

Box E

Scenario Analysis Using the MARTIN Model

What is scenario analysis?

Each *Statement on Monetary Policy* presents economic forecasts and a range of global and domestic uncertainties surrounding them. The discussion is typically expressed in qualitative terms, stating the direction of the risk (that is, whether it is an upside or downside risk) and the channels through which it may affect the economic outlook. The likely effect of these risks, should they be realised, can be illustrated using scenario analysis. Although these modelling exercises are, by their nature, only rough approximations, they are an important input into our forecasting process and broader policy analysis.

Scenario analysis can improve our understanding of the economic outlook by considering the effects of alternative economic outcomes. A scenario can describe the consequences of a particular event, tracing through key channels as they affect economic outcomes. Another type of scenario might explore the effect of a particular event if some economic relationships are stronger (or weaker) than in the past. Scenario analysis is not intended to represent the full range of possible outcomes, but rather to help illustrate which risks are likely to be material and which are not. As such, scenario analysis serves to highlight key risks that could considerably change the central projections if they were to materialise.

How is scenario analysis conducted?

Scenario analysis involves a range of steps and requires the use of economic models. Over the past two years, the MARTIN model – a full-system macroeconomic model of the Australian economy – has been a key tool used to conduct scenario analysis at the RBA (Ballantyne *et al* 2019).^[1]

Using MARTIN, staff can construct a scenario by imposing a path for one or more variables and then observing the behaviour of other variables conditional on that path. This path can be based on one that fits within the range of historical experience for that variable, or on a hypothetical path such as a worst-case scenario. Once the model has been run, staff compare each variable's evolution in the scenario against the baseline forecast presented in the *Statement*. The differences between the predicted economic outcomes of the scenario and the staff forecasts illustrate the economy-wide effects of the event under consideration. By using a model, we can also explore the channels of transmission from the event to economic outcomes.

Scenarios are usually 'forward-looking'. For example, Guttman *et al* (2019) considered a scenario exploring a sharper-than-expected slowdown in the Chinese economy.^[2] But scenarios can also be 'backward-looking' and compare past outcomes to what might have happened under a counterfactual path for a particular variable. For example, in the attempt to answer the question of whether households consume more when their wealth increases, May, Nodari and Rees

(2019) looked at how consumption growth would have evolved between 2013 and 2017 if growth in household wealth had been 5 percentage points lower than it was in the data over the same period.^[3]

A key limitation of scenario analysis is that the model used is a simplified representation of reality. As such, it is difficult to capture all the possible channels through which an event can propagate throughout the economy. For example, MARTIN captures the foreign and financial sectors in a simple way, while some channels, such as confidence channels, can be incorporated by adjusting variables based on information from outside the model.

A scenario example: the implications of a change in the exchange rate

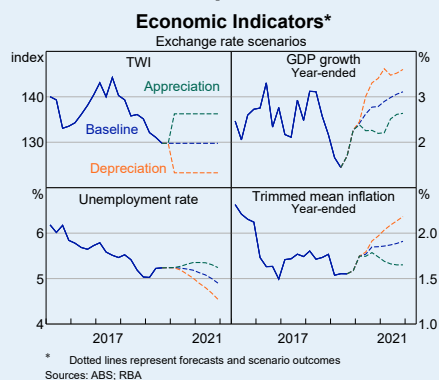
The staff forecasts rely on a set of technical assumptions and other exogenous inputs. For example, the exchange rate, as measured by the trade-weighted index (TWI), is assumed to remain unchanged over the forecast period. This is a pragmatic assumption motivated by the body of past research showing that short-run movements in exchange rates are difficult to predict.^[4]

In the following scenario, MARTIN is used to quantify the impact on the current economic forecasts from imposing a different assumption about the future path of the exchange rate. The exchange rate is assumed to be 5 per cent higher or 5 per cent lower and held constant at that level over the forecast period. All other assumptions that underpin the staff forecasts remain unchanged. Thus, in the scenario, the cash rate does not respond to the effects of a lower/higher exchange rate assumption on the forecasts.

The scenario results show that a sustained 5 per cent depreciation of the exchange rate is expansionary for the economy (Graph E.1). GDP growth is roughly half a percentage point higher than in the central forecasts over the forecast period. The increase in GDP growth largely reflects a substitution towards Australian goods and services following the exchange rate depreciation, which leads to a reduction in imports and an increase in export volumes (Graph E.2). This is consistent with relative price changes: the depreciation lowers the price of domestically produced goods and services relative to goods and services produced overseas.

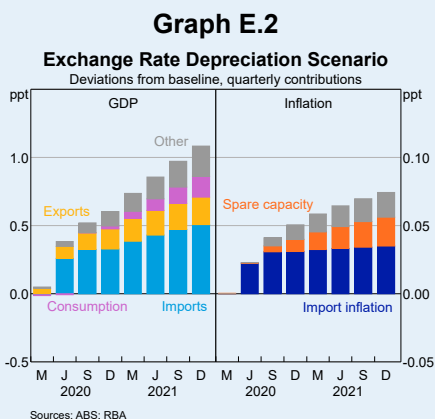
The pick-up in economic activity lowers the unemployment rate by around 0.4 percentage points to 4½ per cent and raises year-ended trimmed mean inflation by around 0.3 percentage points to 2¼ per cent by the end of 2021. Around half of the increase in inflation reflects the direct effect of higher import prices and the rest comes from the indirect effects of a tighter labour market and stronger economic conditions. As such, the stimulatory effect of a sustained 5 per cent exchange rate depreciation on economic activity largely operates through the traded sector.

Graph E.1



As the MARTIN model is mostly linear, the effects of an appreciation in the exchange rate are symmetric to the effects of the depreciation (Graph E.1). So, a sustained 5 per cent appreciation of the exchange rate would be expected to lower GDP growth by

½ percentage point on average relative to the central forecasts, keep the unemployment rate at around 5¼ per cent (instead of declining to 5 per cent by the end of 2021) and keep trimmed mean inflation well below the bottom of the target band throughout the forecast period. The main channel through which the appreciation of the exchange rate affects the economy is, once again, the trade channel. Following the increase in the value of the Australian dollar, the price of Australian goods and services becomes less competitive. As a result, export volumes fall and imports increase. This is consistent with a higher purchasing power of domestic residents and lower import prices; for a given level of production, they can now afford to consume more imports. ↘



Endnotes

- [1] A Ballantyne, T Cusbert, R Evans, R Guttman, J Hambur, A Hamilton, E Kendall, R McCririck, G Nodari and D Rees (2019), 'MARTIN Has Its Place: A Macroeconometric Model of the Australian Economy', RBA Research Discussion Paper No 2019-07. Available at <<https://www.rba.gov.au/publications/rdp/2019/2019-07/full.html>>.
- [2] R Guttman, K Hickie, P Rickards and I Roberts (2019), 'Spillovers to Australia from the Chinese Economy', RBA *Bulletin*, June, viewed 5 November 2019. Available at <<https://www.rba.gov.au/publications/bulletin/2019/jun/spillovers-to-australia-from-the-chinese-economy.html>>.
- [3] D May, G Nodari and D Rees (2019), 'Wealth and Consumption', RBA *Bulletin*, March, viewed 5 November 2019. Available at <<https://www.rba.gov.au/publications/bulletin/2019/mar/wealth-and-consumption.html>>.
- [4] For a review of the literature on exchange rate forecasting, see B Rossi (2013), 'Exchange Rate Predictability', *Journal of Economic Literature*, 51(4), pp 1063–1119.

