits into Asia in the form of weaker external demand. We also assume advanced economy central banks continue their tightening cycle in the face of high inflation, only realising mid-next year that the economy is much weaker than expected. Tighter global financial conditions result in heightened outflows from Asian emerging economies and, as a result, depresses business confidence in these economies.

The scenario was implemented using the Oxford Economic Model. The fall in consumption was generated by shocking consumer confidence sufficiently to impose a sizeable recession in the US (roughly based on ensuring that the savings rate returns to its late-2021 level). At peak, this means consumption falls by 4 per cent. US imports fall by 10 per cent, due to both the endogenous response to lower consumption and an additional shock to goods imports that is calibrated to ensure the value of imports falls by half as much as consumption. This shock was then implemented across advanced economies.[2] The policy shock is implemented as a 100 basis point increase relative to baseline over the next three quarters, reversing to 50 basis points above baseline and then returning to baseline by June 2023 for the remainder for the scenario. This is applied to all economies except China and Japan, given their inflation dynamics differ from the rest of the world.[3]

The shocks cause a recession across advanced economies…

The majority of the impact occurs because of the consumption shock, with the higher policy path having a relatively small additional impact. GDP in the US falls by 3 per cent and the unemployment rate rises 0.7 percentage points. In the euro area, GDP falls by around 2.5 per cent and the unemployment rate rises by close to 1 percentage point (Graph 1). Overall, the effects unwind by the end of 2024 in the US, but not until the end of 2025 in the euro area.

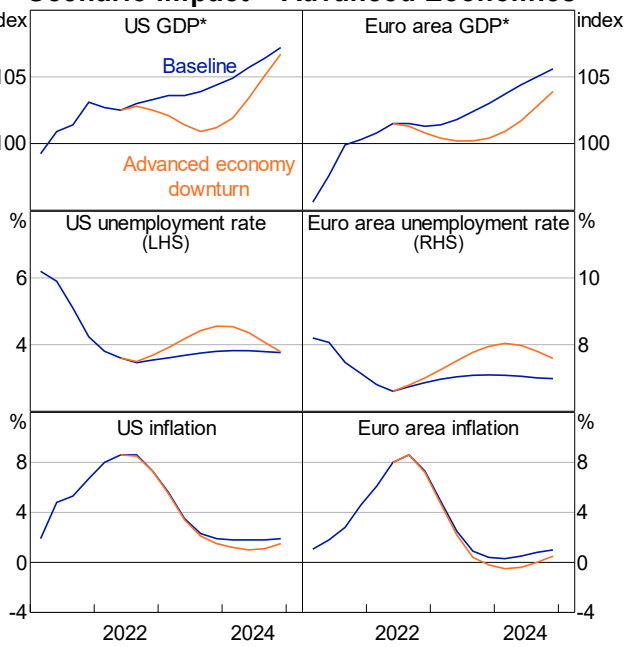
1 Thank you to the SAMM and AIME teams and FCM participants for helpful comments and feedback.

2 Advanced economies are the US, UK, Canada, Germany, France, Italy, Spain, and the Netherlands.

3 Capital outflows in Asian emerging economies (except China) are implemented via the BONDSTRESS variable, with the calibration mimicking that used by Oxford Economics for a capital outflow scenario.

Inflation in both economies is little changed relative to the baseline and returns to target by mid-late 2023. The weakness in each economy in the scenario further reduces inflation by around 1 percentage point by early 2024, pushing the euro area into deflation. It is possible that inflation could fall more quickly than in the scenario if the Phillips Curve is currently steeper than the model assumes and/or the scenario alleviates supply constraints, but we don't alter the Phillips Curve equation in this note.[4] On the other hand, the baseline assumes a much lower path for gas prices than implied by the current futures curve, which has risen significantly recently. Adding this futures curve to the scenario increases inflation by 1 percentage point in the US and 3.5 percentage points in the euro area. A companion note will examine a scenario that builds higher energy prices on top of the downturn modelled here.

Graph 1
Scenario Impact – Advanced Economies



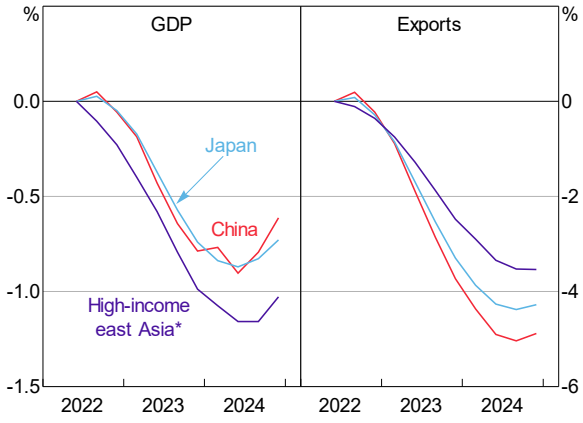
* December quarter 2019 = 100.
Sources: Oxford Economics; RBA

…but only a relatively small impact on Asia and hence MTP growth

An important transmission channel from the US to Australia is via the effect on the Asian region, since it makes up a large share of Australia's MTP weight. The impact of this scenario on growth in China, Japan and high-income East Asia is notably smaller than in advanced economies, falling only 1.2 per cent at peak, despite exports falling by between 3 and 5 per cent relative to baseline (Graph 2). The overall effect of the scenario on MTP GDP growth is therefore only a 0.8 percentage point fall in 2023.

One reason that the effect on Asia is not larger is that employment in Asia is not materially affected and therefore household income and consumption fall only modestly relative to baseline. In contrast, the shocks reduces investment by between 1-1.5 per cent. Another factor is that the shock also reduces imports in the region, which mitigates the decline in net exports and hence overall GDP.

Graph 2
Scenario Impact – Asia
% deviation from baseline



* Hong Kong, Singapore, South Korea and Taiwan.
Sources: Oxford Economics; RBA

More generally, domestic demand in Asia is a large share of the region's economy – consumption accounts for 60 per cent of GDP in these economies – and is not directly shocked.

It is possible we are missing an important channel that is not captured by the model's endogenous responses, reflecting something unique to the current situation. For example, it is possible that weakness in China's export sectors triggers vulnerabilities in the property sector, as financial conditions for developers tighten further and/or households reassess the potential returns from investment in this environment. Alternatively, the consumer confidence shock in advanced economies could be replicated in Asia, directly reducing domestic demand. Additional COVID outbreaks are also possible, but would be unrelated to growth in

4 The Phillips curve equation is specified as pairwise linear relationship whose slope doubles when the output gap turns positive.

advanced economies.[5] On the other hand, it may be that the correct implication to draw from our results is that the region has become increasingly resilient to slowdowns in advanced economies through stronger domestic demand. That lesson could draw some support from the relative performance of Asia during advanced economy downturns of the past 20 years.

Transmission to Australian economy

We use the Oxford model outputs from the global scenario above to calibrate the paths of world variables in MARTIN, and assess the impact on the domestic economy. Three key messages arise:

- The direct effects on Australia are surprisingly contained, with real GDP only 0.35 per cent lower at the end of the horizon.
- Amplifier channels, particularly a fall in consumer confidence as we have seen in previous global recessions, would have markedly larger effects on Australian output. There is substantial uncertainty about the size of these spillovers and there may be other channels in addition to those imposed here.
- The exchange rate plays an important role. It is the key transmission channel for higher global rates which, all else equal, lower the exchange rate. A lower exchange rate supports Australian output and adds to inflation. This would work against our near-term objectives of cooling the economy.

We build up the shocks to our domestic economy in four layers: (1) direct effects; (2) amplifiers; (3) the exchange rate; and (4) policy response. In the first two layers we hold the exchange rate and cash rate fixed at their paths in the August 2022 *SMP*. The exchange rate is allowed to respond in the third layer, and the final layer incorporates a domestic monetary policy response according to MARTIN's Taylor rule.

Direct effects on Australia are contained

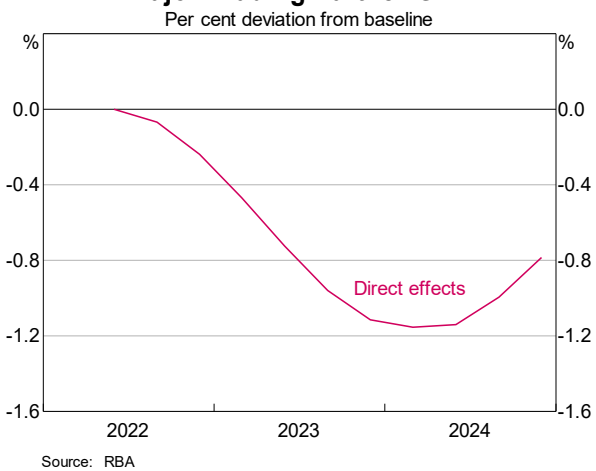
Shocks

We apply shocks in the direct effects layer based on Oxford model outputs from the above global scenario. MTP GDP declines by about 1.2 per cent relative to August 2022 *SMP* forecasts (baseline) at peak (Graph 3). World export prices also fall by around 1.5 per cent, and commodity prices decline by around 6 per cent relative to baseline (Graph 4). We hold the exchange rate and cash rate fixed.

These shocks are small relative to past global downturn scenarios (e.g. Guttmann, Hickie, Rickards and Roberts 2019), mostly reflecting the limited spillover to Asian economies outlined above in the global scenario. These economies have an outsized effect on commodity prices, and make up a large proportion of our trade (China and Japan alone represent 50 per cent of our total trade).

Graph 3

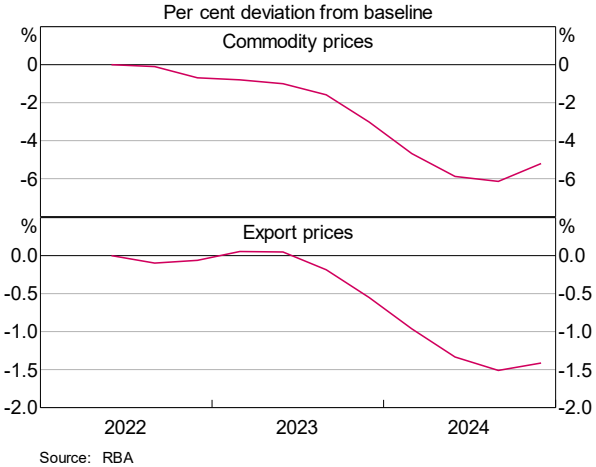
Major Trading Partner GDP



Source: RBA

Graph 4

World Prices - Direct Channels Scenario



Source: RBA

5 Given China accounts for one third of MTP GDP, a rule of thumb is to say that every percentage point of additional slowing in China reduces MTP GDP by at least one third.

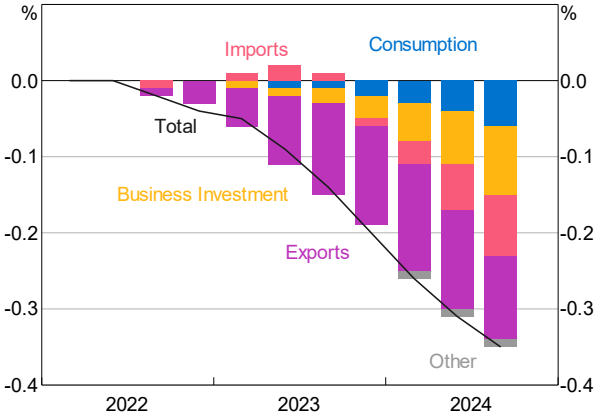
Effects

The overall impact on domestic activity is limited. Real GDP declines by around 0.35 per cent relative to baseline by the end of the horizon, driving a 0.06 percentage point fall in inflation and a 0.12 percentage point increase in unemployment. Slowing domestic growth is mainly driven by a decline in net exports, although lower consumption and investment also contribute (Graph 5). The decline in net exports reflects slowing global growth, as well as lower world export prices that make imports relatively cheaper for Australian consumers, resulting in higher domestic import volumes (Graph 6).

Graph 5

Australian GDP - Direct Channels Scenario

Per cent deviation from baseline, GDP with contributions

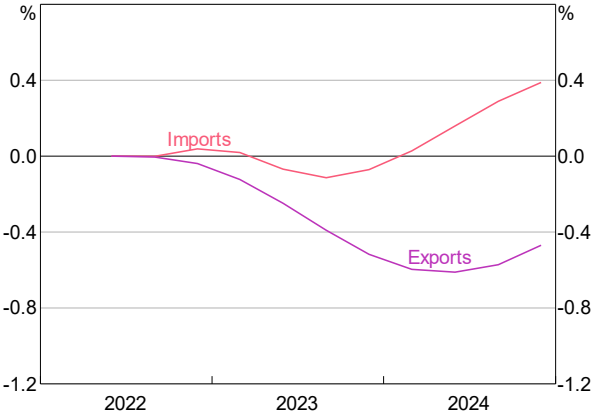


Source: RBA

Graph 6

Australian Trade - Direct Channels Scenario

Per cent deviation from baseline, trade volumes



Source: RBA

Amplifiers exacerbates the downturn, especially the consumer confidence shock

Shocks

We apply additional domestic shocks likely to be caused by an advanced economy downturn – a fall in consumer confidence and heightened risk premia. The consumer confidence shock maintains consistency with the global scenario, where we shocked consumer confidence in other advanced economies.[6] We apply a negative shock to real consumption to proxy for lower consumer confidence, calibrated to be around half the size of the consumption model residuals during the GFC (Graph 7).[7] The shock and the model's endogenous response combined amounts to around 1 per cent lower consumption towards the end of the horizon.

Deteriorating economic conditions across advanced economies is likely to lead to greater uncertainty and larger risk premia, resulting in an increase in corporate borrowing spreads. As a result, they only increase slightly in the direct effects layer. We apply a positive shock to corporate borrowing spreads, also calibrated to around half the size of the equation residuals during the GFC (Graph 8).[8] This results in corporate borrowing spreads rising about ¾ of a percentage point above baseline.

The shock size calibration is consistent with Australia's equity price fall in our scenario relative to its fall during the GFC. However, there is substantial uncertainty surrounding the size of consumer confidence and risk appetite spillovers in the current economic environment. Furthermore, additional channels could weigh on Australian activity that are not captured here. A large fall in firms' hiring intentions, from current exceptionally high levels, and lower business investment could result in markedly weaker activity and slower employment growth.

6 Consumer confidence in Australia is likely to be closely linked to sentiment in the US and UK, with their media heavily consumed by the Australian population.

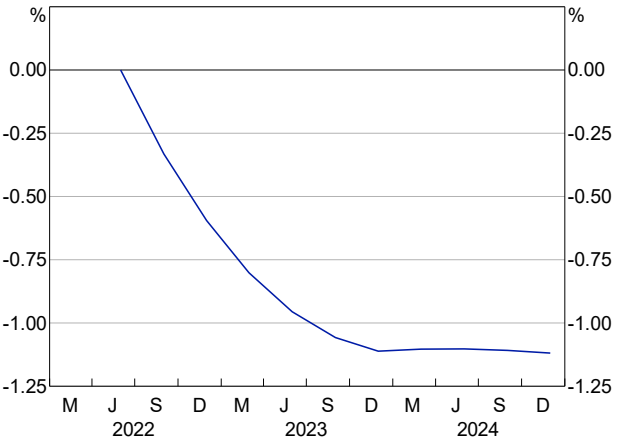
7 This approach is based on Guttmann, Hickie, Rickards and Roberts 2019, where a similar consumer confidence shock is applied to consumption with its size informed by the GFC. The residual is the difference between a variable's actual value and MARTIN's fitted value from the corresponding equation.

8 Corporate borrowing spreads are a simple function of their lag and the unemployment gap in MARTIN, so these residuals are fairly large.

Graph 7

Real Consumption

Per cent deviation from baseline

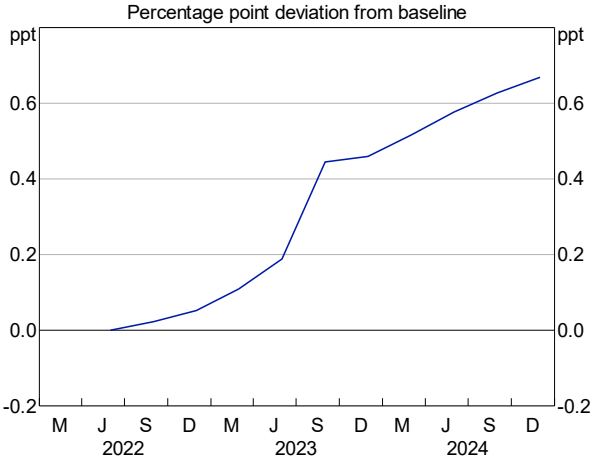


Source: RBA

Graph 8

Nominal Business Borrowing Rate Spread

Percentage point deviation from baseline



Source: RBA

Effects

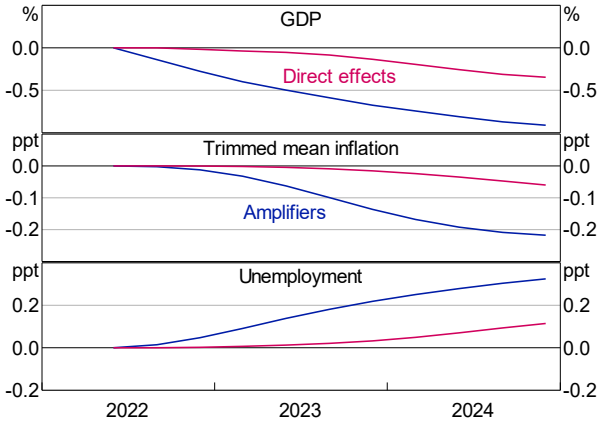
The amplifiers exacerbate the downturn in Australia. Real GDP declines by about one per cent relative to baseline. This decline is almost three times larger than in the direct effects layer (Graph 9), primarily driven by the negative consumption shock, which weighs heavily on output (Graph 10).[9] In addition, the positive shock to corporate borrowing spreads increases business' funding costs. This deters business investment, increasing its negative contribution to GDP.

Weaker economic activity drives a decline in inflation and an increase in the unemployment rate (Graph 9). Expected earnings also falls from lower GDP, resulting in a 5½ per cent decline in equity prices relative to baseline. The fall in equity prices contributes to household net wealth being 1 per cent lower than it otherwise would have been.

Graph 9

Australian Domestic Effects

Scenarios, deviation from baseline

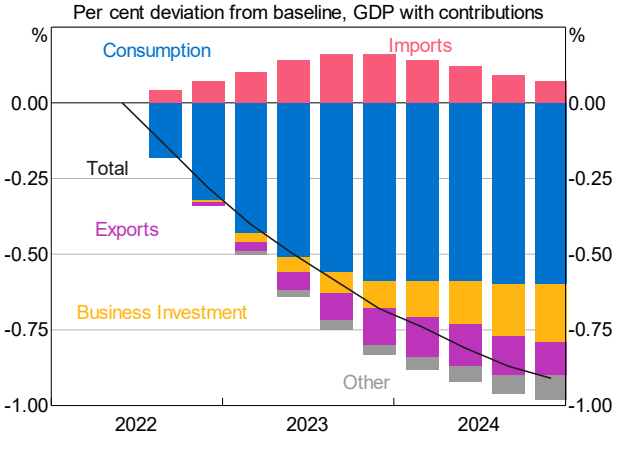


Source: RBA

Graph 10

Australian GDP - Amplifier Scenario

Per cent deviation from baseline, GDP with contributions



Source: RBA

The exchange rate provides some shock absorption…

Shocks

Allowing the exchange rate to respond to global developments highlights its role as a shock absorber. The path of world real interest rates reflects the more aggressive monetary tightening present in the global

9 However, the decline in consumption also positively contributes to GDP through a reduction in import volumes. With consumers spending less overall, their demand for imports falls.

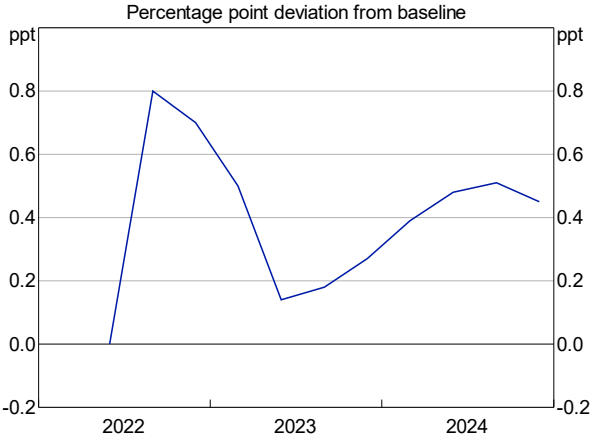
downturn scenario. The exchange rate is the only transmission mechanism in MARTIN for these shocks to world rates. Without allowing the exchange rate to respond, world rates have no *modelled* effect on Australia (although there may be other off-model channels such as through banks' funding costs).

The world (G3) real policy rate is around ¾ of a percentage point higher than baseline over 2022H2 before returning close to baseline in 2023 (Graph 11).[10] World real rates remain above baseline over the forecast horizon due to lower world inflation. These shocks also flow through to world two-year and ten-year real interest rates. Differences between world real interest rates and Australia's real interest rates are the largest contributors to the exchange rate's movements in this scenario. Tighter monetary policy overseas means there is a lower relative return offered in Australia and so the exchange rate depreciates by around 3½ per cent in late 2022 (Graph 12). This is reversed as the spread narrows in 2023. The terms of trade falls slightly from lower export and import prices, weighing on the exchange rate at the margin.

Graph 11

G3 Real Policy Rate

Percentage point deviation from baseline

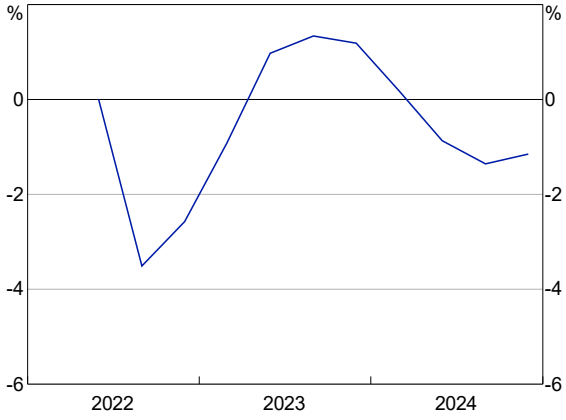


Source: RBA

Graph 12

Real TWI

Per cent deviation from baseline



Source: RBA

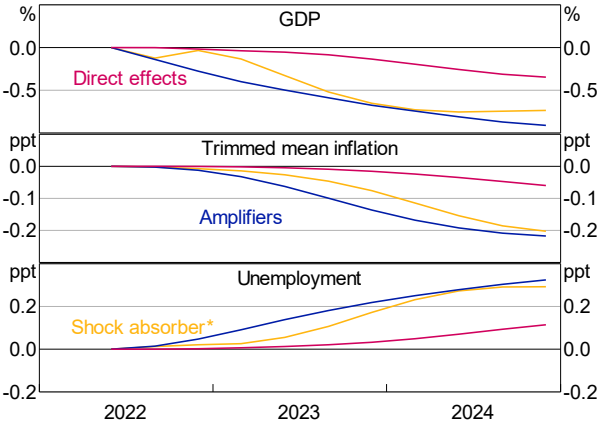
Effects

The exchange rate depreciation partially offsets the declines in activity. When the exchange rate is allowed to respond, GDP remains closer to baseline in the first few quarters, relative to the amplifier scenario, but contracts again as the exchange rate appreciates over 2023 (Graph 13).

Graph 13

Australian Domestic Effects

Scenarios, deviation from baseline



* The exchange rate responds endogenously and the cash rate is kept at its baseline in this scenario.

Source: RBA

The margin of adjustment is primarily net exports. The initial depreciation causes Australia's exports to become relatively cheaper for overseas buyers, increasing export volumes. Import volumes fall as they become relatively more expensive for Australian consumers. The initial depreciation also leads to a stronger profile for business investment. The increase in the unemployment rate is moderated slightly, while underlying inflation is a bit higher as a result of this and the increase in import prices.

10 The path of G3 real interest rates is generated by the Oxford model and includes some endogenous response of both policy rates and inflation to the applied shocks.

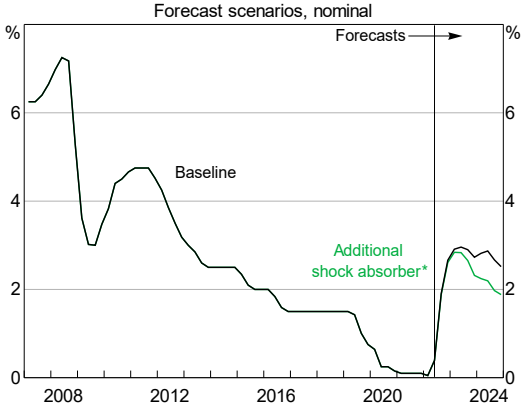
The implied cash rate path peaks at a similar level before falling more quickly

Allowing the cash rate to respond in accordance with MARTIN's Taylor rule suggests a moderately lower path over 2023 and 2024, although it peaks at a similar level as baseline in early 2023 due to current high inflation (Graph 14). Overall, the cash rate falls by around 0.7 percentage points to a little below 2 per cent at the end of the horizon. With this cash rate response, the decline in GDP relative to baseline is half the size in late 2024 (Graph 15). Similarly, the increase in the unemployment rate is about half as large, but inflation is only slightly higher.

Graph 14

Cash Rate

Forecast scenarios, nominal



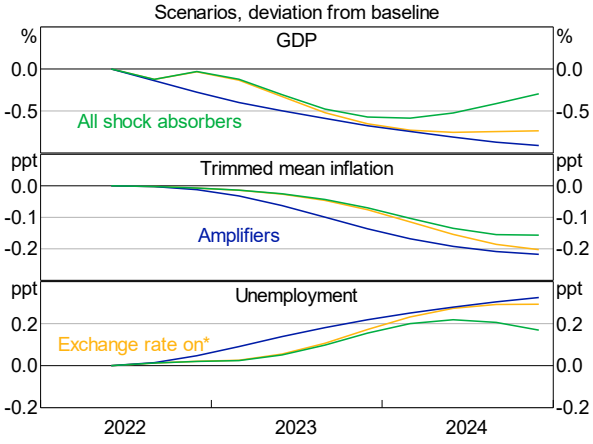
* The exchange rate and cash rate respond endogenously.

Source: RBA

Graph 15

Australian Domestic Effects

Scenarios, deviation from baseline



* The exchange rate responds endogenously and the cash rate is kept at its baseline.

Source: RBA

Conclusion

We examine a global shock to advanced economies and assess the impacts for the Australian economy. We find that the direct effects are small, primarily because of the small shock on Asia and, in turn, on MTP GDP. The effects are exacerbated significantly when we consider amplifiers such as declining consumer confidence. The size of this and other potential spillovers is uncertain, but may well be larger than the limited channels captured here. The exchange rate provides some shock absorption in the short-term. A companion note will assess the impacts of a global energy shock exacerbating this scenario.

SAMM and AIME
Economic Analysis Department
29 September 2022

From:
Sent: Thursday, 19 January 2023 10:48 AM
To:
Subject: FW: housing commitments [SEC=OFFICIAL]

From:
Sent: Thursday, 20 October 2022 4:47 PM
To: @rba.gov.au>
Cc: @rba.gov.au>; @rba.gov.au>; @rba.gov.au>; @rba.gov.au>; ROSEWALL, Tom @rba.gov.au>
Subject: RE: housing commitments [SEC=OFFICIAL]

Hi ,

Unfortunately we don't have any models that forecast loan commitments, or examine the relationship between loan commitments and interest rates. The closest thing to commitments that we forecast are building approvals, which are related for new dwellings as people will require financing to build their new approved home (they're also highly correlated, with a correlation of around 0.6). Considering this, we examined how dwelling approvals and construction activity have moved during some past tightening cycles:

Start date of hiking cycle	End date (next decline in cash rate)	Size of hike and duration	Total approvals peak to trough (with dates)	Total dwelling investment peak to trough	Other factors
July 1994	July 1996	2.75 per cent, 5 months	44 per cent (from August 1994 to October 1995)	26 per cent (from Sep Q 1994 to June Q 1996)	There was a large oversupply of housing – the Indicative Planning Council for the Housing Industry estimated an excess of 37.000 dwellings as at June 1995. There was a need to run down this oversupply and so construction was lower.
October 1999	February 2001	2.5 per cent, 10 months	46 per cent (from January 2000 to September 2000)	34 per cent (from June Q 2000 to Dec Q 2000)	GST had a really big impact on construction over 2000 – huge pickup in demand/activity beforehand, and drop off afterwards (demand pulled forwards), amplifying the peak and trough of this cycle.

September 2009	November 2011	1.75 per cent, 14 months	24 per cent (from March 2010 to October 2011)	10 per cent (from June Q 2011 to June Q 2012)	GFC support measures were unwinding.

Looking at loan commitments data as well (available from 2002 onwards), they declined by 22 per cent during the September 2009 hiking cycle. Measures of housing turnover have also declined during all the above hiking cycles.

Currently, our model is forecasting a **23 per cent decline** in total dwelling approvals from peak to trough in this current tightening cycle**.** This considers the peak to be June quarter 2022, the start of the tightening cycle. However, going a bit further back to the peak in approvals during the pandemic in 2021, the forecasted peak to trough would be **a 38 per cent decline.** There are definitely other factors that are at play with regards to the possible size of the decline in demand for new housing/loan commitments, such as:

- Unwinding of HomeBuilder program
- Unwinding of preferences for housing formed over the pandemic
- Low confidence for potential buyers of new homes due to rising costs in the construction industry

To summarise, we'd expect loan commitments to decline as rates rise, as loan commitments and measures related to it have declined in past tightening cycles, and dwelling approvals are forecasted to decline.

Let me know if you have any questions.

Thanks,

From:
Sent: Thursday, 20 October 2022 11:45 AM
To: @rba.gov.au>
Cc: @rba.gov.au>
Subject: FW: housing commitments [SEC=OFFICIAL]

Hey

As mentioned on teams, we've received a request for DAT from the 8.50 highlighted below.

Let me know if you want to discuss further.
Cheers

From:
Sent: Thursday, 20 October 2022 11:05 AM
To: @rba.gov.au>
Cc: @rba.gov.au>
Subject: FW: housing commitments [SEC=OFFICIAL]

Some further questions from the Gov at the 850 this morning. Ill come out and we can chat.

From: KEARNS, Jonathan
Sent: Thursday, 20 October 2022 9:27 AM
To: DM - IMS Management
Subject: housing commitments [SEC=OFFICIAL]

Lots of interest from Phil at the 850

- Is refinancing at an all-time record high? How far can we go back? Obviously we need to do relative to credit.

- Is the fall in commitments as expected given the rate rise? EA will prob run the Tulip multi equation model to check – can you converse with them and check they're doing that and see if there is anything else you can do.

I'm in training (again!) this morning – but send me a message if you want more info

Thanks
Jonathan

From:
Sent: Wednesday, 25 January 2023 5:49 PM
To:
Cc:
Subject: RE: Note EA: Alternative Monetary Policy Paths - February 2023 [SEC=OFFICIAL]

Hi

Thanks for the answer (and I hope you had a great longish leave when you read this upon your return), always useful to know/be reminded of such issues.

I guess I can infer the direction of where inflation and unemployment are heading beyond the scenario horizon at least directionally for each scenario based on the different levels of the cash rate at that point. Maybe one general suggestion would therefore be to have the scenarios all meet at the same terminal rate. In that case I'd only need to worry about dynamics in the system due to the past different profiles but not the level difference in the cash rate, right? Right now I have the sense that the different scenarios would impose very different adjustments to the cash rate as soon as it's allowed to respond endogenously.* Or in other words, even though the BoC scenario might look optimal over the horizon, it seems like we'd be adding quite a bit more stimulus in 2025.

*Correct that much of this would be driven by Rstar pulling the cash rate towards its level given how the policy reaction function is specified?

Cheers

From:
Sent: Wednesday, 25 January 2023 4:57 PM
To: @rba.gov.au>
Cc: @rba.gov.au>; @rba.gov.au>; @rba.gov.au>
Subject: RE: Note EA: Alternative Monetary Policy Paths - February 2023 [SEC=OFFICIAL]

Hi

Thanks for the feedback! We are planning to do one every month in the lead-up to EC Policy. Always happy to hear suggestions for possible paths if you have any as well.

We were also interested in what the extensions would look like. Unfortunately, MARTIN's extended forecast needs to be treated with caution at present. It forecasts a steeper decline in activity than we expect, which makes the forecast levels of unemployment and inflation unreliable at present. Work is ongoing and we hope to have this fixed in time for the next release of this note.

That said, generally the BoC and Flat paths deliver similar inflation outcomes to the baseline by end 2026 while the steady raise and RBNZ paths push it lower. On the unemployment side, again the BoC, flat and baseline paths are similar and significantly lower than the RBNZ and steady paths.

Cheers,

From:
Sent: Wednesday, 25 January 2023 1:41 PM
To: @rba.gov.au>
Cc: @rba.gov.au>
Subject: RE: Note EA: Alternative Monetary Policy Paths - February 2023 [SEC=OFFICIAL]

Hi and

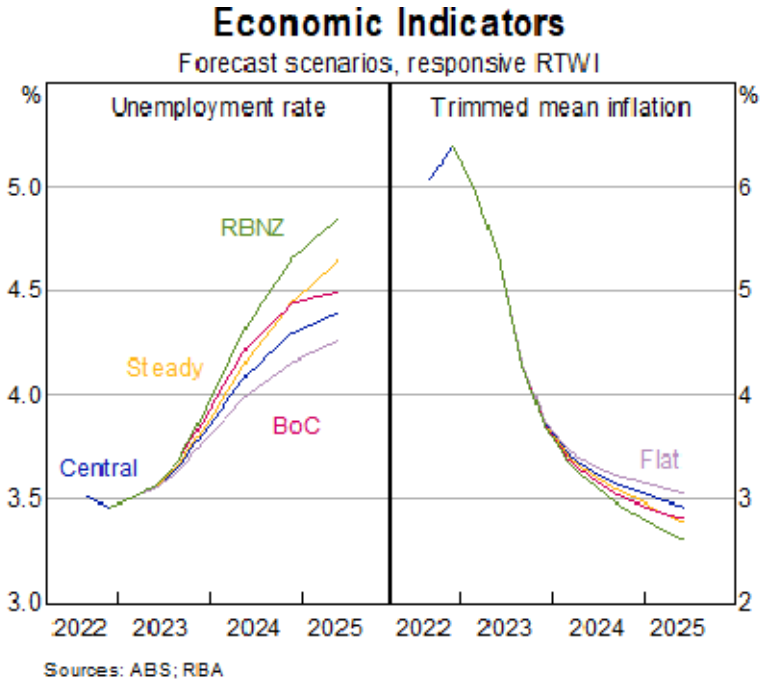
Thanks for this note, this is a great exercise. Glad to see it becoming a regular thing (?).

I had a comment on your modelling, maybe relevant if this comes up in the policy discussion (which I will unlikely be able to attend): Since you're imposing cash rate paths out to 2025, maybe it would be useful to extend the timeline for unemployment and inflation for when the cash rate moves endogenously. Is that possible? With the long lags in the model, I'd be interested how 'smooth' the landing is in 2025 in particular for the steady and RBNZ path. Is unemployment increasing strongly beyond that and is inflation falling down to the bottom of the band as a consequence of the PC? Either way, the BoC path appears superior unless inflation remains at the top of the band

Cheers

From:
Sent: Wednesday, 25 January 2023 11:44 AM
To: EC - Economists @rba.gov.au>
Cc: @rba.gov.au>
Subject: Note EA: Alternative Monetary Policy Paths - February 2023

We evaluate four alternative monetary policy paths against the technical assumptions in our central forecast. Various policy paths push inflation within the target band by the end of the forecast horizon. However, a more aggressive path achieving within-target inflation by end-2024 causes a Sahm recession. We also find that rapid tightening yields better unemployment and similar inflation outcomes within the forecast horizon relative to a similar path holding rates high for longer.



For more information, please see: D23/21729. *(i.e. document 8 released)*

Structural Analysis & Macroeconomic Modelling | Economic Group
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w: www.rba.gov.au

The Reserve Bank of Australia acknowledges the Traditional Custodians of Australia and we pay our respects to their past, present, and emerging Elders.

FEBRUARY 2023 – ALTERNATIVE MONETARY POLICY PATHS[1]

We evaluate four alternative monetary policy paths against the technical assumptions in our central forecast. Various policy paths push inflation within the target band by the end of the forecast horizon. However, a more aggressive path achieving within-target inflation by end-2024 causes a Sahm recession. We also find that rapid tightening yields better unemployment and similar inflation outcomes within the forecast horizon relative to a similar path holding rates high for longer.

Setup

This note examines the economic outcomes from four alternative monetary policy paths to the technical assumptions underlying the *February 2023 SMP* forecasts: a 'steady' path, a 'Bank of Canada (BoC)' path, a 'Reserve Bank of New Zealand (RBNZ)' path and a constant path at 3.1 per cent.

Steady path

The cash rate increases by 25 basis points each Board meeting until a little above 4 per cent (Graph 1). We consider this level around half a percentage point above a reasonable nominal neutral rate estimate of around 3½ per cent. The cash rate's peak is sustained for 1½ years, before falling gradually by 25 basis points every 6 months.[2]

BoC path

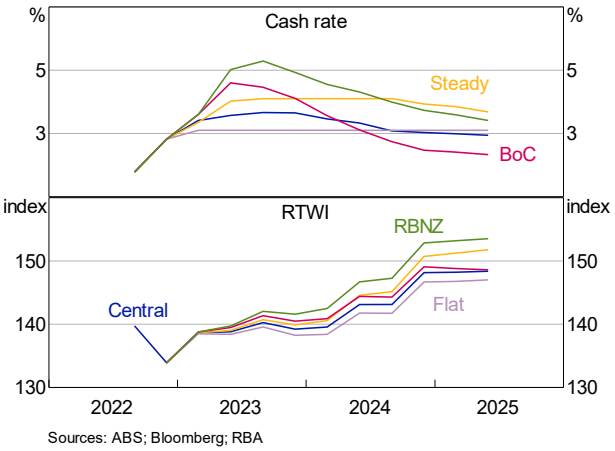
We impose the market-implied path for the BoC's policy rate, calculated from OIS rates. The cash rate is first increased to reach the BoC's policy rate level, then follows market expectations. This path involves a higher peak of a little over 4½ per cent and steeper decline, relative to the central path.

RBNZ path

We impose the market-implied path for the RBNZ's policy rate, calculated from OIS rates. The cash rate is first increased to reach the RBNZ's policy rate level, then follows market expectations. This path involves a higher peak of a little over 5 per cent (125bps above neutral) and steeper decline, relative to the central path. It settles at a higher level than the 'BoC' path.

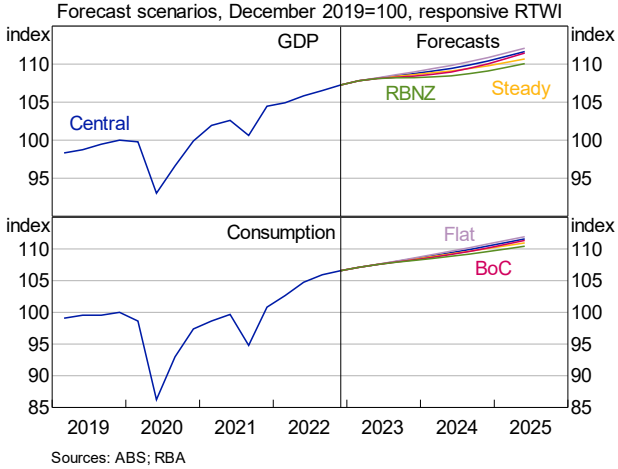
Results

Graph 1
Economic Indicators
Forecast scenarios



Sources: ABS; Bloomberg; RBA

Graph 2
Economic Indicators
Forecast scenarios, December 2019=100, responsive RTWI



Sources: ABS; RBA

1 Thank you to the SAMM team for providing policy path ideas, and to for providing international policy rate expectations.

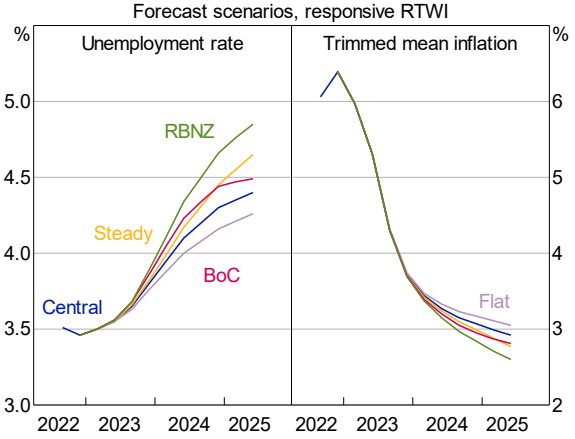
2 Assumptions about the rate of decline are less important than assumptions about the rate of increase early in the horizon, as activity responds to monetary policy with a significant lag.

See Appendix A for results where the exchange rate is not allowed to respond exogenously to changes in the cash rate.[3]

Graph 3

Economic Indicators

Forecast scenarios, responsive RTWI



Sources: ABS; RBA

All policy paths except the 'flat' path bring inflation to within the band by the end of the horizon (Graph 3).

The 'RBNZ' path brings inflation to within the band by the end of 2024, and near the midpoint of the band by the end of the horizon. However, this path triggers a 'Sahm' recession, with unemployment increasing by over ¾ percentage point within a year (see and Rosewall 2020). In level terms, unemployment remains below 5 per cent in this scenario (Graph 3).[4]

While the 'steady' and 'BoC' paths deliver similar inflation outcomes, the more aggressive 'BoC' path yields better unemployment outcomes within the forecast horizon. In this scenario, a rapid pace of tightening imposes a less severe policy trade-off on the central bank relative to holding rates high for longer. This result aligns with other literature (2022).

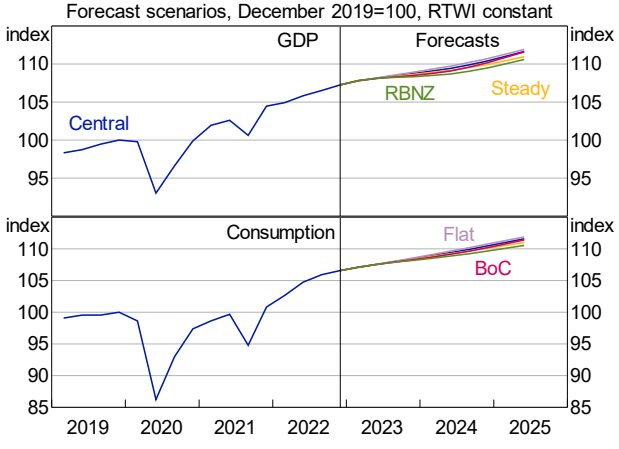
Structural Analysis and Macroeconomic Modelling
Economic Analysis Department

25 January 2023

Appendix A

Economic Indicators

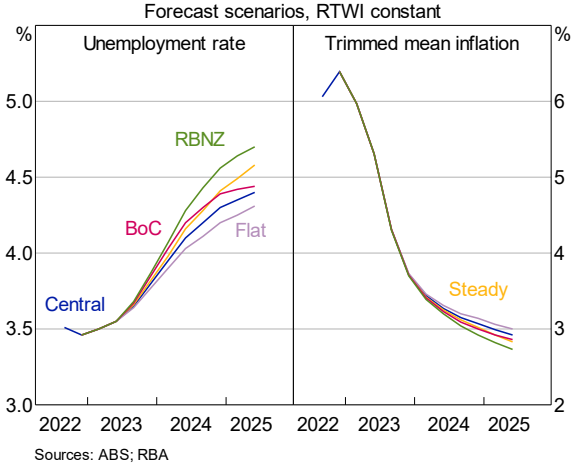
Forecast scenarios, December 2019=100, RTWI constant



Sources: ABS; RBA

Economic Indicators

Forecast scenarios, RTWI constant



Sources: ABS; RBA

3 We provide results with a fixed exchange rate in the Appendix for consistency with the technical assumptions used in the February SMP forecast.

4 When we hold the exchange rate fixed in the 'RBNZ' scenario, a Sahm recession is still (barely) triggered and inflation still falls to the top of the target band by the end of 2024.

From:
Sent: Tuesday, 28 February 2023 3:02 PM
To:
Cc:
Subject: RE: Note EA: Alternative Monetary Policy Paths - March 2023

Hi

Sorry for my delay in replying, thanks for your feedback!

Great question, looking at the Sahm rule rather than GDP growth paths allows us to detect any mild recessions too, as noted in Rosewall and (2020): "*The ¾ percentage point threshold would have detected the technical recessions in the early 1980s and 1990s. The dot com bust of 2001 and the Global Financial Crisis would also be classified as (mild) recessions, consistent with broader interpretations of recessions in Australia including previous commentary from the Bank.*"

Using the Sahm rule means we can identify any mild recessions that don't classify as technical recessions, but may be consistent with broader interpretations of recessions in Australia, similar to the dot com bust and GFC.

Thanks,

From:
Sent: Thursday, 23 February 2023 4:37 PM
To: rba.gov.au>
Subject: RE: Note EA: Alternative Monetary Policy Paths - March 2023

Hi

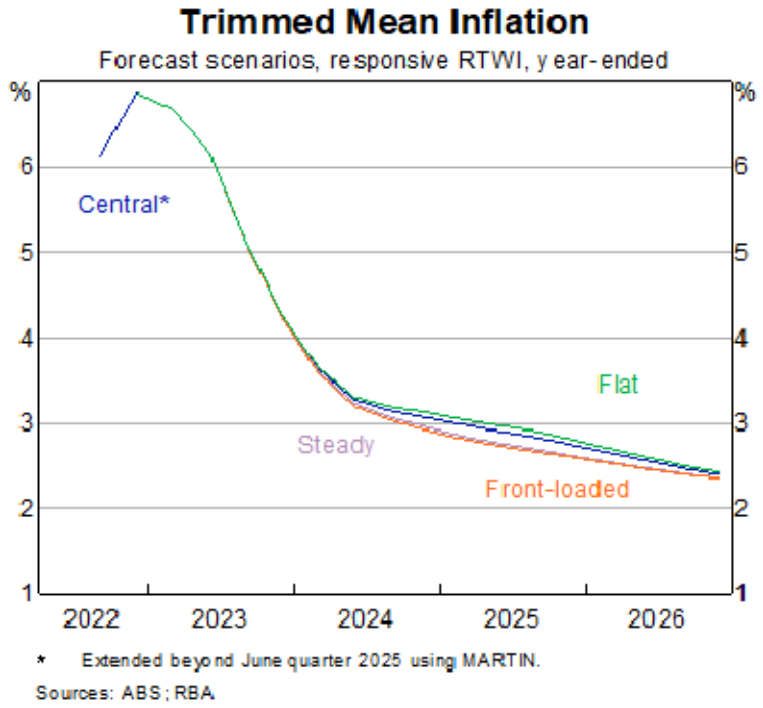
Thanks for this note – I find it really useful for thinking about policy.

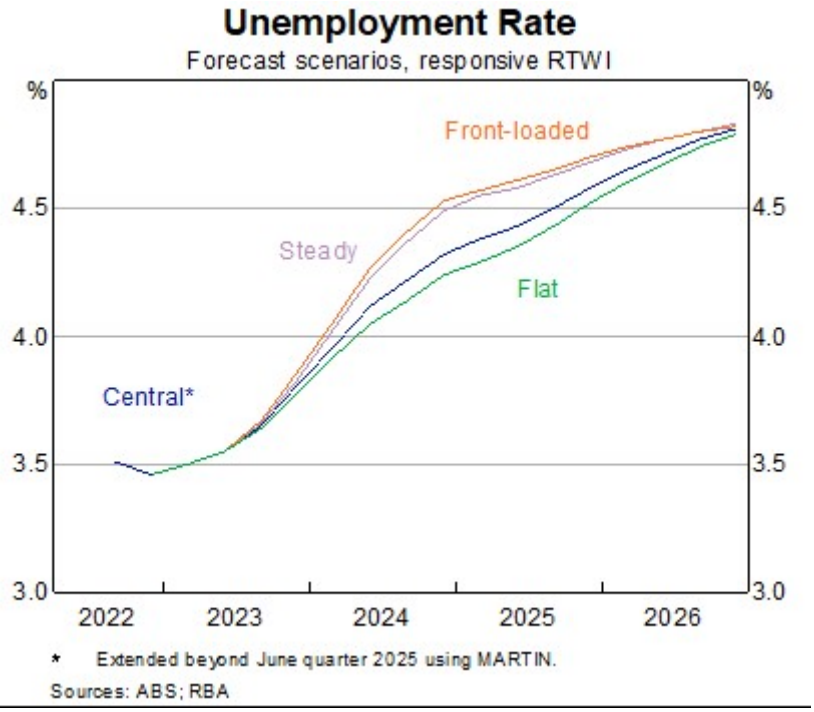
One thing I am curious about is the reference to a 'Sahm recession'. My understanding is that the Sahm recession indicator was developed as an early warning for technical recessions. But in this setting you can observe the paths of GDP growth directly, so you can tell whether there is a recession or not. What is the motivation for looking at whether a Sahm recession occurred rather than an actual recession in this setting?

Cheers,

From:
Sent: Wednesday, 22 February 2023 12:25 PM
To: Notes policy groups @rba.gov.au>
Subject: Note EA: Alternative Monetary Policy Paths - March 2023

We assess three alternative monetary policy paths against the technical assumptions in our February 2023 SMP forecast. A 'front-loaded' path of 50 basis point increases, and a 'steady climb' path of 25 basis points increases achieve similar outcomes provided they reach the same terminal rate. Both cash rate paths peak at 4.8 per cent, which achieves within-target inflation by end-2024, and brings unemployment closer to the NAIRU.





For more information, please see: D23/50681.

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MARCH 2023 – ALTERNATIVE MONETARY POLICY PATHS[1]

We assess three alternative monetary policy paths against the technical assumptions in our February 2023 SMP forecast. A 'front-loaded' path of 50 basis point increases, and a 'steady climb' path of 25 basis points increases achieve similar outcomes provided they reach the same terminal rate. Both cash rate paths peak at 4.8 per cent, which achieves within-target inflation by end-2024, and brings unemployment closer to the NAIRU.

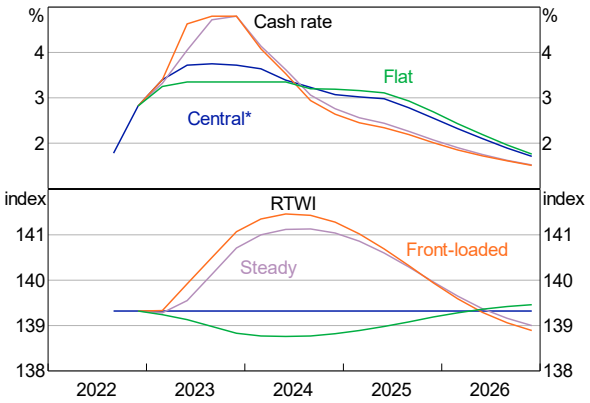
Setup

This note explores the economic outcomes from three alternative monetary policy paths, alongside the technical assumptions underlying the *February 2023 SMP* (central) forecasts: a 'steady climb' path, a 'front-loaded' path, and a 'flat' path (Graph 1). We use MARTIN's Taylor rule to extend the central forecast to the end of 2026, with technical assumptions imposed (see SAMM 2023).[2]

Steady climb

The cash rate increases by 25 basis points each Board meeting to 4.8 per cent in August 2023. We consider this level to be about a percentage point above a reasonable nominal neutral rate estimate. The peak is sustained over the rest of 2023, occurring one quarter after the peak in the central scenario. From 2024 onwards, the cash rate's movements are determined by MARTIN's Taylor rule. It falls quickly, reaching 1½ per cent at end-2026.[3]

Graph 1
Economic Indicators
Forecast scenarios



* Extended beyond June quarter 2025 using MARTIN.
Sources: ABS; Bloomberg; RBA

Front-loaded

The cash rate increases by 50 basis points each Board meeting to 4.8 per cent in May 2023. Similar to the 'steady climb' path, the cash rate responds endogenously using the Taylor rule from 2024 onwards.

Flat

We keep the cash rate constant at its current level of 3.35 per cent until mid-2024, then the cash rate moves in-line with the Taylor rule.

Results

All cash rate paths bring inflation within the target band by the end of the SMP forecast horizon (mid-2025) (Graph 2). The 'steady climb' and 'front-loaded' paths are the quickest to return inflation to the target band in late-2024. These paths also push the unemployment rate up to the assumed NAIRU (4½ per cent in the *February 2023 SMP*), narrowly avoiding a Sahm recession (Graph 3).[4]

Looking beyond the SMP forecast horizon, all paths have similar inflation and unemployment outcomes in late-2026. Inflation is around the midpoint of the target band, and the unemployment rate is above the NAIRU. The 'front-loaded' and 'steady climb' profiles are the most alike, indicating that the pace of tightening over the next 6 months may make little difference, provided their cash rates reach the same terminal rate.

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1 Thank you to for helpful feedback, and and for scoping policy path ideas and providing the forecast extensions. Replication files can be found here.

2 The exchange rate responds endogenously in our main results. We provide results with a fixed exchange rate in Appendix A for consistency with the technical assumptions used in the February 2023 SMP forecast.

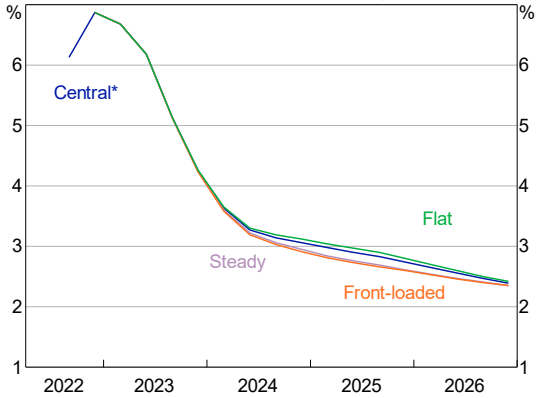
3 Assumptions about the rate of decline are less important than assumptions about the rate of increase early in the horizon, as activity responds to monetary policy with a significant lag.

4 A Sahm recession occurs when unemployment increases by over ¾ percentage point within a year (see and Rosewall 2020). It is not triggered because we imposed a short cash rate peak, and allowed the Taylor rule to respond from 2024 onwards, resulting in a fast decline. We see similar results when holding the exchange rate constant.

Graph 2

Trimmed Mean Inflation

Forecast scenarios, responsive RTWI, year-ended

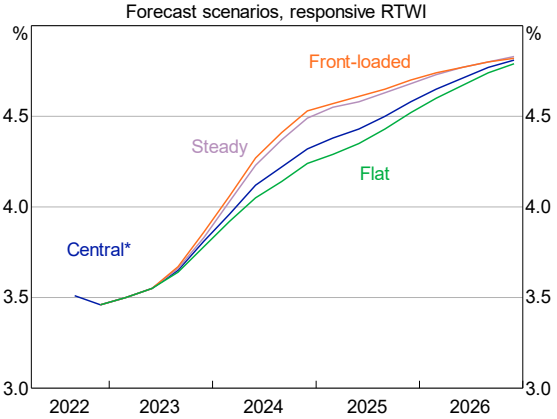


* Extended beyond June quarter 2025 using MARTIN.
Sources: ABS; RBA

Graph 3

Unemployment Rate

Forecast scenarios, responsive RTWI

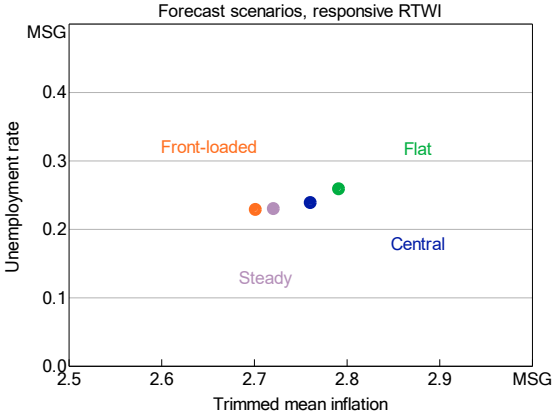


* Extended beyond June quarter 2025 using MARTIN.
Sources: ABS; RBA

Graph 4

Mean Squared Gaps*

Forecast scenarios, responsive RTWI



* NAIRU at 4.5 per cent; inflation target at 2.5 per cent.
Source: RBA

For each cash rate path, Graph 4 shows the mean squared gaps (MSGs) of trimmed mean inflation from its assumed target of 2½ per cent and of the unemployment rate from the assumed NAIRU. The 'front-loaded' and 'steady climb' paths improve outcomes, moving inflation and the unemployment rate closer to their respective targets (smaller MSGs).

Structural Analysis & Macroeconomic Modelling
Economic Analysis Department

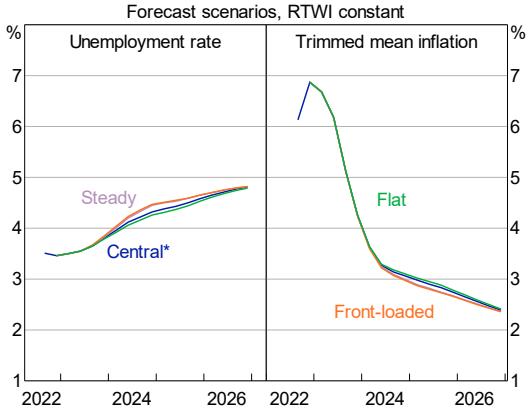
22 February 2023

Appendix A: Alternative monetary policy paths with a constant exchange rate

Graph A1

Economic Indicators

Forecast scenarios, RTWI constant

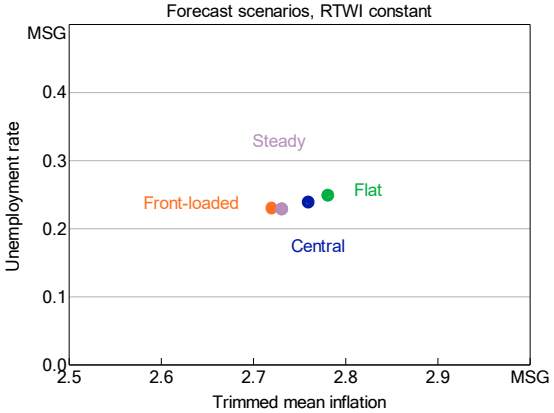


* Extended beyond June quarter 2025 using MARTIN.
Sources: ABS; RBA

Graph A2

Mean Squared Gaps*

Forecast scenarios, RTWI constant



* NAIRU at 4.5 per cent; inflation target at 2.5 per cent.
Source: RBA