Forecast inflation

A report prepared for the Essential Services Commission | 31 May 2021

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1 Introduction

1.1 Background

In 2020, the Essential Services Commission of Victoria (ESC) asked us to develop a model to derive, amongst other things, inflation forecasts for the purposes of setting regulatory allowances. The ESC required that the model be able to derive inflation forecasts using a number of different methods, including the RBA geometric mean method and the bond breakeven approach.[1]

The ESC is currently reviewing Melbourne Water's prices for the 2021-26 regulatory period. In the context of that price review, we have been asked by the ESC for further advice on forecast inflation.

1.2 Our instructions

We have been asked by the ESC to:

- Provide a report that:
  - Describes the approaches used to forecast inflation in the model we provided to the ESC in 2020, including the RBA geometric mean method, the bond breakeven approach and the approach that weights the estimates derived using these two methods;
  - Explains briefly the pros and cons of the approaches above in a regulatory context; and
  - Explains if it is appropriate to use different cut-off date dates to estimate forecast inflation. For example, is it appropriate to use RBA data as of 31 March 2021 to derive the bond breakeven inflation forecast, but use RBA's latest Statement on Monetary Policy (released on 7 May 2021) to derive the RBA geometric mean inflation forecast?
- Provide inflation forecasts using the same model updated with the latest available data.

[1] Note, we were instructed by the ESC to implement the RBA geometric mean method in such a way as to produce inflation forecasts over a 10-year horizon—consistent with the approach that the ESC has typically used prior to 2020.

2 Advice sought by the ESC

2.1 Methods used by the model to forecast inflation

In 2020, the ESC asked us to develop a model that could be used derive inflation forecasts using a number of different approaches, including:

- The RBA geometric mean method;
- The bond breakeven approach; and
- A weighted average of the two approaches above.

This section describes how each of the methods above were implemented in the model we developed.

2.1.1 RBA geometric mean method

At the time the ESC asked us to develop the inflation forecasting model, the RBA geometric mean method was used by most regulators in Australia, including the ESC, the Australian Energy Regulator (AER), the Essential Services Commission of South Australia (ESCOSA), the Queensland Competition Authority (QCA), the Independent Competition and Regulatory Commission (ICRC) and the Office of the Tasmanian Economic Regulator (OTTER).[2] We therefore implemented the RBA geometric mean method in the way it was employed by these various regulators.

The RBA geometric mean method relies on Reserve Bank of Australia (RBA) CPI inflation forecasts, published in the quarterly RBA Statements on Monetary Policy (SMP).[3,4] The approach takes the RBA CPI inflation forecasts for the first and second years of the upcoming regulatory period. When deriving the forecasts presented in this report, we have adopted the RBA forecasts for the year ended June 2022 and the year ended June 2023, as these align best with the first two years of Melbourne Water's regulatory period.

We understand that the ESC's preferred approach is to use the most recent RBA SMP available at the time of the determination. For the purposes of determining forecasts for Melbourne Water, whose next regulatory period commences on 1 July 2021, the relevant SMP would be the May 2021 RBA SMP. The forecasts are 1.25% and 2.00% for year 1 and year 2 respectively as at the May 2021 RBA SMP.

The approach assumes that the annual rate of inflation will be equal to the midpoint of the RBA inflation target (i.e., 2.5%) for years 3 to 10 (inclusive). This results in a series of 10 forward-looking estimates—the first two derived from RBA forecasts, and the remaining eight being 2.5% (based

2 The Independent Pricing and Regulatory Tribunal (IPART) was also using (and continues to use) a version of the RBA geometric mean approach.

3 See Section 5: Economic Outlook in the May 2021 SMP, available at https://www.rba.gov.au/publications/smp/2021/may/pdf/statement-on-monetary-policy-2021-05.pdf

4 We note that whilst the ESC has referred to this approach as the RBA geometric mean approach, that approach has not in any way been endorsed by the RBA as an appropriate way to forecast inflation over a 10-year horizon. The naming of the method simply reflects the fact that it makes use of some (short-term) RBA inflation forecasts and the midpoint of the RBA's inflation target range.

on an assumption that inflation beyond year 2 of the regulatory period would return to the midpoint of the RBA's inflation target range and remain at that level.

The final step of the RBA geometric mean approach is to compute the geometric average of these 10 forward-looking numbers. That is:

$$\pi_{RBA\ Geometric} = \left((1 + RBA_{Year\ 1}) * (1 + RBA_{Year\ 2}) * \left(1 + RBA_{Midpoint}\right)^{8}\right)^{\frac{1}{10}} - 1$$

Note that the geometric average is computed as the tenth root of the product of one plus each of the estimated forward-looking rates, minus one. We have previously seen the RBA geometric mean approach implemented using the following formula:

$$\pi_{RBA\ Geometric} = \left(RBA_{Year\ 1} * RBA_{Year\ 2} * RBA_{Midpoint}^{8}\right)^{\frac{1}{10}}$$

We do not think the application of this formula is appropriate for two reasons:

- The inflation forecast produced by the first formula above has the natural interpretation as the average (expected) rate of inflation over a 10-year horizon. The second formula above simply computes the geometric average over the 10 future rates and does not have the same economic interpretation.
- The second formula can produce implausible forecasts of inflation when the forecast rate of inflation in years 1 or 2 is low. For instance, suppose the RBA's 1-year ahead forecast is 0%, but the 2-year ahead forecast is 2.5%. In that example, nine of the 10 forward-looking rates would be 2.5%. However, the overall forecast of inflation would be 0% p.a., because the 1-year ahead forecast is 0%.

We note that in its 2018 WACC methodology review, IPART considered which of these two geometric averaging methods it should adopt when forecasting inflation. It concluded that the first formula above should be used.[5]

2.1.2 Bond breakeven approach

The approach to forecasting inflation the using market implied breakeven approach relies on nominal and indexed government bond data, published daily by the RBA in Table F16.[6]

To forecast inflation, we first specify a sampling period. For each day within that sampling period, we derive a forecast of inflation, and then average the forecasts over each of the days in the sampling period to obtain the breakeven forecast. We understand that the ESC's preferred approach is to use the most recent 40 trading days.

For each day in the sampling period, we derive the nominal risk-free rates for two maturity dates: the last day of the current regulatory period (i.e., 30 June 2021) and the last day of the upcoming regulatory period (i.e., 30 June 2026). This is performed by interpolating between the yields of the

5 IPART, Review of our WACC method, Final report, February 2018, section 7.5.

6 Available at https://www.rba.gov.au/statistics/tables/xls/f16.xls

available nominal Treasury Bonds with the closest maturity dates before and after the desired maturity date.[7] The rate is then annualised to reflect the payment schedule of bonds.[8]

Similarly, for each day in the sampling period, we derive the indexed risk-free rates for two maturity dates: the last day of the current regulatory period (i.e., 30 June 2021) and the last day of the upcoming regulatory period (i.e., 30 June 2026). This is performed by interpolating between the yields of the available indexed Treasury Bonds with the closest maturity dates before and after the desired maturity date.[9] The rate is then annualised to reflect the payment schedule of bonds.[10]

The implied inflation over the periods starting at the sample date, ending at the last days of the current and upcoming regulatory period are obtained using the Fisher equation.[11] The inflation over the upcoming regulatory period can then be obtained by comparing the two inflation rates and the number of years in each period.[12]

2.1.3 Weighted inflation forecast

The weighted inflation forecast is taken as a weighted average of the RBA geometric mean and bond breakeven inflation forecasts. As a default setting, we have assumed that equal weight is to be given to the forecasts obtained by each method. However, we note that the ESC may vary those weights, for instance to reflect its views on the reliability of each approach.

2.2 Strengths and weaknesses of the forecasting approaches

The ESC has asked us to provide advice on the pros and cons of the RBA geometric mean approach, the bond breakeven approach and the approach it has used recently of adopting an equal-weighted average of the two approaches. The Table below summarises our views on the strengths and weaknesses of the approaches.

7 Or, in circumstances where there is no available bond with maturity prior to the desired maturity date, extrapolating using the two bonds with the earliest maturity.

8 $Y_{annualised} = \left(1 + \frac{Y_{unannialised}}{2}\right)^2 - 1$. We note that interest on nominal Australian Government bonds is paid semiannually.

9 Or, in circumstances where there is no available bond with maturity prior to the desired maturity date, extrapolating using the two bonds with the earliest maturity.

10 $Y_{annualised} = \left(1 + \frac{Y_{unannialised}}{4}\right)^4 - 1$. We note that the interest on inflation-protected Australian Government bonds is paid quarterly.

11 $(1 + \pi) = (1 + Y_{nominal})/(1 + Y_{indexed})$

12 For example, if there was exactly 1 year between the sample date and the forecast start date, and 6 years between the sample date and the forecast end date, and the implied inflation rates were 2% and 2.5% respectively, the inflation forecast between the start and end date would be $\left(\frac{(1+2.5\%)^6}{(1+2\%)^1}\right)^{\frac{1}{6-1}} - 1 = 2.6\%$

Table 1: Strengths and weaknesses of the inflation forecasting approaches

Approach	Strengths	Weaknesses
RBA geometric mean method	• Simple and transparent • Until recently the RBA geometric mean method was used by nearly all economic regulators in Australia	• The RBA geometric mean method has systematically over-forecast actual inflation over most of the past decade. The main reasons for this are that the method ○ assumes that inflation will return to the midpoint of the RBA's inflation target range (i.e., 2.5%) in year 3 of the regulatory period, and remain at that level, regardless of prevailing economic conditions; and ○ produces a forecast of inflation over a 10-year horizon, whereas regulatory periods are typically much shorter (i.e., three to five years). • In recognition of the shortcomings of the approach, nearly all regulators in Australia have now moved away from the RBA geometric mean method.
Bond breakeven approach	• Estimated using financial instruments (Government bonds) that are actually traded by investors, so is more likely to reflect investors' inflation expectations. • Forecasts derived using the bond breakeven approach have typically predicted actual inflation more closely than the RBA geometric mean method.	• The bond breakeven approach is currently used by only one regulator in Australia – the Economic Regulation Authority of Western Australia. • Some regulators have expressed concerns that the bond breakeven forecasts may be affected by illiquidity and inflation risk premiums reflected in the yields on inflation-protected Government bonds—so bond breakeven forecasts may not reflect unbiased estimates of inflation expectations. The size of any illiquidity/inflation risk premiums have not been quantified.
Weighted inflation forecast	• The statistics/forecasting literature suggests that the accuracy of forecasts can typically be improved by combining estimates/forecasts derived using different approaches—if the individual forecasting approaches have strengths and weaknesses.	• None that we are aware of.

2.3 Should inflation forecasts derived using different methods use a common or consistent sampling period?

The ESC has asked us to provide a view on whether it is appropriate to use different cut-off date dates to estimate forecast inflation. For example, is it appropriate to use RBA data as of 31 March 2021 to derive the bond breakeven inflation forecast, but use RBA's latest SMP (released on 7 May 2021) to derive the RBA geometric mean inflation forecast?

In our view, the ESC should use the latest data available (as close as practically possible to the start of the regulatory period) to inform its forecasts of inflation over the regulatory period.

- In terms of the RBA geometric mean inflation forecast, the May 2021 SMP contains the latest RBA forecasts prior to the commencement of Melbourne Water's next regulatory period on 1 July 2021. Therefore, it is reasonable for the ESC to rely on the data contained in that SMP.
- In terms of bond yield data to inform the bond breakeven inflation forecast, there is no reason why the ESC should restrict the data to 31 March 2021 if more up-to-date information is available. Nor is there any reason why the ESC should artificially truncate the data to 7 May 2021 (the release date for the most recent SMP) to ensure consistency with the timing of the data used to inform the RBA geometric mean forecast. Either of those approaches would exclude more recent data that are arguably more relevant to the forthcoming regulatory period. For the purposes of developing the bond breakeven forecasts presented in this report, we have used a 40-day sampling period to 28 May 2021 as those were the latest data available to us when preparing this report.

2.4 Inflation forecasts

The ESC has asked us to provide updated inflation forecasts by applying the latest data available to the model. Our updated forecasts are summarised in the Table below.

Table 2: Updated inflation forecasts

RBA geometric mean forecast	Bond breakeven forecast	Weighted inflation forecast
2.32%	2.11%	2.22%

Source: Frontier Economics analysis, RBA forecasts (May 2021 SMP) and F16 data to 28 May 2021.

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