Regulatory treatment of inflation - 2020 review

SUBMISSION TO THE DRAFT POSITION PAPER – 6 NOVEMBER 2020

Queensland Treasury Corporation (QTC) welcomes the opportunity to provide comments on the Australian Energy Regulator's (AER) Draft Position Paper on the regulatory treatment of inflation.

1   Summary

- QTC supports a 5-year glide path for estimating expected inflation. A glide-path should produce a better estimate compared to the current approach, provided the glide-path inputs are tested against market estimates of inflation.
- QTC supports the new objective of making revenue deductions on the regulated asset base (RAB) equal to the amount of inflation that is expected to be added to the RAB in Roll-Forward Model (RFM).
- QTC considers zero-coupon inflation swap rates (ZCIS) to be useful market-based information that can be used to test the AER's assumption that expected inflation will revert to the 2.50 per cent mid-point of the Reserve Bank of Australia's (RBA) target band in the final year of the glide-path.
- The AER has cited perceived biases in inflation swaps such as margins for hedging costs, cash flow mismatches and counterparty risk. To the extent these margins exist, they will be reflected in the dealt inflation swaps rates on actual transactions, which are not disclosed to the market, not the published closing ZCIS mid-rates.
- The AER's proposed approach uses RBA forecast inflation for years 1 and 2 followed by a linear glide-path from the year 2 forecast to the 2.5 per cent point of the RBA target band in year 5. In our view, assuming that expected inflation will revert to the RBA mid-point in year 5 is not realistic at the current time:
  - The implied forward 1-year ZCIS rate in year 5 is **1.75 per cent**. If expected inflation actually is 2.50 per cent then the implied inflation risk premium would be -0.75 per cent.
  - Model-based estimates using US Treasury bond yields show a strong positive relationship between expected inflation and the inflation risk premium. This does not support a combination of 2.50 per cent expected inflation and a -0.75 per cent inflation risk premium.
  - Model-based estimates of the inflation risk premium have been declining since 1983, and the most recent estimate is -0.20 per cent.
  - As the inflation risk premium depends on the covariance between inflation and the expected return on the market, a large inflation risk premium (positive or negative) will typically require inflation volatility to be high. However, realised inflation volatility in Australia has been steadily declining since 1980 and is currently near its all-time lows. This is more consistent with a relatively small inflation risk premium.
  - Based on these considerations, it is QTC's view that expected inflation in the final year of the glide-path is more likely to be between **1.75–2.00 per cent** at the current time.
- There is no reason to delay the application of the glide-path or to progressively transition away from the current approach to the glide-path. The new estimate of expected inflation should apply in full from the start of a service provider's next regulatory period.
- The issue of negative net profit after tax (NPAT) in the Post-Tax Revenue Model (PTRM) received very little attention in the Draft Position Paper. QTC expects this important issue will receive the attention it deserves in the financeability working paper in the 2022 Rate of Return Instrument (RoRI) review.
- The Regulatory Economics Unit (REU) provided comments on QTC's submission to the inflation Discussion Paper. Our responses to these comments are set out in Appendix A.

2 Zero-coupon inflation swaps

- QTC considers zero-coupon inflation swap rates (ZCIS) to be useful market-based information that should be used in the 5-year glide-path. The ZCIS curve can be used to estimate expected inflation in specific years, and to test the plausibility of any non-market-based estimates the AER may consider using.

- In the Draft Position Paper, the AER states[1]:

  'The [inflation] swaps method does have some positive attributes. It uses readily available market data, and is simple to calculate. However, whilst the biases are arguably smaller than the bond break-even approach, they are likely to be material.'

  'None of the stakeholders that proposed the adoption of swaps (or other market-based measures) provided any new evidence or modelling that demonstrates that market-based measures are less affected by the biases or distortions of volatility than determined in the 2017 inflation review.'

- Both statements are inconsistent with the AER's own assessment of the perceived biases in the 2017 inflation review, which is repeated in Table H.1 of the Draft Position Paper, and summarised in Table 1 below:

TABLE 1: AER ASSESSMENT OF PERCEIVED BIASES IN ZCIS RATES

Perceived bias	AER's assessment in 2017 and 2020
Hedging costs	*'The ACCC/AER working paper #11 found that **academic literature suggests that hedging costs may be minor**, but there are not many studies to support drawing robust conclusions.'*
Inflation indexation lag	*'**This bias is potentially small** due to the short lag on indexed CGS and is not likely to be time-varying.'*
Counterparty default risk	*'… the effect of counterparty default risk on zero coupon inflation swap rates **may not be significant**. This premia could result in overestimates of expected inflation and is not likely to be time-varying.'*
Liquidity premia	*'**A-priori liquidity premia may be near zero** since swaps can be created as required and there is no supply limitation. Observations of Australian data suggest that this **liquidity premia may be negligible**.'* *'… the liquidity premium is likely to be greater during periods of uncertainty when investors' appreciation of liquidity risk may have changed.'*
'Inflation risk premium'	The inflation risk premium (based on the covariance between inflation and the expected return on the market) was not cited as a bias in the 2017 inflation review or in Table H.1 of the draft position paper. What the AER described as 'inflation risk' is actually a risk arising from cash flow mismatches when an inflation swap is hedged with nominal and real CGS (ie, an imperfect hedge). There is no reason to believe the compensation (if there is any) for this risk is systematic, so it should be treated as a hedging cost/risk.

Source: AER Draft Position Paper, Table H.1, p. 133–134

- According to the AER's assessment in the 2017 inflation review, and repeated in Draft Position Paper, the perceived biases in Table 1 may be 'minor, potentially small, near zero or negligible'. The AER has not explained why these perceived biases are now be considered likely to be material, and why the AER expected stakeholders that proposed using inflation swaps to provide new evidence or modelling for an issue that seemed to have been settled in 2017.

- The AER also does not explain how it is possible for a perceived bias that has not been quantified to also be considered material[2]:

  'As long as these biases remain material and unquantified, we do not consider it suitable to use swaps as a measure of inflation ….'

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[1] AER, October 2020, *Draft Position Paper – Regulatory treatment of inflation*, p. 53

[2] AER, October 2020, *Draft Position Paper*, p. 54

- It is important for the AER to clarify its position on these perceived biases in the final decision. This position should consider Section 2.1 of this submission, which explains the difference between published end-of-day ZCIS mid-rates and the dealt rates are agreed on actual inflation swap transactions.

- It is also important for the AER to take a balanced approach and address the potential biases in the inflation forecasts from the RBA and Consensus Economics (CE). Unlike market-based estimates of inflation, forecasts are subjective opinions that are not backed by real money in real markets. The inability to scrutinise the CE forecasts and to understand the assumptions behind them is a major weakness (ie, the process is a 'black box').

- In our view, it is highly unlikely that a balanced and objective assessment of all potential biases would conclude that no weight should be given to ZCIS rates when implementing a 5-year glide-path.

2.1 Published closing ZCIS rates

- ZCIS rates are the market price of inflation as they reflect the base rates for converting nominal cash flows to real cash flows and vice-versa. The published closing ZCIS rates are mid-market rates. They do not reflect the actual total inflation swap rates that have been agreed on actual transactions between market makers and initiating swap counterparties.

  - This is an important distinction because even if margins for hedging costs, transaction costs, cash flow mismatches due to imperfect hedges and counterparty risk exist, they will be reflected in the spread charged by the market maker between the mid-rate and the dealt rate.

- Inflation swaps are marked-to-market using published closing ZCIS mid-rates. By reflecting any cost/risk margins in the spread from the mid-rate the NPV of the inflation swap will be positive at inception for the market maker. Part of the positive NPV will be offset by the initial hedging costs with the remainder acting as a buffer against future adverse outcomes from imperfect hedges and counterparty defaults.

- If these margins were reflected in the published closing mid rates the NPV of the inflation swap for the market maker would be zero at inception. This would provide no incentive for the market maker to provide liquidity and make two-way prices to the market.

- Another reason why certain cost/risk margins are not reflected in the published closing ZCIS mid-rates is because they are not the same for all counterparties and all transaction types. For example:

  - There is no single margin for counterparty default risk because different counterparties have different levels of credit worthiness. Different spreads may apply to transactions involving counterparties with different credit ratings, but this does not change the base market price of inflation.

  - The impact of a counterparty risk margin on the dealt rate will also depend on whether the counterparty is paying fixed (ie, the margin increases the dealt rate) or receiving fixed (ie, the margin decreases the dealt rate), so it is not possible for this margin be expressed in the published ZCIS mid-rates.

  - Hedging mismatches for a standard ZCIS transaction, which has a single net cash flow at maturity, are smaller than the mismatches for a bespoke cash flow profile for a long-term infrastructure project. All else equal, the spread charged from the mid-rate is likely to be higher for the second type of transaction compared to the first. However, the higher spread does not change the market price of inflation.

- If ZCIS rates are used for regulatory purposes it is the published closing mid-rates that will be used. *Even if* margins for hedging costs, transaction costs, cash flow mismatches due to imperfect hedges and counterparty risk exist, they will not be reflected in the published end-of-day ZCIS mid-rates.

- QTC notes that ZCIS mid-rates may be temporarily affected by relatively large transactions depending on the level of market liquidity at the time. To the extent that liquidity effects are an issue, a 20–40-day average of the published closing ZCIS mid-rates as suggested in Moore (2016) should be used[3].

2.1.1 A real-world example

- In 2010 QTC executed an inflation swap transaction based on a bespoke series of nominal cash flows and a non-standard indexation lag. The process for setting the fixed inflation rate for the transaction was as follows:

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[3] Moore, December 2016, *Measures of Inflation Expectations in Australia*, p. 29.

It should also be noted that liquidity effects due to relatively large transactions tend to reverse over short periods of time. For example, if a large pay fixed ZCIS transaction causes the ZCIS rate in the market to increase, it will become more attractive for other market participants who are interested in receiving fixed. As a result, liquidity-driven movements in ZCIS rates are likely to reverse over the short-term. A 20–40-day average of the closing mid-rates is an effective way of smoothing out these movements.

- The inter-bank ZCIS bid/offer rates for a standard size market transaction were used to calculate a blended base inflation rate based on the present value of the nominal cash flow profile.
- A separate margin was determined prior to transacting to compensate the swap counterparty for execution risk, hedging mismatches and the non-standard indexation lag requested by QTC. The total rate for the transaction was equal to the blended base rate plus the margin.
- The transaction was priced at the market close. The NPV of the inflation swap was positive (negative) for the counterparty (QTC) when it was first marked-to-market.

2.2 Volatility in ZCIS rates

- The AER also considers the volatility in ZCIS rates to be a reason why they are unsuitable for regulatory purposes[4]:

   '… the volatility of swaps noted in the 2017 inflation review, has increased since the outbreak of COVID-19. In the RBA's August 2020 Statement on Monetary Policy, the RBA noted that short and long-term market-based measures of inflation expectations have declined since the outbreak of the pandemic in early 2020. The RBA noted that these measures have been significantly affected by dysfunction in these markets in the months following the initial shock of COVID-19.'

- QTC notes the very next sentence from the RBA Statement on Monetary Policy[5]:

   'Since May, market functioning has improved and market-based measures have increased.'

- As shown in Figure 1 the 10-year ZCIS mid-rate pre-COVID-19 was not volatile. The steady downtrend is consistent with a progressive fall in market-expected inflation and a declining inflation risk premium.

FIGURE 1: 10-YEAR ZCIS MID-RATE RATE

Source: Bloomberg. 20-day averages.

- The increase in volatility due to COVID-19 was not unique to the ZCIS market. For example, between 20 February and 23 March the Australian stock market fell by 36 per cent, which is a *10 standard deviation* event. This was accompanied by a large spike in implied equity volatility from 11 per cent to over 50 per cent (Figure 2).

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[4] AER, October 2020, *Draft Position Paper*, p. 53–54.

[5] RBA, August 2020, *Statement on Monetary Policy*, p. 86

FIGURE 2: ASX200 IMPLIED VOLATILITY
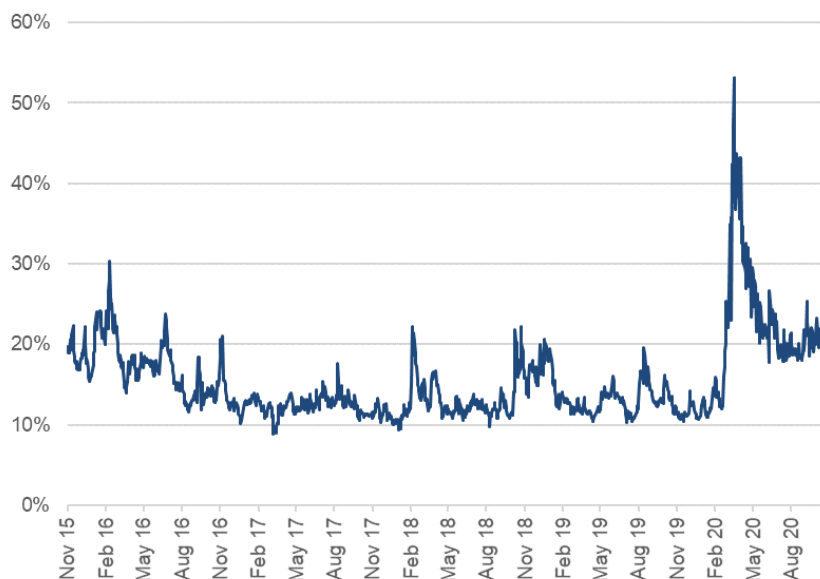
Source: S&P Dow Jones Indices

- During this period of increased volatility, market participants were trying to assess the impact and effectiveness of a range of unprecedented stimulus and support packages from the Commonwealth Government and the RBA. Of particular note was the spike in the 10-year nominal CGS yield from its previous closing value of 1.3 per cent to an intra-day high of 2.5 per cent before closing at 1.60 per cent. These movements coincided with the RBA providing details of its quantitative easing program to the market.

- It should not be surprising that ZCIS became more volatile during a period of unprecedented economic and social uncertainty. In fact, it would be surprising if the ZCIS *did not* become more volatile during this period. Against the backdrop of a 10 standard deviation fall in the stock market, it is reasonable to assume that market participants revised down their inflation expectations during this period.

- Part of the increased volatility in ZCIS rates is due to the floating leg being indexed by changes in the headline CPI. As explained by the RBA Assistant Governor Luci Ellis:[6]

    'Temporary factors are driving large movements in inflation in the June and September quarters. Headline CPI declined by 2 per cent in the June quarter. This decline is entirely accounted for by two factors: the fall in petrol prices and the decision to make child care (and some preschool) free.'

    'Most of the decline in headline CPI will reverse in the September quarter. Petrol prices increased a little in recent months, and fees for child care and preschool are being progressively reintroduced. So there will be some further volatility in the headline inflation figures. This volatility will be less evident in the various underlying measures.'

- The volatility in headline CPI that affected the ZCIS market for a few months was the same volatility that prompted the AER to temporarily change its inflation approach and use the more stable trimmed mean inflation (TMI) forecasts instead of headline CPI forecasts:[7]

    *'We used TMI forecasts in making our June 2020 final decisions for SA Power Networks, Energex, Ergon Energy, Jemena Gas Networks and Directlink. **This was due to exceptional COVID-19 related volatility reflected in the May 2020 RBA SMP CPI forecasts over the course of the 2020 calendar year.**'*

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[6] Reserve Bank of Australia, 7 August 2020,, *The Economic Outlook*, p. 9.

Headline CPI in the June 2020 quarter fell by 1.9 per cent, and this was largely reversed by the 1.6 per cent increase in headline CPI in the September 2020 quarter. This reversal has resulted in the 10-year ZCIS rate returning to pre-COVID-19 levels.

[7] AusNet Services, 2020, *Draft Decision - Attachment 3: Rate of return*, p. 8

- Based on the RBA inflation forecasts in the May 2020 Statement on Monetary Policy the average CPI forecast for FY21 and FY22 was 2.13 per cent based on headline CPI and 1.38 per cent based on trimmed mean inflation. Under the proposed glide-path this would have reduced the AER's estimate of expected inflation by 0.30 per cent.
- As shown in Figure 1, the impact of COVID-19 on ZCIS rates was short-lived with the market quickly returning to pre-COVID-19 levels after the temporary distortionary impacts on headline CPI had reversed.
- QTC submits that it is not reasonable to give zero weight to ZCIS mid-rates because of the short-term volatility created by COVID-19.

3   Implementing a 5-year glide-path

- The AER's proposed approach uses RBA forecast inflation for years 1 and 2 followed by a linear glide-path from the year 2 forecast to the 2.5 per cent point of the RBA target band in year 5.
- In our view, the assumption that expected inflation will revert to the RBA mid-point in year 5 is not realistic at the current time. Our views on the de-anchoring of inflation expectations from the RBA target band, due mostly to constrained and monetary policy, and asymmetric inflation risks, are summarised in Appendix A of our submission to the inflation Discussion Paper.
- For the glide-path to produce reasonable estimates, it is important for the estimate of expected inflation in year 5 to be consistent with market expectations for inflation in year 5.

3.1   Potential use of ZCIS mid-rates

- The plausibility of expected inflation reverting to the RBA mid-point in the final year of the glide-path can be tested by comparing the implied 1-year ZCIS rate 4 years forward with the RBA mid-point (Figure 3)[8].

FIGURE 3: IMPLIED FORWARD 1-YEAR ZCIS RATE IN YEAR 5 VS 2.5 PER CENT EXPECTED INFLATION

Source: Bloomberg, QTC calculations. 20-day averages

- The difference between the implied-forward ZCIS mid-rate and 2.50 per cent is the implied inflation risk premium in the final year of the glide-path (Figure 4).

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[8] The implied 1-year ZCIS rate 4 years forward is calculated by dividing the indexed value of $1 using the spot 5-year ZCIS rate over the next 5 years by the indexed value of $1 using the spot 4-year ZCIS rate over the next 4 years. This is the implied forward ZCIS rate for the final year of the 5-year glide-path.

FIGURE 4: IMPLIED INFLATION RISK PREMIUM IN YEAR 5 ASSUMING 2.5 PER CENT EXPECTED INFLATION

Source: Bloomberg, QTC calculations. 20-day averages

- The current 20-day average implied forward ZCIS rate is **1.75 per cent**. If expected inflation in year 5 actually is 2.50 per cent then the implied inflation risk premium would be **-0.75 per cent**. QTC does not consider this combination of expected inflation and the inflation risk premium to be plausible:

  – Figure 5 shows model-based estimates of expected inflation and the inflation risk premium based on US Treasury bond yields between 1983–2020[9]. The relationship is strongly positive, with even slightly negative inflation risk premiums being associated with significantly below-average expected inflation.

FIGURE 5: RELATIONSHIP BETWEEN EXPECTED INFLATION AND INFLATION RISK PREMIUM (US DATA1983–2020)
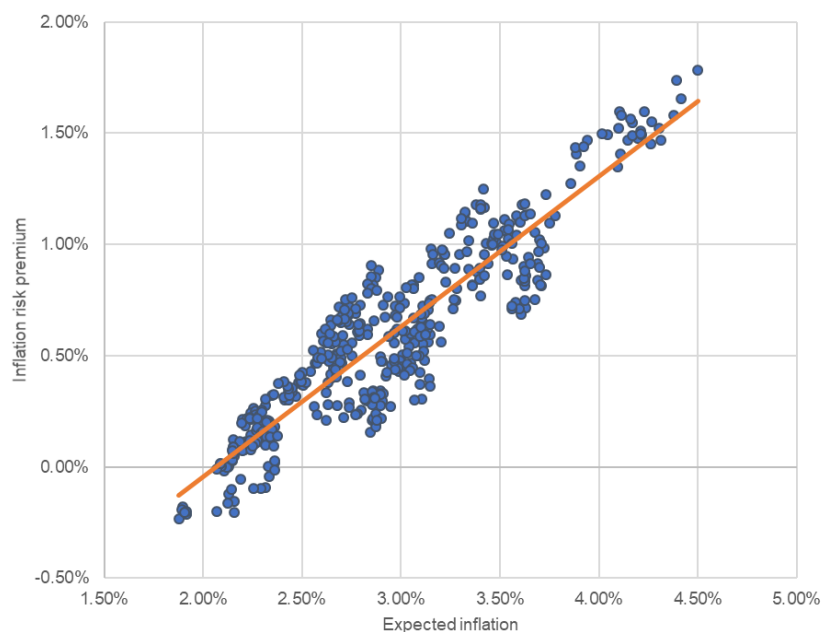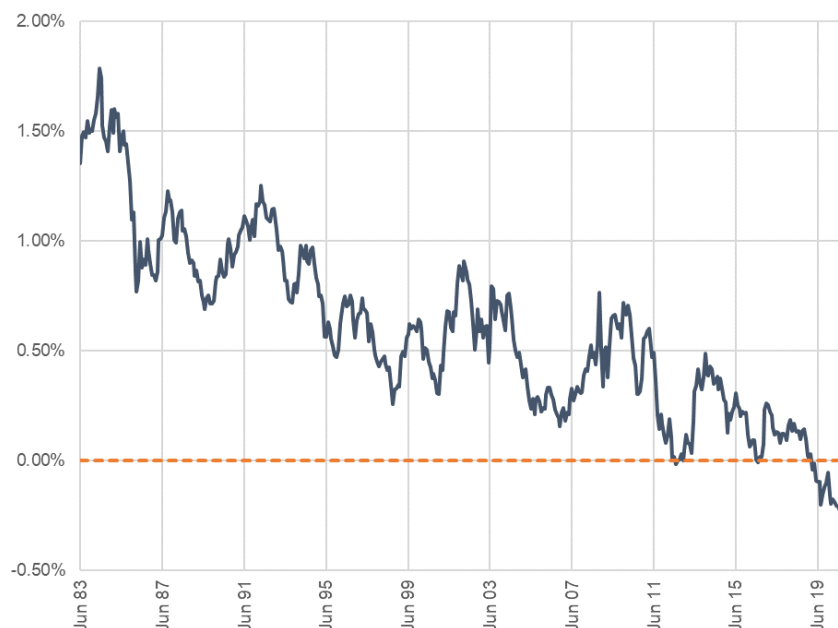

Source: Kim et al, May 2019

  – Figure 6 shows the time series of the model-based estimates of the inflation risk premium from Figure 5. The lowest estimate since 1983 is -0.23 per cent, and the most recent estimate is -0.20 per cent. Both estimates are

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[9] Kim, Walsh & Wei, May 2019, *Tips from TIPS: Update and Discussions, FEDS Notes*. Washington: Board of Governors of the Federal Reserve System, https://doi.org/10.17016/2380-7172.2355.

significantly higher (ie, less negative) than the -0.75 per cent implied inflation risk premium assuming expected inflation of 2.50 per cent in year 5.

FIGURE 6: 5-YEAR US INFLATION RISK PREMIUM 5 YEARS FORWARD

Source: Kim et al, May 2019

– Finally, the inflation risk premium compensates for systematic inflation risk because it depends on the covariance between inflation and the expected return on the market. A large inflation risk premium (positive or negative) will typically require inflation volatility to be high. Figure 7 shows the rolling 10-year standard deviation of quarterly changes in the headline CPI

FIGURE 7: ROLLING 10-YEAR CPI VOLATILITY
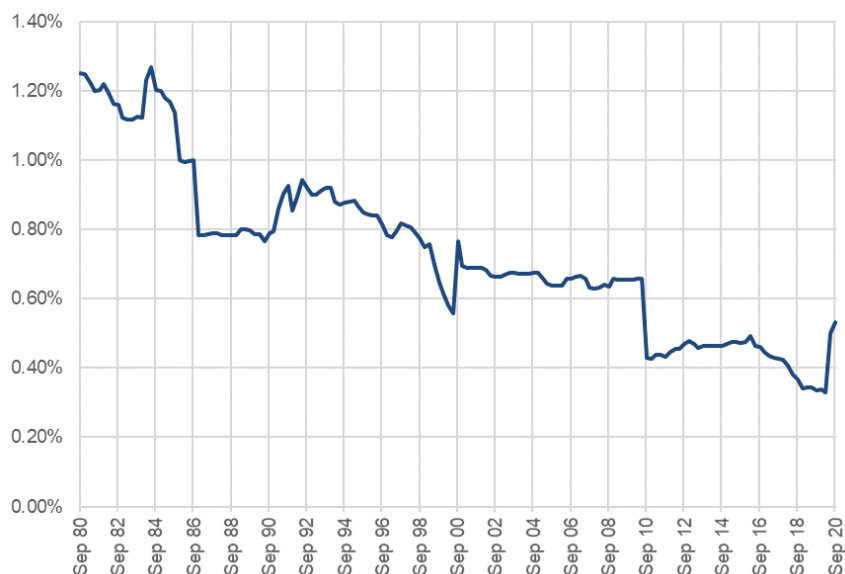
Source: RBA

– The long-term decline in realised inflation volatility is consistent with a declining inflation risk premium. This conclusion is supported by model-based estimates of the inflation risk premium in Figure 6. Australia and the United States have shared broadly similar inflation outcomes since the 1980 so it is reasonable to believe the Australian inflation risk premium would show a similar long-term decline to low or slightly negative values, but not as low as -0.75 per cent.

- In QTC's view, there are sound reasons for why expected inflation in year 5 is likely to be significantly lower than 2.5 per cent. Using the inflation risk premium estimates in Figure 6, QTC submits that expected inflation in year 5 is likely to be between **1.75–2.00 per cent** at this time.
- It is important for the AER to consider this analysis in its final decision and to provide an opinion on whether such a large a large difference between the RBA mid-point and the market estimate of inflation in the final year of the glide-path is reasonable.

3.2 The glide-path should apply immediately

- The Draft Position Paper asks if a transition from the current inflation approach to the new approach should apply, or if a delayed start date for the new approach should be adopted.
- In QTC's view, there is no reason to delay the application of the glide-path approach or to progressively transition away from the current approach. The outcome from the glide-path should apply in full from the start of a service provider's next regulatory control period.
- By way of example, the transition to a 10-year trailing average cost of debt approach was intended to replicate the debt management strategy used by a benchmark service provider as it moved away from the previous on the day approach. There is no comparable strategy associated with expected inflation.
- The estimate of expected inflation in a service provider's current regulatory period expires at the end of the regulatory period and is fully reset just prior to the start of the next regulatory period. Whether the new estimate is calculated using a different approach is not relevant.

4 Negative net profit after tax

- The issue of negative NPAT in the PTRM received very little attention in the Draft Position Paper.
- In addition to not being able to pay a dividend for *at least* five consecutive years, an efficiently financed benchmark service provider will have a material cash shortfall that must be funded. These are important issues that have not been properly addressed in the Draft Position Paper.
- The AER's choice of Google as an example for why dividends are apparently not important is difficult to understand. There is a significant difference between a company that *chooses* to reinvest profits in growth opportunities and to fund acquisitions rather than pay a dividend, and a regulated benchmark service provider that cannot pay a dividend because a regulatory determination has put it in a loss-making position[10].
- QTC expects this important issue will receive the attention it deserves in the financeability working paper in the 2022 RoRI review.

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[10] AER, October 2020, *Draft Position Paper,* p. 88

Appendix A: REU comments on QTC's submission

- The Regulatory Economics Unit (REU) provided comments on QTC's submission to the inflation Discussion Paper[11]. Our responses to these comments are set below. A summary of QTC's proposed liquidity adjustment for the observed indexed CGS yield is provided in Appendix B.

A.1: QTC responses

> 'QTC proposed that the spread between the zero coupon inflation swap and the BBIR can provide a correction for the liquidity premia on indexed CGS. Such a correction can be employed to adjust the implied real yields when using the BBIR as an estimate of inflation in the PTRM.
>
> However, REU considers that QTC has not provided evidence that all the other biases, premia and distortions that are observed/estimated in these markets aside from the liquidity premia are negligible. Even if these other premia, biases and distortions are negligible, the potential time variation of liquidity premia presents problems for its estimation.'

- QTC's submission to the Discussion Paper clearly explains that the proposed adjustment is based on a broad definition of 'liquidity' that captures more than just traditional measures of liquidity such as bid/offer spreads and the potential market impact of large transactions[12].

> *'Christensen & Gillian 2012 use nominal and real zero-coupon US Treasury (UST) yields, and fixed zero-coupon inflation swap (ZCIS) rates to derive a maximum range for the liquidity premium in real UST yields.* ***The authors define 'liquidity' as a measure that captures any friction that drives a wedge between the observable yield and the yield that would prevail in a frictionless world.****'*

- Several of the perceived biases in observable indexed Commonwealth Government Security (CGS) yields cited by the AER/REU are actually 'frictions' that are removed by QTC proposed adjustment. For example:
  - The deflation floor in indexed CGS is a potential source of bias in the observable real CGS yields. As there is no deflation floor in ZCIS, the synthetic indexed CGS yields produced by QTC's approach do not reflect a deflation floor. As such, this perceived bias is removed by QTC's proposed adjustment for 'liquidity'.
  - The indexation lag and indexation lag risk premium are also cited as a potential source of bias in the observable inflation-indexed CGS yields. The indexation lag associated with ZCIS is much shorter than the lag for inflation-indexed CGS, so this bias is also removed (or at least greatly reduced) by QTC's proposed adjustment for 'liquidity'.
- Other perceived biases such as problems with fitting an indexed CGS yield curve, convexity, mismatched pattern of cash flows and sensitivity to short-term inflation expectations are not relevant because the observable indexed CGS yields are not required to estimate the unbiased indexed CGS yield.
- Finally, REU does not explain why time variation in the liquidity premium presents a problem for its estimation. This may be a problem for model-based estimates such as those used in decomposition studies in the academic literature, however QTC's estimate is model-free and based on observable market prices. Any time variation is automatically captured in these prices, so it is unclear why REU considers time variation to be an issue.

> 'QTC submitted that by using a market-based measure of expected inflation, the same amount of inflation compensation is included in the nominal allowed return as is included in the revenue deduction. This way, the net effect of an inflation risk premium is zero. However, the NER/NGR requires that the AER to determine a method that is likely to result in best estimates of expected inflation or a best forecast/estimate possible in the circumstances. These estimates exclude any biases, premia or distortions or at the very least they are relatively negligible compared to other methods.'

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[11] AER, October 2020, *Draft Discussion Paper*, p. 119–121

[12] QTC, July 2020, *Review of the regulatory treatment of inflation – Submission to the AER Discussion Paper*, p. 25

- The AER's legislative objective is to determine a rate of return that reflects the efficient *market* cost of capital[13].

  > *'… for the allowed rate of return to contribute to the achievement of the legislative objectives it should reflect the efficient cost of capital. If it does, then it will (all else equal) promote both efficient investment in, and efficient use of, energy network services.*
  >
  > *An allowed rate of return that reflects the efficient market cost of capital will promote both investment and consumption efficiency.'*

- An allowed return on equity that includes a negative inflation risk premium does not meet this requirement because a negative inflation risk premium can only exist in the expected return on an asset that pays off when inflation is low *and* when the marginal utility of consumption is high. Equity cannot be expected to meet this requirement.

- The relevant consideration is whether the AER's inflation approach achieves what the inflation parameter in the PTRM is intended to achieve. Under the current inflation approach (which is what QTC was responding to) the objective is to ensure the equity providers are not compensated for inflation twice. This means the dollar value of the revenue deductions on the equity-funded portion of the RAB (ie, the amount of inflation compensation taken out) must equal the total inflation compensation in the 10-year nominal CGS yield in the nominal allowed return on equity. The total inflation compensation equals expected inflation plus the inflation risk premium.

- Since 2017 the AER's current approach has allowed a large negative inflation risk premium to be reflected in the real return on equity allowance. This means the revenue deductions for expected inflation have been consistently greater than the amount of inflation compensation in the nominal allowed return on equity, thereby producing a real return on equity that does not reflect the efficient market cost of capital.

- Under the current inflation approach, the best estimate of expected inflation is one that delivers an unbiased real return on equity allowance in the PTRM. An efficient real allowance should not include the inflation risk premium.

  > '… the BBIR is often calculated from the estimates of yields on nominal and indexed bonds. If there are few tenors of nominal or indexed bonds and/or if maturities do not approximately match, yield curve models may be fitted to the observed yields to maturity. Given the few tenors of indexed CGS, many different yield curves may be fitted obtain the estimates of yields on indexed CGS with the consequence of many different BBIR implied estimates of expected inflation.'

- It is not necessary to fit a real CGS yield curve to estimate a 10-year indexed CGS yield. There are enough indexed bonds with suitable tenors to use straight line interpolation. This is an accepted approach used by real-world investors. It is also the same linear interpolation approach set out in Devlin and Patwardhan (2012)[14].

- Regardless, QTC's proposed approach is a simple and accurate approximation of a more detailed approach that uses the full ZCIS and the nominal zero coupon CGS curve from 1–10 years to produce a synthetic 10-year indexed CGS yield. The more detailed approach does not require indexed CGS yields as inputs. Fitting a nominal CGS curve is not a problem as there are currently 29 nominal CGS lines on issue with remaining tenors of 1–30 years.

  > 'REU also notes that zero coupon inflation swaps may also be subject to a number of premia, biases and distortions. The Australian zero coupon inflation swap market may have a large number of distortions arising from hedging costs, indexation lag, inflation risk premia and potential distortions from thin trading (noting also that observed zero coupon swap prices do not necessarily represent mark-to-market prices).'

- REU's concerns regarding perceived premia, biases and distortions in inflation swaps have been addressed in Section 2. QTC also notes that according to the AER's assessment in the 2017 inflation review and repeated in Draft Position Paper, the perceived biases may be 'minor, potentially small, near zero or negligible'.

- The claim that observed zero coupon swap prices do not necessarily represent mark-to-market prices is incorrect. The published closing ZCIS rates are the mid-rates that are used to calculate the end-of-day mark-to-market value of existing inflation swap positions.

  > 'QTC also considered a model free approach to the estimation of liquidity premia for the purpose of correcting AER implied real yield when using the BBIR. However, REU notes that model free estimates of liquidity

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[13] AER, 2018, *Rate of Return Instrument Final Decision - Explanatory Statement*, p. 40

[14] Devlin & Patwardhan, 2012, *Measuring market inflation expectations*, p. 9

> premia are hampered by the relative paucity of Australian data on proxies for liquidity in which to estimate liquidity premia, noting that the US cash and derivative markets are relatively data rich in that regard. In any case, in many of the studies surveyed, liquidity premia estimates were highly sensitive to both the study conducted and sample period chosen.'

- As explained in Appendix B, QTC's proposed approach is a simple and accurate approximation of a more detailed approach that uses the full ZCIS and the nominal zero coupon CGS curve from 1–10 years to produce a synthetic 10-year indexed CGS yield. The difference between the observable and synthetic indexed CGS yields *is a proxy for liquidity* – it does not rely on some other proxy for liquidity for its estimation.

- The final sentence from REU's quote appears to relate to model-based estimates of liquidity, so this is not relevant to an assessment of QTC's model-free approach.

> 'QTC observed that the average difference between the BBIR and the AER's estimates for the 12 months to December 2019 cannot be explained by the difference between the inflation risk premia and the liquidity (risk) premia because such differences would only be consistent with liquidity/flight to quality episodes.'

- This statement is not accurate. QTC's observation was based on the following claim by the AER in SA Power Network's 2020 final decision[15]:

> *'SA Power Networks stated that we did not quantify or adjust these biases in the 2017 inflation review. However, these biases were discussed at length in the 2017 inflation review. We referred to academic works where the bias is calculated such as Finlay and Wende (2011) and an updated version of their analysis published by the RBA in 2016. The analysis showed that during some periods a premia (cause of bias) of* **over 2 percentage points** *premium was estimated. Such size of bias is consistent with the differences between our existing methodology and the unadjusted bond breakeven approach.'*

- The average difference between the 10-year BBIR and AER expected inflation in the 12 months to December 2019 was *negative* 1.00 per cent, which is more negative than any estimate in the study by Finlay and Wende. Therefore, the claim that the size of bias is consistent with the estimates by Finlay and Wende is not correct.

- The average value of QTC's liquidity estimate in the 12 months to December 2019 is 0.35 per cent, which implies an inflation risk premium of -0.65 per cent based on the AER's -1.00 estimate. An inflation risk premium of this size cannot be reconciled with the AER's 2.40 per cent average estimate of expected inflation based on the prevailing market conditions in 2019.

> '… even if inflation risk and liquidity premia are robustly estimated, QTC should demonstrate with evidence that the other premia, biases and distortions are sufficiently negligible such that inferences of bias are veritably collapsible to inflation risk and liquidity premia.'

- If REU is referring to the perceived biases in inflation swaps, this is addressed in Section 2. For completeness QTC notes the following regarding other perceived premia, biases and distortions the REU may be referring to (Table 2):

TABLE 2: SUMMARY OF PERCEIVED BIASES

Perceived bias	QTC response	Relevance
Problems fitting a real yield curve	An unbiased indexed CGS yield can be calculated without using any observed or fitted indexed CGS yields.	Not relevant.
Liquidity premia	The liquidity premium in observable indexed CGS yields has been removed from QTC's unbiased indexed CGS yields.	Not relevant.
Inflation risk premia	The use of nominal CGS yields and ZCIS rates means the inflation risk premium is not part of QTC's unbiased indexed CGS yields.	Not relevant.

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[15] SAPN, June 2020, *Final Decision - Attachment 3*, p. 29–30.

Perceived bias	QTC response	Relevance
Convexity	QTC's unbiased index CGS yields and the AER's 'real' CGS yields are both based on deducting an estimate of inflation from observable nominal CGS yields. Therefore, convexity has no incremental impact relative to the AER's current approach.	Not relevant.
Inflation indexation lag	By design, ZCIS rates greatly reduces the impact of the indexation lag in QTC's unbiased indexed CGS yields.	Not relevant.
Inflation indexation lag premium	*'Risa (2001) finds that the yields on UK 10 year indexed bonds included an indexation lag risk premium of approximately 3.3 basis points. However, Risa considers that this premium is **not economically relevant in size**. D'Amico et al. (2016) find an indexation lag premium on the yields on 10 year TIPS varies **between –5 and 3 basis points**.'[16]*	Immaterial according to the academic studies cited by the AER.
Post-tax variability of indexed bond cash flows	May have some relevance, however the AER would need to produce a best practice decomposition study to support the implied claim that the taxation has a material impact on the observed indexed CGS yields and ZCIS rates.	Not relevant unless the AER's implied claim is supported by a best practice decomposition study.
Mismatched pattern of cash flows	*'Christensen et al. (2004) also cite Sack's (2000) study of the US 10 year BBIR **where the impact of these differences is estimated to be small, typically under 5 basis points and are often negative.'[17]*	Immaterial according to the academic studies cited by the AER.
Sensitivity to short-term inflation expectations on coupon paying bonds	The academic study cited by the AER concludes that the typical bias will **not be bigger than 3–4 basis points**, however this is based on a 30-year term, so the outcome for a 10-year term is likely to be smaller.[18]	Immaterial according to the academic studies cited by the AER.
Supply/demand changes for indexed and nominal CGS	Given the significant increase in the Commonwealth Government's borrowing requirement, and its commitment to support the indexed CGS market, a return to the supply/demand imbalances experienced between 2003–2009 is highly unlikely.	Not relevant.
Effect of the deflation floor	The use of ZCIS, which do not have a duration floor, means the effect of the duration floor is not present in QTC's unbiased indexed CGS yields.	Not relevant.
Personal price indices and the substitution effect	The indexed CGS market is dominated by institutional investors that are benchmarked against indices made up of bonds that are indexed to the CPI, or have liabilities that are linked to the CPI. If the 'substitution effect' means that CPI overstates true inflation, this would make assets with cash flows linked to CPI (eg, indexed CGS and ZCIS) more attractive, thereby lowering the indexed CGS yield and increasing the ZCIS rate.	The personal price index issue is not relevant in the Australian market. The substitution effect may result in a downward (upward) bias in observed indexed CGS yields (ZCIS rates).

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[16] ACCC/AER Working Paper No. 11, *Best estimate of expected inflation: a comparative assessment of four methods*, p 34

[17] ACCC/AER Working Paper No. 11, p. 35

[18] Christensen, Dion & Reid, 2004, *Real return bonds, inflation expectations and the break-even inflation rate*, p. 21

A.2: Negative inflation risk premium in the real return on equity

- In its response to a submission from Energy Networks Australia, REU states that it is appropriate for the inflation risk premium in the nominal risk-free rate to be reflected in the expected 'real' risk-free rate, and by extension the real return on equity allowance in the PTRM[19]:

  > 'As shown by Lally and as stated by Armitage, the inflation risk premium, if it exists and assuming it could be accurately and robustly estimated, is a component of the expected real rate of return on an asset – and therefore also a component of the asset's expected nominal rate. As Armitage states: 'An inflation risk premium is not part of the difference between the nominal rate and the real rate.' Armitage's point is consistent with the NER/NGR that the difference should represent best estimates of expected inflation. The corollary is that adjusting the nominal risk free rate by best estimates of expected inflation gives a correct expected real return, where the latter may or may not include an inflation risk premium.'

- Armitage describes the inflation risk premium as follows[20]:

  > *'If inflation is uncertain, this raises the possibility that the real returns on an asset covary with inflation. If they do then inflation can be treated as a risk factor, or as a proxy for a risk factor, and the expected real return on the asset will, in theory, incorporate an 'inflation risk premium'...*
  >
  > *Whether the premium is positive or negative depends on the sign of $cov(R_{real}, Inf)$ and on the relation between inflation and marginal utility. For example, if $cov(R_{real}, Inf)$ is negative and low inflation is associated with recession states (high marginal utility), the asset provides a relatively high real return when inflation is low and marginal utility is high. So, in this case, the inflation risk premium would be negative, in theory.'*

- The relationship between inflation and marginal utility is important because it means a negative inflation risk premium can only make up part of the expected return on an asset that pays off in real terms when inflation is low *and* when low inflation is associated with unfavourable economic states where wealth and consumption are low and the incremental value of additional consumption is high (ie, the 'marginal utility' of consumption is high).

- While it is possible for nominal CGS to produce positive pay offs during unfavourable economic states, the same cannot be said for equity[21]:

  > *'Conventional asset pricing theory suggests that the sign of risk premiums depends on the sign of the covariance of the returns of those assets with the typical investors' consumption or wealth. **For example, stocks require a high positive risk premium because equity prices tend to fall during recessions, precisely when consumption also falls.'***

- It follows that a negative inflation risk premium cannot make up part of the expected real return on equity because equity cannot be *expected* to pay off during periods when the margin utility of consumption is high.

- If the CAPM is used to estimate the real return on equity, Lally advises that the correct risk-free rate is the indexed bond yield[22]:

  > *'If the discrete-time CAPM applies, it would then apply in real terms, and the risk-free rate would be that on indexed bonds.'*

- By definition, the risk-free indexed bond yield does not contain the inflation risk premium in the expected real return on a risk-free nominal bond. The AER implicitly uses the latter to determine the real return on equity allowance in the PTRM. This results in the real allowance being biased downwards when the inflation risk premium is negative. This problem is compunded by the AER's use of a historical market risk premium that reflects a deduction for the positive historical average inflation risk premium.

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[19] AER, October 2020, *Draft Position Paper*, p. 115

[20] Seth Armitage, 2005, *The Cost of Capital: Intermediate Theory*, Cambridge, p. 226

[21] Chen, Engstrom & Grishchenko, April 2016, *Has the inflation risk premium fallen? Is it now negative?*, p. 2

[22] Martin Lally, July 2020, *Review of the AER's inflation forecasting methodology*, p. 12

- As shown in Figure 8 the implied inflation risk premium in the AER's 'real' CGS yields has been negative since the last inflation review in 2017. Given the Given the way the AER calculates the nominal allowed return on equity, the same negative inflation risk premiums have been reflected in the real return on equity allowance in the PTRM.

FIGURE 8: IMPLIED INFLATION RISK PREMIUM IN AER 'REAL' CGS YIELDS

Source: Bloomberg, Yieldbroker, QTC calculations. 20-day averages

Appendix B: QTC's proposed indexed CGS yield liquidity adjustment

B.1: Background

- The following is background information for QTC's response to some of the REU's comments on our submission to the inflation discussion paper (Appendix A).

B.2: Proposed approach

- A 10-year indexed CGS yield should be reflected in the real return on equity allowance in the PTRM. However, there is evidence that the observable indexed CGS yield is biased upwards by a liquidity premium and may also be affected by frictions such as indexation lags and the value of the deflation floor.

- To address this issue QTC proposed an approach, based on academic literature, for estimating a lower and upper bound for the liquidity premium in the observable indexed CGS yield[23]. It is important to note that this estimate of liquidity is broad and captures any 'friction' that drives a wedge between the observable yield and the yield that would otherwise prevail in a frictionless world. The liquidity estimate is not limited to the size of bid/offer spreads or the market impact of relatively large transactions.

- The lower bound equals zero and the upper bound equals the 10-year zero coupon inflation swap rate (ZCIS) minus the 10-year bond break-even rate (BBIR). Deducting the upper bound for the liquidity premium from the observable indexed CGS yield produces a *lower bound* for the 'unbiased' indexed CGS yield[24].

- The unbiased indexed yields are a simple and accurate approximation of the estimates from a more detailed and technically correct approach that uses the full ZCIS and nominal CGS zero coupon yield curves from 1–10 years to calculate a 10-year synthetic indexed CGS yield. The more detailed approach is as follows:

  - Use the full ZCIS curve to project the indexed value of a $100 principal for each year out to 10 years.

  - Solve for the single interest rate that, when applied to the annual indexed principal, produces coupons and a final indexed principal with a present value equal to $100 when discounted using the 1–10-year nominal zero coupon CGS yields. The single interest rate is the synthetic 10-year indexed CGS yield.

  - By design, the synthetic indexed CGS yield is not affected by the liquidity premium in observable indexed CGS yields, expected inflation or the inflation risk premium[25]. The yield is also free from frictions such as indexation lags, indexation lag risk premiums and the value of the deflation floor.

- In our submission to the inflation Discussion Paper we compared the unbiased indexed CGS yields with the implied real CGS yields using AER expected inflation. Even after making the maximum deductions for liquidity and other frictions, the unbiased indexed CGS yields were always higher than AER's implied real CGS yields.

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[23] QTC, July 2020, *Review of the regulatory treatment of inflation – Submission to the AER Discussion Paper*, p. 25–29

[24] Although any value between the lower and upper bound is feasible, QTC chose to adopt a conservative approach and make the maximum deduction from the observable indexed CGS yield to estimate the unbiased indexed CGS yield.

[25] Expected inflation and the inflation risk premium are common to the ZCIS rate and corresponding nominal zero coupon CGS yield. Therefore, both values are cancelled out in the process of producing the synthetic real CGS yield.