Water

SA Water Regulatory Determination 2020: Guidance paper 6 (technical paper)

Treatment of inflation in the regulatory rate of return

June 2019

Enquiries concerning this Guidance Paper should be addressed to:

Essential Services Commission
GPO Box 2605
ADELAIDE SA 5001

Telephone: (08) 8463 4444
Freecall: 1800 633 592 (SA and mobiles only)
E-mail: escosa@escosa.sa.gov.au
Web: www.escosa.sa.gov.au

Any queries on SA Water Regulatory Determination 2020 should be directed to:

Nathan Petrus, Director Consumer Protection and Pricing

Related reading

This Guidance Paper should be read in conjunction with the Framework and Approach paper and other Guidance Papers released by the Commission for SA Water Regulatory Determination 2020. Those papers and other information about SA Water Regulatory Determination 2020, are available on the Commission's website:

https://www.escosa.sa.gov.au/industry/water/retail-pricing/sa-water-regulatory-determination-2020

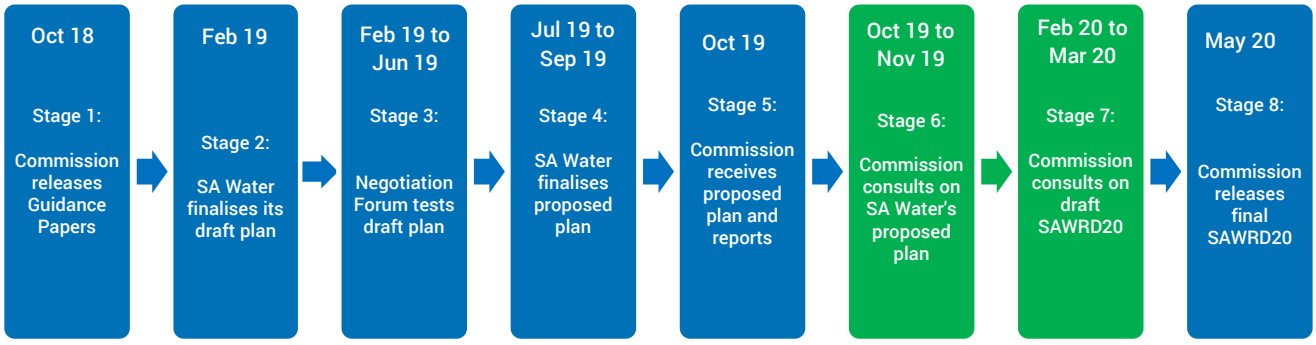
Timing for this review and upcoming consultation opportunities

While the Commission remains responsible for making the final regulatory determination, which will require SA Water to provide the water and sewerage retail services valued by customers for the lowest sustainable cost, the review process will involve multiple opportunities for stakeholders to be involved prior to that final determination.

Input from a diverse range of stakeholders is important, as it helps the Commission to make better informed and more inclusive decisions. The Commission will therefore draw on the full range of evidence provided by all stakeholders in making the final determination.

The timing of the key stages in SA Water Regulatory Determination 2020 are illustrated below, with the Commission's key consultation stages shown in green.

SAW RD20 review timeline



SA Water Regulatory Determination 2020 (SAW RD20) will set maximum revenues and minimum service standards for SA Water's drinking water and sewerage services, as well as setting pricing requirements for other miscellaneous retail services, to apply from 1 July 2020 to 30 June 2024.

SAW RD20 will challenge SA Water to:

- provide water and sewerage services at the lowest sustainable price for the quality and reliability levels valued by customers, and
- have in place sound long-term asset management, operating and financing strategies, which support the provision of those services for customers of today and tomorrow.

Those intended outcomes are consistent with the Commission's primary objective of protecting the long-term interests of consumers with respect to the price, quality and reliability of essential services.

Purpose of this document

In July 2018, the Essential Services Commission (**Commission**) established a framework and approach for SA Water Regulatory Determination 2020 (**SAW RD20**), which is intended to deliver the lowest sustainable prices for the services that SA Water's customers value.[1]

This is the sixth of a series of Guidance Papers released by the Commission to explain the requirements, methodology and process that will apply to SAW RD20. This Guidance Paper provides further technical guidance related to Guidance Paper 5 – the cost of funding and using assets. In particular, it outlines approaches that could be used to estimate inflation, for the purpose of calculating the regulatory rate of return using a real, post-tax weighted average cost of capital (WACC).

This Guidance Paper explains:

- the Commission's current methodology for estimating long-term inflation expectations and SA Water's concerns with that methodology
- alternative approaches that could be used to estimate long-term inflation expectations, such as those based on market-based measures and surveys of professional forecasters, and
- the limited additional forecast accuracy likely to be gained, relative to that of the Commission's current methodology, from using an alternative approach.

The development of a robust inflation forecasting methodology can facilitate the determination of the lowest sustainable cost of drinking water and sewerage services. If the methodology produces inflation forecasts that are well above actual inflation during a regulatory period, SA Water may not earn a real return on assets that is sufficient to drive necessary investment in the essential services that it provides, which may compromise future service levels. If it produces inflation forecasts that are well below actual inflation, real returns on investment may be above efficient amounts, which may lead to customers paying prices that are higher than they need to be. Using a methodology that avoids large or persistent forecast errors is, therefore, in line with the Commission's primary objective of protecting the long-term interests of consumers with respect to the price, quality and reliability of essential services. It is also consistent with the Commission's principles for determining the regulatory rate of return, outlined in Guidance Paper 5 (page 8).[2]

[1] See Commission (2018), 'SA Water Regulatory Determination 2020: Framework and approach', July 2018, available https://www.escosa.sa.gov.au/projects-and-publications/projects/water/sa-water-regulatory-determination-2020-framework-and-approach

[2] The Commission's principles for determining the regulatory rate of return are presented in Appendix A.

Why has the issue of expected inflation been raised?

Inflation can have an effect on revenues, costs and the asset values of network assets. Investors' regulated returns should allow for inflation, so as to protect their purchasing power regardless of what happens to general price levels in the future.

The Commission currently adjusts for inflation by setting SA Water's maximum revenues in real terms and SA Water adjusts customers' prices annually to reflect changes in actual inflation. However, as discussed in Guidance Paper 5, the Commission sets SA Water's regulatory rate of return using a post-tax, real WACC.[3] Under that approach, it is necessary to convert the WACC from a nominal rate of return to a real rate of return. The implication is that, while inflation risk is removed from the majority of the Commission's regulatory framework, the risk remains in the setting of the real rate of return. The presence of inflation risk can lead to material impacts on revenues, as will be shown later in this paper. Inflation forecasting methodologies have attracted much attention from regulators and regulated entities in light of the recent low Consumer Price Index (CPI) inflation outcomes.

The Commission's current approach to adjusting nominal returns for inflation is, in practice, in line with most utility regulators in Australia,[4] and, as will be shown below, supported by a number of research findings.

The current approach uses an estimate of long-term inflation expectations to deflate the nominal WACC. This reflects that 'expected inflation' – which is a theoretical construct not directly observed – is a latent object inherent in long-term nominal borrowing and investment decisions relevant to the regulatory determination (as debt and equity investors seek nominal returns that recover expected inflation on top of their required real returns). The approach is consistent with the Commission's rate of return principles, in particular that the return should reflect an efficient financing strategy that minimises costs in the long term (see Appendix A).

As will be discussed in more detail below, the current approach used by the Commission combines the use of Reserve Bank of Australia (RBA) forecasts of inflation in the short-term (one-year ahead) and an assumption of long-term inflation expectations based on the mid-point of the RBA's medium-term inflation target for the nine years thereafter. The Commission calculates the geometric average of the estimates of annual expected inflation over a ten year horizon and then uses this figure each year to derive a real, post-tax WACC. The ten-year average is used so as to be in line with the terms of the available financial market data used to calculate the nominal WACC.

SA Water has stated concerns about the current approach

SA Water has raised concerns about the Commission's current approach. Its submission to the Guidance Papers states:

> *'The current rate of return methodology has a misalignment between the inflation allowance in the calculation and the actual rate of inflation. This misalignment creates a risk of over or under recovery of revenue based upon whether the actual rate is above or below the Reserve Bank of Australia's (RBA) long-term forecast.'* [5]

SA Water's concerns appear to centre on CPI inflation in the SA Water Regulatory Determination 2016 (SAW RD16) period, which has been below both the RBA's target band and the Commission's forecast at the time of the determination (Figure 1). Lower-than-expected CPI inflation over the SAW RD16 period has meant that the real, post-tax WACC has been estimated to be, on average, more than half a percentage point below

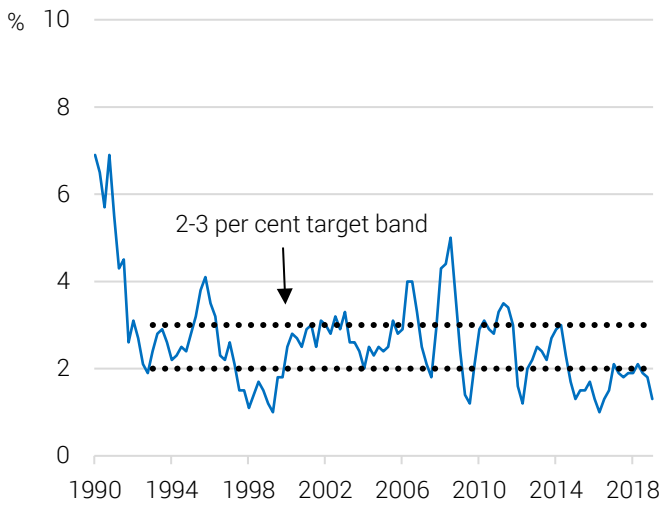
[3] See Commission (2018), 'SA Water Regulatory Determination 2020 Guidance Paper 5: The cost of funding and using assets', November 2018, p. 29, available at https://www.escosa.sa.gov.au/ArticleDocuments/1200/20181101-Water-SAWRD20-GuidancePaper5-CostOfFundingAndUsingAssets.pdf.aspx?Embed=Y.

[4] See Appendix A.

[5] SA Water (2018), 'Re: Submission on Guidance Papers for the SA Water Regulatory Determination 2020', 6 November 2018, p. 2, available at https://www.escosa.sa.gov.au/ArticleDocuments/11293/20181206-Water-SAWRD20-GuidancePapersSubmission-SAWater.pdf.aspx?Embed=Y.

what would have been the case had actual inflation been used (equivalent to more than $70 million per year in revenues).

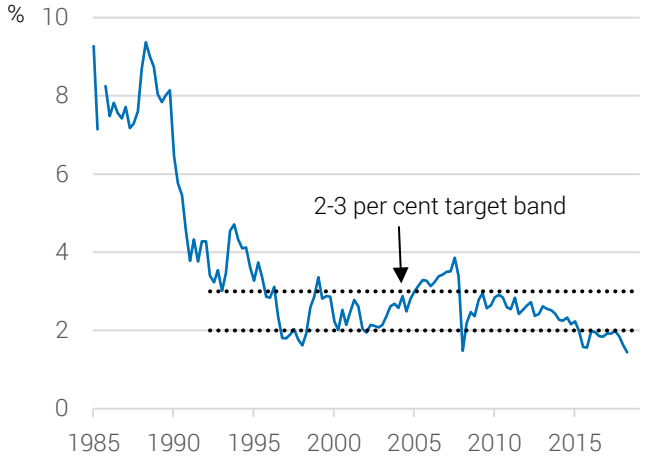
Figure 1: CPI inflation, year-ended[6]



Source: RBA

SA Water has also observed that the bond market-implied rate of long-term inflation expectations has been below the mid-point of the RBA's target band in the SAW RD16 period (Figure 2).

Figure 2: Bond market-implied long-term inflation expectations, end-quarter observations



Source: RBA

The Commission has considered SA Water's concerns about the robustness of the current inflation forecasting approach and, as will be explained below, the latest CPI inflation data do not necessarily detract from the Commission's current approach. For instance, inflation forecast errors in the SAW RD16 period do not imply large and/or asymmetrical errors in future, and some available indicators suggest long-term inflation expectations remain anchored within the target band (despite recent falls in market-based measures[7]).

[6] CPI all groups excluding interest and tax changes of 1999-2000. The inflation measure presented in the chart is calculated and published by the RBA. See RBA Statistical Table G1, accessed 1 May 2019: https://www.rba.gov.au/statistics/tables/.

[7] The yields on ten-year Commonwealth Government Securities (CGS) have declined to historic lows over recent months. Ten-year government bond yields have also declined noticeably in major overseas markets. According to the RBA, the recent declines across major markets, including Australia, reflect lower expected paths for monetary policy, lower term premiums and, to varying degrees, lower inflation expectations; see RBA (2019), 'May 2019 Statement on Monetary Policy', pp.26-29, available at: https://www.rba.gov.au/publications/smp/2019/may/pdf/statement-on-monetary-policy-2019-05.pdf.

In addition, market-based measures of inflation expectations can have large and time-varying biases, limiting their accuracy and deterring their use among most utility regulators in Australia. As stated by the RBA in July 2017 in its submission to the Australian Energy Regulator's (AER) review of the treatment of inflation: *'… market-based measures of inflation expectations have several shortcomings that probably make them unviable alternatives to the current [AER] method.'* [8] The AER's method is similar to the Commission's method.[9]

SA Water has access to various mechanisms within the broader regulatory framework that can help to mitigate inflation risk, such as a cost-pass through mechanism, and there are available financial products that can help companies to hedge inflation risk. There is also the potential to further address inflation risk through updating the WACC each year (and adjusting revenues accordingly), rather than fixing it for the four-year regulatory period. Updating the rate of return annually for inflation would also allow adjustments for some other market-based WACC parameters. This approach would reduce the risk of forecasting error as it would only require annual forecasts rather than four years of forecasts and is likely to avoid the potentially large step changes in prices that may occur when updating the WACC once every four years. Both the AER and Independent Pricing and Regulatory Tribunal (IPART) reset the WACC annually.

For example, the use of annual resets for the cost of debt was an option proposed by the Commission during the SAW RD16 review but not adopted having regard to the submission from SA Water.[10] At that time, SA Water preferred to keep the WACC fixed for the four-year period, stating that annual resets would add price volatility during the period.[11]

Estimating expected inflation

In light of SA Water's stated concerns about the current inflation forecasting approach, this section briefly summarises some of the various approaches that could be used to estimate inflation expectations, for the purpose of calculating the real, post-tax WACC for SAW RD20. It presents the key advantages and disadvantages of the following four approaches:

- the Commission's current method
- the long-term bond breakeven rate
- the fixed rate on long-term inflation swaps, and
- survey-based estimates of expected inflation.

The materiality of the approach to estimating inflation expectations for the WACC is illustrated in Table 1. It presents the current annual average rate of long-term inflation expectations under each approach, and, based on market-based inputs and using the same assumptions as per SAW RD16, the corresponding estimated annual average WACC for the SAW RD20 period.[12] The difference in the estimates of the WACC are commensurate with the gap that has opened up between market-based measures of long-term inflation expectations and those measures that are anchored around the mid-point of the target band.

Table 2 (below) presents a simple comparison of the measures of long-term inflation expectations under each potential method for SA Water Regulatory Determination 2013 (SAW RD13) and SAW RD16 compared with the actual average annual inflation outcomes. While the bond-breakeven approach has had less error in the SAW RD16 period, it had larger errors in the SAW RD13 period. Had regulatory determinations occurred every four years prior to SAW RD13, the average difference between expected and realised inflation over the inflation targeting period would have been lower under the Commission's current method compared with the

8 See Ellis (2017), 'Letter re: Regulatory treatment of inflation expectations', 5 July 2017, pp.1-2, available at https://www.aer.gov.au/system/files/Letter%20from%20the%20RBA%20to%20AER%20-%2025%20July%202017.pdf.

9 See Appendix A.

10 See SA Water (2015), 'SA Water regulatory Rate of Return 2016-2020', Draft Report to the Treasurer, p. 20, available at: https://www.escosa.sa.gov.au/ArticleDocuments/423/20150204-SAWaterRateOfReturnDraftReportSubmissionSAW.pdf.aspx?Embed=Y.

11 See SA Water 2015, p. 20.

12 Estimates in Table 1 based on the data available in early April 2019.

long-term bond breakeven rate (Appendix C). It is acknowledged that a more sophisticated analysis is required to draw strong conclusions on forecast error analysis.

Table 1: Estimated average annual real, post-tax WACC for SAW RD20

Measures of long-term inflation expectations	Rate of expected inflation	Estimated real post-tax WACC
	Annual average 2020-2024 (per cent)	
Current	2.47	3.2
Long-term bond breakeven rate	1.4[13]	4.3
Long-term inflation swap	1.8[14]	3.8
Survey-based	2.5[15]	3.1

Table 2: Comparison of long-term inflation expectations at the time of determination compared with actual inflation[16]

Measures	SAW RD13			SAW RD16		
	Rate of expected long-term inflation	Actual CPI[17]	Difference (ppt)	Rate of expected long-term inflation	Actual CPI[9]	Difference (ppt)
	Annual average (per cent)			Annual average (per cent)		
Current[18]	2.5	1.9	0.6	2.5	1.8	0.6
Long-term bond breakeven rate[19]	2.7	1.9	0.8	2.0	1.8	0.2
Survey-based[20]	2.5	1.9	0.6	2.5	1.8	0.7

Overall, the Commission's assessment is that:

- the current approach is simple, transparent and supported by research (and there is probably limited additional forecast accuracy to be gained from using an alternative approach)
- an approach that uses market-based measures is transparent and grounded in theory, but may have significant practical limitations, and
- an approach that uses surveys of professional forecasters' long-term inflation expectations is simple and supported by research, but may raise practical issues (such as limiting the Commission's ability to publish these specific figures due to proprietary restrictions).

That assessment is discussed in more detail in the following sections of this paper.

13 Based on the end-quarter observation for March 2019. Sourced from RBA Statistical Table G3, available at: https://www.rba.gov.au/statistics/tables/.

14 Based on daily data for ten-year swap reported on 26 March 2019; see Poljak and Commins (2019), 'Inflation expectations dive, sending chills through market', *Australian Financial Review*, 26 March 2019.

15 As noted later in the paper, survey-based forecasts are proprietary. The number in Table 1 is estimated from RBA 2019 p. 61.

16 Historical data on inflation swaps were unavailable to the Commission, therefore the long-term inflation swaps approach is not included in Table 2.

17 Simple average of year-ended all groups CPI inflation over the period.

18 Based on RBA forecasts as at February 2013 and May 2016; see RBA (2013), 'February 2013 Statement of Monetary Policy', p.65, available at: https://www.rba.gov.au/publications/smp/2013/feb/pdf/0213.pdf; and RBA (2016), 'May 2016 Statement of Monetary Policy', p.61, available at: https://www.rba.gov.au/publications/smp/2016/may/pdf/statement-on-monetary-policy-2016-05.pdf.

19 Based on end-quarter observations of March in both 2013 and 2016. Sourced from RBA Statistical Table G3.

20 Survey data unavailable without a subscription; however, available charts point to expectations of around 2.5 per cent.

Commission's current method

The Commission's current approach to forecasting inflation is to take the RBA's forecast for inflation one-year ahead[21] and assume inflation expectations of 2.5 per cent thereafter (based on the mid-point of the RBA's inflation target band). The Commission then calculates one annual rate of long-term inflation expectations, by taking a geometric average of the estimates of expected inflation over a ten-year horizon:

$$Expected\ inflation\ =\ \sqrt[10]{(1+RBA\ forecast)*(1+midpoint\ of\ target1)*,\ldots,*(1+midpoint\ of\ target9)}\ \text{-1}$$

where:

$RBA\ forecast$ is the RBA forecast for year-ended CPI inflation, one year ahead

$midpoint\ of\ target1, .., midpoint\ of\ target9$ are the mid points of the RBA target inflation band of two to three per cent, each year from two to ten years ahead.

The approach is based on estimating long-term (ten years) inflation expectations. As noted earlier, this reflects that the borrowing and investment decisions are for long horizons and have inflation expectations embedded within them. The Commission uses a ten-year term to be consistent with the term of the market instruments used to arrive at the nominal WACC — that is, ten-year Commonwealth Government Securities (CGS) and ten-year BBB corporate bonds.[22] The approach tends to yield an estimate that is close to 2.5 per cent.

The credibility of the RBA's flexible inflation targeting framework underpins the Commission's methodology and current evidence indicates the inflation targeting framework remains credible.[23,24] This means short-term fluctuations in CPI inflation outside of the target band should be considered normal and do not necessarily imply large and/or asymmetrical errors in future or changes to long-term inflation expectations.[25]

The historically low level of interest rates has prompted some concern about structurally weak aggregate demand in the economy and persistent deflationary pressures, and therefore the likelihood for low inflation in future years (which would be within the SAW RD20 regulatory period).[26] While this risk cannot be dismissed, there are also reasons to think aggregate demand could pick-up and become relatively strong.[27] This uncertainty suggests that in the regulatory determination it is not currently appropriate to use an assumption about long-term inflation expectations which is well below the target band. Furthermore, an assumption of persistent, low inflation has not recently been used by SA Water's owner, the SA Government, for the purposes of the State budget.[28]

---

21 Where the RBA forecast is a range, the midpoint is used.

22 Data on market instruments in Australia with a term beyond ten years are not readily available.

23 Studies show long-term inflation expectations have been anchored within the target band and near the mid-point since introduction of inflation targeting; see Debelle (2018), 'Twenty five years of Inflation Targeting in Australia', in *Central Bank Frameworks: Evolution or Revolution* proceedings of RBA conference edited by John Simon and Maxwell Sutton, 2018, pp. 53-71, available at https://www.rba.gov.au/publications/confs/2018/pdf/rba-conference-volume-2018.pdf.

24 Since the introduction of inflation targeting in 1993, the mean, median and mode of CPI inflation (adjusted for tax changes and interest charges) have been approximately equal to 2.5 per cent. Over the past decade, however, the mean has been around 2.1 per cent.

25 See Debelle 2018, pp. 59-62.

26 Several submissions to the AER's review of inflation raised this scenario as a possibility. For example, see CEG (2016), 'Best Estimate of Expected Inflation', September 2016, p.33, available at https://www.aer.gov.au/system/files/AusNet%20Services%20-%206F%20-%20Best%20Estimate%20of%20Expected%20Inflation%20-%20September%202016.pdf.

27 See Vahey (2017), 'Response to the Spark Infrastructure submission on the AER's Preliminary Position Paper', December 2017, pp. 3-4, available at https://www.aer.gov.au/system/files/Prof%20Shaun%20P.%20Vahey%20%E2%80%93%20Response%20to%20the%20Spark%20Infrastructure%20submission%20on%20the%20AER%E2%80%99s%20preliminary%20position%20%E2%80%93%207%20December%202017.pdf. Also, see RBA 2019, pp. 69-78.

28 See Department of Treasury and Finance (2018), '2018-19 Budget Statement', p. 110, available at https://statebudget.sa.gov.au/documents/2018-19_budget_statement.pdf?q=774208.

In addition, the Commission's method is supported by a number of research publications on forecasting inflation.[29] In particular, RBA forecasts have been shown to have accuracy one-year ahead, at least relative to both those of professional forecasters and a no-change assumption ('random walk' approach[30]).[31] A 2.5 per cent forecast (the mid-point of the target band) was found to be about as accurate a guide as the second-year RBA forecast.[32]

Overall, the Commission's current approach to inflation expectations is simple, transparent and consistent with a number of research findings.[33,34] Nonetheless, if long-term inflation expectations were to 'de-anchor' (ie, shift materially for a sustained period), it would not be valid to use 2.5 per cent as a proxy target.

How would a four-year forecasting approach compare with the Commission's current method?

The Commission could consider approaches that aim to forecast inflation over the four-year regulatory horizon, as opposed to ten years. This would require balancing any extra accuracy of using a shorter time horizon against the potential inconsistency with the (unobserved) long-term inflation expectations inherent in capital investment decisions and the ten-year market instruments used to calculate the nominal WACC.

There are many ways to forecast inflation. The RBA's forecast, which is limited to two years ahead, can be considered a subjective assessment of the inflation path, implicitly weighting many indicators, including various inflation models[35] as well as surveys and market-based measures of inflation expectations.[36]

Examples of forecasting approaches that the Commission could use are: the RBA's forecast for either one or two years ahead with an assumption of 2.5 per cent thereafter;[37] a random walk approach for one-year ahead and assuming 2.5 per cent for the three years thereafter; market-implied forecasts for the four-year horizon; or predictions from professional forecasters or from consumer and business surveys. As can be seen in Table 3, a number of the approaches result in forecasts that are similar to the measures of long-term inflation expectations outlined earlier in Table 1.

29 See Tulip and Wallace (2012), 'Estimates of Uncertainty around the RBA's Forecasts', RBA Research Discussion Paper 2012-07, pp.12-13, available at https://www.rba.gov.au/publications/rdp/2012/pdf/rdp2012-07.pdf.

30 The random walk model assumes that increases and decreases are equally likely and therefore always forecasts no change. Outperforming a random walk is not necessarily common for inflation forecasting; see Tulip and Wallace 2012 p. 14.

31 See Tulip and Wallace p. 13. Tawadros (2013) also finds that RBA forecasts outperformed professional forecasters; see Tawadros (2013), 'The information content of the Reserve Bank of Australia's inflation forecasts', *Applied Economies*, 45(5), pp. 626-627.

32 This is consistent with successful inflation targeting: over periods where the central bank's policy lever has most influence (typically known to be a 1-2 year horizon), deviations of inflation from the target band should be unpredictable; see Tulip and Wallace p. 13.

33 The consumer groups surveyed as part of the AER's review of the regulatory treatment of inflation in 2017 favoured this type of approach; see AER (2017), 'Regulatory treatment of inflation' final position, December 2017, p.30, available at https://www.aer.gov.au/system/files/AER%20-%20Final%20position%20paper%20-%20Regulatory%20treatment%20of%20inflation%20-%20December%202017%20-%20Web%20upload.PDF.

34 To the extent that the RBA will publish forecast ranges, the Commission has to use the mid-point even though this may not reflect the RBA's central forecast; see Ellis 2017 pp.1-2.

35 See Norman and Richards (2012), 'Modelling inflation in Australia', RBA Research Discussion Paper 2010-03, available at: https://www.rba.gov.au/publications/rdp/2010/pdf/rdp2010-03.pdf.

36 See Vahey (2017), 'Report to the AER on estimating expected inflation', September 15 2017, p. 7, available at: https://www.aer.gov.au/system/files/Prof%20Shaun%20P%20Vahey%20-%20Report%20to%20the%20AER%20on%20estimating%20expected%20inflation%20-%2015%20September%202017.PDF.

37 This approach is followed by IPART; see Appendix B.

Table 3: Example forecasting approaches for the next four years (from May 2019)[38]

Approach	Inflation forecast
	Annual average for next four years (from May 2019, per cent)
RBA forecast one-year and three years of 2.5 per cent	2.4
RBA forecasts for next two years and two years of 2.5 per cent	2.2
Random walk for one-year and three years of 2.5 per cent	2.2
Market economists' inflation expectations two years ahead and two years of 2.5 per cent	2.5

Recent research on inflation expectations in advanced economies, including Australia, suggests that, since 2005:

- professional forecasters' inflation expectations have been more accurate at anticipating future inflation than those of market-implied measures at a two-year horizon or longer,[39] and
- market-implied forecasts and those of professional forecasters have had similar forecast accuracy at shorter horizons, and both tend to be as accurate as a random walk or auto regressive process (ie a benchmark where the forecast depends on the central bank's target and the last period's observed inflation).[40]

Taken at face value, the research findings outlined above suggest that there is likely to be limited extra accuracy from moving toward a forecasting approach, relative to the level of accuracy already implicitly embedded in the Commission's current method (which includes the RBA's forecast of inflation one-year ahead). Nonetheless, the Commission is open to discussing forecast approaches that avoid large and persistent forecast errors and are supported by evidence.

Alternative approaches to estimating long-term inflation expectations

There are three alternative methods that may be used to estimate long-term inflation expectations:

- the long-term bond breakeven rate
- using long-term inflation swaps, and
- surveys of professional forecasters

Long-term bond breakeven rate

The long-term bond breakeven rate approach is a market-based measure of long-term inflation expectations. It is calculated as the difference in yields between nominal and inflation-indexed CGS, adjusted for other market-based factors and typically calculated over a short-term averaging period such as 20 days.[41] The key argument in favour of using the long-term bond breakeven rate is theoretical and based on the notion that

[38] Based on latest available data: RBA 2019, p. 71; CPI inflation is for March quarter 2019; survey data on market economists' inflation expectations two years ahead was collected in the March quarter 2019 and is based on the median of survey respondents. The latter two data series are sourced from RBA Statistical Tables G1 and G3.

[39] See Adeney, Arsov and Evans (2017), 'Inflation expectations in Advanced Economies', RBA Bulletin, March quarter 2017, pp. 37-38, available at https://www.rba.gov.au/publications/bulletin/2017/mar/pdf/bu-0317-4-inflation-expectations-in-advanced-economies.pdf.

[40] See Adeney, Arsov and Evans, pp. 37-38. The market-implied forecasts used in this particular research were based on inflation swaps.

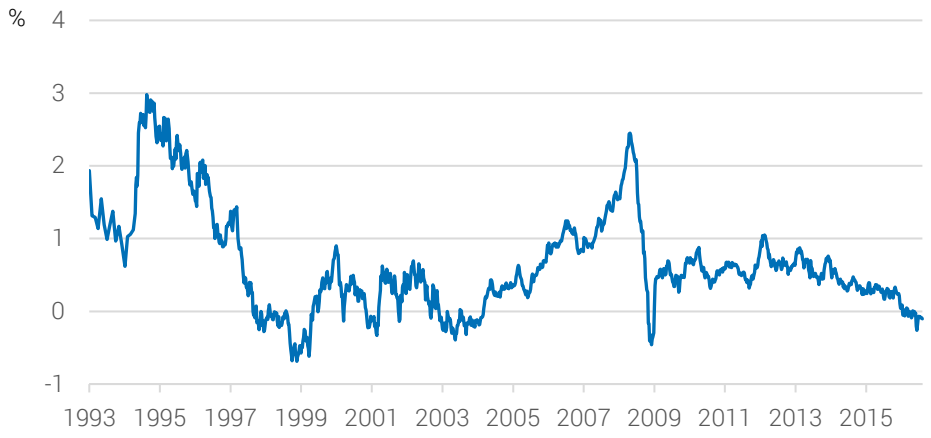
[41] Such as the different maturities and coupon frequencies of the bonds.

investors have large financial resources at stake and strong incentives to form accurate expectations of inflation.

However, two aspects of CGS markets can impede its use as a pure measure of inflation expectations.

First, the yield on nominal and inflation-indexed CGS includes an inflation risk premium, which is compensation for bearing inflation risk (that is, higher or lower than expected inflation).[42] Research suggests the inflation risk premium can bias the long-term bond breakeven rate upward; estimates suggest that it can be large, time-varying and at longer-term horizons can account for much of the variation in the bond breakeven rate (Figure 3).[43] This makes it difficult to distinguish between movements due to pure changes in inflation expectations and those associated with the risk premium.

Figure 3: Estimates of long-term inflation risk premiums in Australia[44]



Source: Finlay and Wende (2011), updated in Moore (2016)

Second, the market for inflation-indexed CGS is relatively small. In 2017-18, annual turnover of nominal CGS was more than twenty times as large as turnover for inflation-indexed CGS.[45] Investors may therefore demand a liquidity premium (ie a higher yield on inflation-indexed CGS) to compensate for the risk of market prices moving against them in a substantial way if they try to sell their position. This can downwardly bias the bond breakeven inflation rate.[46,47]

Taking these two biases together, there is a risk they will not be offsetting. As a result, their presence has led most utility regulators to move away from the use of the bond breakeven rate. The current exception is the Economic Regulatory Authority (ERA) in Western Australia; in recent regulatory decisions the ERA has argued for the use of the bond breakeven rate.[48]

---

42 See Finlay R and S Wende (2011), 'Estimating Inflation with a Limited Number of Inflation-indexed Bonds', RBA Research Discussion Paper 2011-01, pp. 1-39, available at https://www.rba.gov.au/publications/rdp/2011/pdf/rdp2011-01.pdf.

43 See Finlay R and S Wende, pp. 15-16. The authors note that their estimates of risk premiums may include liquidity premiums.

44 The data in Figure 3 is up to August 2016.

45 Turnover is calculated in value terms and includes all tenors. Data available from the Australian Office of Financial Management (AOFM), available at: https://aofm.gov.au/statistics/historical-data/secondary-market-turnover/.

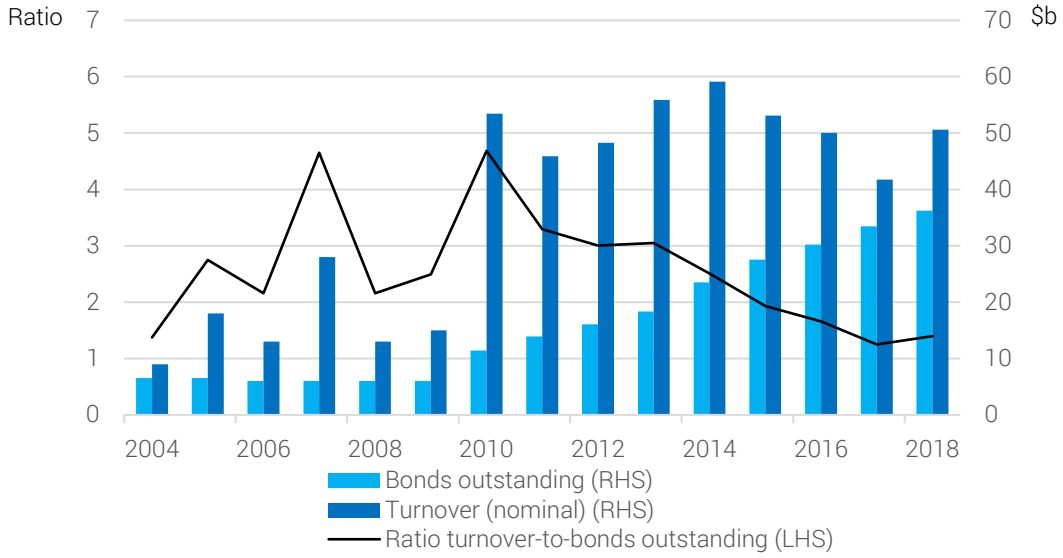
46 See Moore (2016), 'Measures of inflation expectations', RBA Bulletin, December quarter 2016, pp.27-28, available at https://www.rba.gov.au/publications/bulletin/2016/dec/pdf/rba-bulletin-2016-12-measures-of-inflation-expectations-in-australia.pdf. The effect of a lack of liquidity can be most pronounced in times of uncertainty. A number of regulators, including the AER, discontinued the use of the bond breakeven approach following the onset of the global financial crisis; see AER 2017, p. 58.

47 The presence of liquidity premiums in inflation-indexed government securities is also evident in international securities markets. See Christensen and Gilan (2011),' TIPS liquidity, breakeven inflation, and inflation expectations', FRBFS *Economic Letter*, 20 June 2011, available at https://www.frbsf.org/economic-research/publications/economic-letter/2011/june/tips-liquidity-breakeven-inflation-expectations/.

48 See ERA (2018), 'Final Gas Rate of Return Guidelines Explanatory Statement – Meeting the requirements of the National Gas Rules', pp.249-52, available at https://www.erawa.com.au/cproot/19969/2/2018%20Final%20Gas%20Rate%20of%20Return%20Guidelines%20Explanatory%20Statement.PDF.

In addition to research indicating the presence of premiums and biases, some quantity-based metrics suggest that market liquidity for inflation-indexed CGS is relatively low.[49] While issuance (ie supply) of inflation-indexed CGS has increased in recent years, traded volume (turnover) has not kept pace with the expansion, suggesting that liquidity in the secondary market may have fallen (Figure 4). The turnover to bonds outstanding ratio is around half the same ratio calculated for nominal CGS in Australia, further reinforcing the risk that liquidity of inflation-indexed CGS could be low.[50] More generally, research suggests that market participants in Australia have been increasingly transacting in derivative instruments rather than bonds.[51] This is consistent with the broad-based decline since the global financial crisis in the ratios of turnover to bonds outstanding in Australian fixed-income markets including nominal CGS, State Government securities and Corporate securities.[52]

Figure 4: Stock of outstanding inflation-indexed CGS and annual turnover, all available tenors included



Sources: AOFM; RBA

The bid-ask spread observed for inflation-indexed CGS can also be an indicator of market liquidity. However, while the spread can measure the cost of trade execution, it does not account for how costs might vary for multiple trades or trades larger than the minimum size.[53] In 2016, the RBA reported that bid-ask spreads in government bond markets had narrowed and reached their narrowest levels in many years. The RBA has previously attributed the narrowing in spreads to a fall in the volume that can be transacted at those low spreads due to increased electronic trading and decreased principal-based market making.[54]

Overall, while the use of the bond breakeven measure is transparent and grounded in theory (ie market participants have strong incentives to form accurate expectations), the potential presence of large and time-varying biases and premiums is a key limitation.

[49] It should be noted that measuring liquidity is not straight-forward, particularly in Australian fixed income markets where secondary activity is not always conducted on electronic markets. See speech by Deputy Governor of the RBA: Debelle (2016), 'Liquidity in Australian Fixed Income Markets', address to the 4th Australian Regulatory Summit, Sydney, 21 June, available at https://www.rba.gov.au/speeches/2016/sp-ag-2016-06-21.html.

[50] In 2017-18, the ratio of turnover to bonds outstanding for nominal CGS was approximately 2.5 compared to 1.5 for inflation-indexed CGS.

[51] See Debelle 2016.

[52] See Debelle 2016

[53] See Debelle 2016.

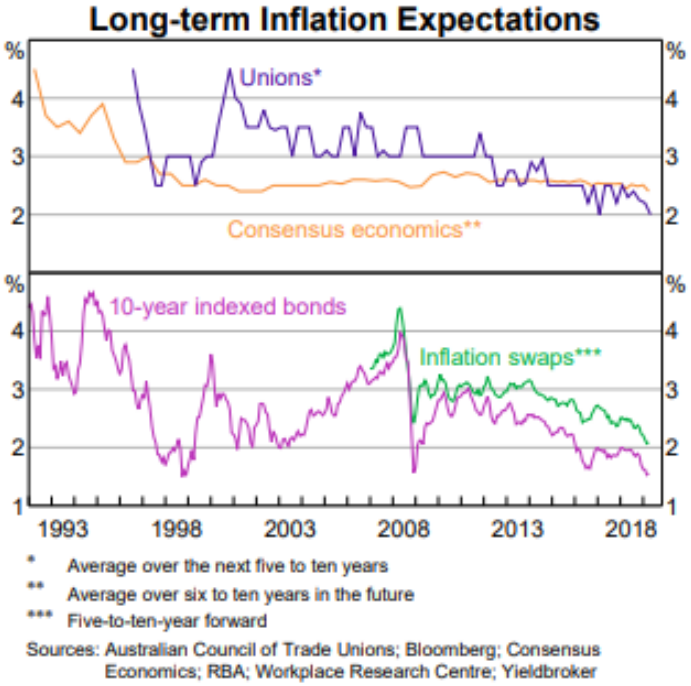
[54] See Debelle 2016. The AOFM reported in late 2018 that liquidity in inflation-indexed CGS had continued to prove noticeably more challenging than for nominal CGS and that large transactions of inflation-indexed CGS can at times move market prices. See AOFM (2018), 'Annual Report 2017-18', 17 September 2018, p. 20, available at: https://cdn.tspace.gov.au/uploads/sites/31/2018/10/AOFM-annual-report-2017-18.pdf.

The bond breakeven approach was previously used by the Commission in SAW RD13,[55] a time when the bond market-implied rate was averaging around 2.5 per cent over the year in the lead up to the determination. However, at the time of SAW RD16, a number of utility regulators in Australia had already moved away from the bond breakeven approach, partly due to concerns about premiums and biases in the measure, and the RBA forecast one-year ahead was in line with the bond market-implied rate of long-term inflation expectations.[56]

Long-term inflation swaps

Another measure of inflation expectations that could be considered is the fixed rate on inflation swaps, which is a type of financial derivative product (bottom panel, Figure 5). In an inflation swap, one party receives a payment indexed to inflation in exchange for a payment determined by a fixed rate, which is agreed at initiation of the contract.[57] Users of inflation swaps include pension funds (who use them to hedge long-dated inflation-linked obligations) and infrastructure project providers (who use them to hedge their inflation-linked assets or revenues).[58]

Figure 5: Market- and survey-based measures of long-term inflation expectations[59]

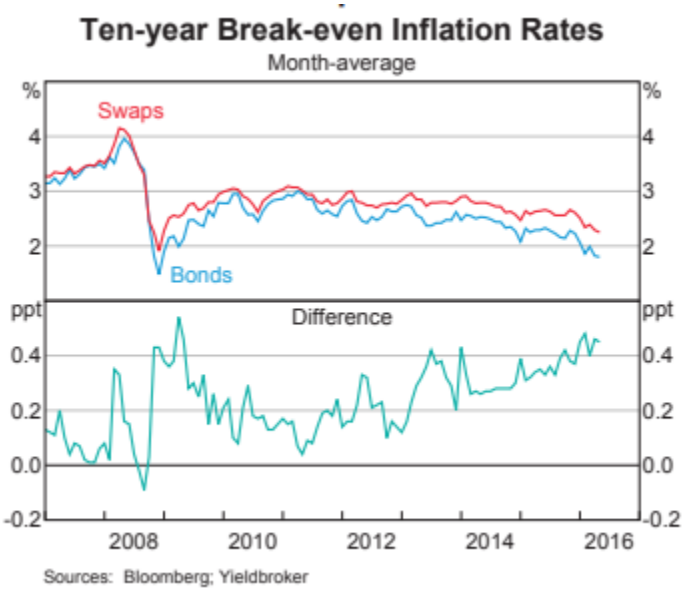


As with the bond breakeven approach, the key advantage of inflation swaps is that their pricing is determined by markets (where investors should have strong incentives to form accurate expectations for inflation). Also, the supply of inflation swaps is not constrained, so in theory they should be less affected by liquidity premiums.[60] Figure 6 illustrates that the long-term rate of inflation expectations implied from inflation swaps

[55] See Commission (2012), 'SA Water regulatory determination', June 2013, p.145, available at: https://www.escosa.sa.gov.au/ArticleDocuments/488/130527-SAWater_Water_SewerageRevenu.pdf.aspx?Embed=Y.
[56] See RBA, p. 61.
[57] See Moore, pp. 24-25.
[58] See Moore, pp. 24-25.
[59] The chart is sourced from RBA 2019, p. 61.
[60] See Finlay and Olivan (2012), 'Extracting information from financial markets', RBA Bulletin, March quarter 2012, pp. 50-51, available at https://www.rba.gov.au/publications/bulletin/2012/mar/pdf/bu-0312-6.pdf.

in Australia has tended to be consistently higher than the rate implied by the bond breakeven approach (and as of 26 March 2019 the size was estimated to be around 0.3 percentage points[61]).[62]

Figure 6: Gap between market-based measures of long-term inflation expectations[63]



Nonetheless, there are a number of disadvantages in the use of long-term inflation swaps. The market for swaps can lack transparency[64] and, like the bond breakeven approach, includes inflation risk premia that can bias the measure.[65] Also, the users of swaps (eg financial institutions) are subject to various financial regulations and this can act as a practical liquidity constraint.[66] In addition, the market for inflation swaps has only been in operation in Australia since 2008 and so, arguably, there is uncertainty about the size of potential biases and further research may be needed to resolve that uncertainty.[67] In its recent review of inflation, the AER noted some of the advantages of the swaps approach, but expressed caution about deriving inflation expectations from these products.[68] No Australian utility regulator currently uses this approach.

Surveys of professional forecasters

The use of surveys of market economists' expectations of average annual inflation over the next five to ten years, such as that published by Consensus Economics, could be a potential alternative to the Commission's current method (top panel, Figure 5). These surveys are considered a useful way to gauge long-term inflation expectations, as they should be less influenced by temporary economic factors or financial market developments, and because respondents are well informed.[69] They should also react to any de-anchoring of inflation expectations (that is, the measure should capture if long-term inflation expectations were to shift materially for a sustained period).[70,71]

61 Based on daily data reported on 26 March 2019; see Poljak and Commins.
62 The difference between the bond breakeven and swaps measures is also observed in many international markets, with the difference sometimes thought of as the upper bound estimate of the liquidity premium present in that particular inflation-indexed bond market; see Christensen and Gilan.
63 The chart is sourced from Moore, p.28.
64 See Moore, pp. 28-30.
65 See Finlay and Olivan, pp. 50-52.
66 See Moore, pp. 28-30.
67 See Moore, pp. 28-30.
68 See AER, pp. 55-56.
69 See Ellis, pp. 1-2.
70 See Ellis, pp. 1-2.
71 Research by the AER indicates that following an event that leads to a shift of professional forecasters' long-term inflation expectations, these expectations have tended to return to the mid-point of the target band within two to three years; see AER, pp.111-112.

A practical issue is that the information in the survey is proprietary, which may restrict replicability and transparency. The data are also only published twice a year (in April and October).[72] While no Australian utility regulator follows this approach, the AER recently (in 2017) began subscribing to Consensus Economics to obtain survey estimates to better inform their decision-making.[73] The AER considers the survey-based measure a cross-check to its current approach (which is similar to the Commission's approach[74]) and indicates that further research on the measure could be undertaken.[75]

Assessment

There exists many ways to estimate inflation for the purposes of converting the WACC from a nominal return to a real rate of return. This includes using estimates of long-term inflation expectations or forecasts of inflation over the SAW RD20 period. However, there is no known framework that eliminates inflation risk entirely, which could be practically implemented. Selection of the most appropriate approach involves some compromise, balancing the theoretical and practical advantages and disadvantages of each approach.

Existing research and the Commission's review of other regulators' practices supports the Commission's current method. Nonetheless, the Commission remains open to discussing the various approaches to estimating long-term inflation expectations and forecasting inflation, and the available mechanisms to mitigate inflation risk.

In considering the various options described in the paper, the Commission's current assessment is that:

- the current approach is simple, transparent and supported by research (and there is probably limited additional forecast accuracy to be gained from using an alternative approach)
- an approach that uses market-based measures of long-term inflation expectations would be transparent and grounded in theory, but at the same time would have significant practical limitations, and
- an approach that uses surveys of professional forecasters' long-term inflation expectations is simple and supported by research, but the data is proprietary and would limit transparency.

Rather than re-setting the real rate of return at the start of each regulatory period, annual resets could be a regulatory mechanism to help to mitigate inflation risk.

[72] See Ellis, pp. 1-2.
[73] See AER, pp. 1-2.
[74] See Appendix B.
[75] See AER, p. 48.

Appendix A

General principle: The rate of return should reflect the prudent and efficient financing strategy of an incumbent large water utility, which minimises expected costs in the long term, on a risk-adjusted basis.

Supporting principle 1: The rate of return should reflect a long-term obligation on the utility to provide reliable and secure water and sewerage services to consumers. It should not solely reflect the new entrant cost of capital.

Supporting principle 2: The rate of return should provide an incentive for SA Water to incur prudent and efficient investment in regulated assets and financing costs.

Supporting principle 3: The approach to setting the regulatory rate of return should be based on consistent principles over time and should be predictable. It should change only to reflect material changes in evidence or regulatory practice.

Supporting principle 4: The assumed prudent financing strategy should not depend on the ownership of the regulated business (that is, the approach is indifferent to whether the entity is in Government or private ownership).

Appendix B[76]

Regulator	Inflation estimation method	Basis of determination
ESCOSA	Average of RBA forecast for the first year and the RBA target band (currently 2.5 per cent) for the next nine years	Post-tax real
AER	Average of RBA forecasts for the first two years and the RBA target band (currently 2.5 per cent) for the next eight years	Post-tax nominal
IPART	Estimates inflation for the regulatory period rather than the next 10 years, using the RBA's Statement of Monetary Policy for the first year's estimate	Post-tax real
ERA	Difference between the on-the-day nominal and real, five-year risk-free rate of return	Pre-tax real
ESCV	Variable according to proposals from businesses, but generally zero	
QCA	Assumes a general inflation rate of 2.5 per cent	
OTTER	Assumes a general inflation rate of 2.5 per cent	
ICRC	Assumes a general inflation rate of 2.5 per cent	

[76] See Commission, SA Water Regulatory Determination 2020 Guidance Paper 5: The cost of funding and using assets, pp. 28-29.

Appendix C

Regulator	Current method[77] (measured as at time of determination, per cent)	Long-term bond breakeven rate method (measured as at time of determination, per cent)	Realised CPI inflation[78] (annual average over period, per cent)
SAW RD16	2.5	2.0	1.8
SAW RD13	2.5	2.7	1.9
The outcomes below are those calculated under each method every four year period prior to RD13			
2009	2.5	2.2	2.4
2005	2.5	2.9	3.0
2001	2.5	2.0	2.6
1997	2.4	3.1	1.6
1993	2.5	3.4	2.4
Average absolute difference between method and realised CPI inflation	0.4	0.7	

[77] Historical RBA forecasts of CPI inflation have been used to calculate the rate of long-term inflation expectations that would have occurred at the start of each four-year period. We use the one-year ahead forecasts as of March 1993, March 1997, May 2001, May 2005 and May 2009. These forecast data are available: https://rba.gov.au/statistics/historical-forecasts.html.

[78] Based on headline (all groups) measure of year-ended CPI inflation.