Pathway to the 2022 Rate of Return Instrument

OCTOBER 2020

Queensland Treasury Corporation (QTC) welcomes the opportunity to comment on the following draft working papers prepared by the Australian Energy Regulator (AER) as part of the Pathway to the 2022 Rate of Return Instrument (RoRI):

- CAPM and alternative return on equity models, and
- International regulatory approaches to rate of return.

1   Summary

- QTC supports using the capital asset pricing model (CAPM) to determine the allowed return on equity. If broad support is received for the CAPM the next stage of the review can focus on how to determine the best estimates of the CAPM parameters, in particular the expected return on the market portfolio (*ERm*).

- The different approaches for estimating *ERm* should be evaluated within the constraints imposed by a binding RoRI that must include a value or approach that can be applied automatically and without discretion. However, the value or approach must also be capable of producing the best estimate of the prevailing *ERm* across a range of future economic and capital market scenarios that cannot be known when the RoRI is made.

- Given these constraints it is unrealistic to expect a single estimation approach to produce the best estimate of *ERm* across all potential market scenarios. In our view, the absence of review mechanism requires a more diversified approach to be set out in the 2022 RoRI where explicit and meaningful weight is given to multiple approaches for estimating *ERm* based on historical and forward-looking data, such as:

  - historical excess returns (HER)
  - the Wright approach, and
  - the Dividend Growth Model (DGM)

- Each approach is likely to produce a better estimate of *ERm* during different market conditions compared to the other approaches. Because the market conditions during all future return on equity averaging periods cannot be known in advance, a weighted average approach should produce a better and more robust estimate than the estimate from any single approach outlined above.

- An important issue to be explored is the relationship between *ERm* and the 10-year Commonwealth Government Security (CGS) yield. In our view, there is no evidence to support a positive point-for-point relationship, which is what the current 2018 RoRI approach assumes. Rather, there are valid reasons for why *ERm* changes by less than changes in the 10-year CGS yield such as:

  - the time series properties of DGM estimates of *ERm*
  - an observation that the hurdle rates used by real-world investors have *moderately reduced* despite the significant decline in the 10-year CGS yield, and
  - a long-term decline in the inflation risk premium, which reduces the 10-year CGS yield but not *ERm*.

- QTC encourages stakeholders to work constructively towards developing a robust approach for estimating the allowed return on equity. Focusing on perceived issues with certain approaches is not be useful because all estimation approaches are imperfect. The next stage of the review will be productive if stakeholders focus on how to best use the different and imperfect approaches that are available to estimate the allowed return on equity.

- Finally, the overarching objective of the RoRI review is to determine an approach for producing the best estimate of the return on equity required by real-world investors operating in real-world financial markets. As such, primacy should be given to how real-world investors actually determine required rates of return. Finance theory and academic research may be useful, but it should always remain on tap, not on top.

2 Constraints under a binding RoRI

- Compared to the 2013 Rate of Return Guideline (RoRG), which was not binding on the AER or service providers, the RoRI is far more prescriptive in how the allowed return on equity must be calculated[1]:

> 'In November 2018 the national electricity and gas laws were amended to require us to make a binding rate of return instrument. This instrument will be binding on all of our regulatory determinations made after the instrument is published. As a binding instrument, it must set out the precise value for the rate of return, or set out a method for calculating the rate of return that can be applied automatically without exercise of discretion.'

- Under the non-binding RoRG it may have been reasonable for the AER to set out a preferred approach because the AER or a service provider could propose a departure based on prevailing market conditions at the time of a regulatory determination.

- In contrast, a binding RoRI must be capable of producing the best estimate of *ERm* across a range of future economic and capital market scenarios that cannot be known when the RoRI is made. This is a far more challenging task because there is no ability to review the outcomes from that approach even if a review is justified based on prevailing market conditions when a determination is made.

- It is unrealistic to expect a single estimation approach to produce the best estimate of *ERm* across all potential market scenarios. In our view, the absence of review mechanism requires a more diversified approach to be included in the 2022 RoRI based on historical data and forward-looking data.

3 A diversified approach for estimating *ERm*

- QTC considers the 2022 RoRI should include an approach that gives fixed and meaningful weight to each of the following approaches to estimate the *ERm* that is used as an input in the CAPM:
    - historical excess returns (HER)
    - historical real equity returns (ie, the Wright approach), and
    - the Dividend Growth Model (DGM).

- Each approach is likely to produce a better estimate of *ERm* during different market conditions compared to the other approaches. Given that future market conditions cannot be known when the 2022 RoRI is made, a weighted average approach should produce a more robust estimate than any single approach outlined above.

- QTC considers a weighted average approach that uses historical and forward-looking data to be consistent with The Brattle Group's advice to the AER that:[2]

> '… the CAPM using a historical MRP relies on backward-looking information, while the Dividend Growth Model (DGM) uses forward-looking information. **During periods of changes in financial markets, it becomes important to consider both historical (stable) and forward-looking (contemporaneous) information.**'

- Changing and uncertain financial market conditions are particularly challenging for a return on equity approach that must be applied automatically and without discretion. As noted in Section 2, the inability to review the outcomes from the approach even if a review is justified based on prevailing market conditions is a significant constraint under a binding RoRI. The return on equity approach in the 2022 RoRI should be developed with this constraint in mind.

3.1 Historical excess returns

- QTC considers that some weight should be given to HER when estimating *ERm* as past excess returns are likely to have some impact on investor expectations for future excess returns.

- The HER approach produces estimates of *ERm* that move point-for-point in the same direction with changes in the 10-year CGS yield. On a stand-alone basis this outcome is unrealistic because it assumes the factors that affect the

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[1] AER (December 2018), *Rate of return instrument Explanatory Statement*, p. 13.

[2] The Brattle Group (June 2020), *A Review of International Approaches to Regulated Rates of Return*, para. 142.

expected return on a risk-free asset always affect the expected return on the risky market portfolio by exactly the same amount[3]. However, combining the HER approach with other approaches has the potential to produce estimates of *ERm* with more plausible time series properties.
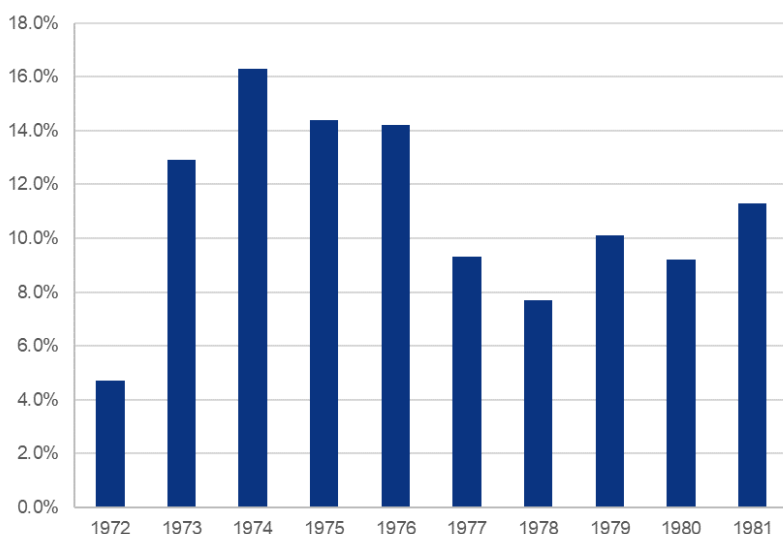
3.2   The Wright approach

- The Wright approach estimates *ERm* by inflating the historical average real return on equity by current 10-year expected inflation. This produces a stable estimate of *ERm* that is not affected by changes in the 10-year CGS yield.

- QTC considers that some weight should be given to the Wright approach when estimating *ERm*. As explained in Section 4 there are sound reasons for why the true *ERm* is more stable than the *ERm* under the HER approach.

- The *ERm* produced by the Wright approach results in the implied MRP exactly offsetting any change in the 10-year CGS yield. On a stand-alone basis this outcome is unrealistic, however combining the Wright approach with other approaches has the potential to produce estimates of *ERm* with more plausible time series properties.

- QTC notes the recent advice to the AER from Partington and Satchell who argue that the Wright approach would have produced large negative implied MRPs when 10-year nominal CGS yields were relatively high[4]:

    '… when Australian government bond rates were of the order of 15%, using the Wright approach would have resulted in a substantial negative estimate of the market risk premium. In the most elementary models of investor behaviour, negative risk premiums are not possible for risk averse investors.'

- The 10-year nominal CGS yield peaked at 15.0 per cent in 1981. Depending on the averaging period used the historical average real return on equity up to and including 1981 was about 7.5 per cent. As such, the implied MRP using the Wright approach would have been positive if 10-year expected inflation was greater than 7.0 per cent.

- As shown in Figure 1 actual year-on-year inflation in the 10 years up to and including 1981 was persistently high and averaged 11.0 per cent per annum.

FIGURE 1: YEAR-ON-YEAR ACTUAL INFLATION

- Based on these persistently high inflation outcomes it is plausible that 10-year expected inflation in 1981 was greater than 7.0 per cent, which means the implied MRP using the Wright approach would have been positive[5]. It is also likely that the 15 per cent 10-year CGS yield included a large and positive inflation risk premium, which means the yield was over-estimating the expected return on a true zero-beta asset.

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[3] This assumption is most likely to break down during periods of heightened investor risk aversion and other 'flight-to-quality' periods. Furthermore, the long-term decline in the inflation risk premium (Appendix A) has contributed to the long-term fall in the 10-year CGS yield but not the *ERm*.

[4] Partington and Satchell (June 2020), *Report to the AER: Alternative Asset Pricing Models*, p. 23

[5] Average actual inflation for the 10-year period immediately following 1981 was 7.1 per cent.

- It does not follow that the implied MRP using the Wright approach was significantly negative when the 10-year nominal CGS yield was around 15 per cent. Regardless, the outcomes from a distant period of double-digit interest rates and high expected inflation are unlikely to be relevant to the time period for which the 2022 RoRI will operate.

- QTC also notes the following issues with the Wright approach that were raised by the AER in the 2018 RoRI process:

  - *The Wright approach is not used in practice:*

    > QTC does not agree. As shown in Section 4, there is evidence that investors and valuation experts have not reduced the required rates of return for new investment point-for-point (or at all in some cases) with a falling risk-free rate. This is consistent with investors implicitly giving material weight to a stable *ERm*, which is what the Wright approach produces.

    > The Brattle Group's report to the AER also notes that several international regulators make use of the Wright approach, with some giving the approach a 100 per cent weight.

  - *No theoretical basis for exactly offsetting changes in the MRP and 10-year CGS yield:*

    > This may be a reason for not giving 100 per cent weight to the Wright approach. However, if the same standard is applied to the belief that the MRP is stable, the AER would not be able to justify the current approach in the 2018 RoRI of giving 100 per cent weight to the HER approach.

    > QTC is not proposing that 100 per cent weight be given to the Wright approach. Rather, it is our view that combining estimates from the Wright approach with other approaches is likely to produce more plausible estimates compared to each individual approach on a stand-alone basis.

  - *No causal relationship between the risk-free rate and MRP:*

    > As shown in Section 4.1.1 econometric tests of the relationship between the MRP and risk-free rate lack statistical power, which undermines the inferences that can be drawn from the data.

- These concerns and the recent advice from Partington and Satchell do not justify giving zero weight to the Wright approach when estimating *ERm*.

3.3   Dividend Growth Model

- The DGM is a forward-looking approach for estimating *ERm* based on the current market value of the market portfolio and consensus forecast dividends. QTC considers that some weight should be given to the DGM when estimating *ERm*, which is consistent with The Brattle Group's conclusion that[6]:

  'Since the DCF [DGM] is inherently forward-looking, it is particularly beneficial to put some weight on this model if the CAPM implementation is purely backwards-looking.'

- Unlike the HER and Wright approaches the DGM is silent on whether there is a relationship between *ERm* and the 10-year CGS yield (and by extension the implied MRP and the 10-year CGS yield).

- In addition to being forward-looking, the DGM has produced a plausible and economically sensible time series of implied MRPs. Figure 2 is taken from QTC's December 2017 submission to the AER's Rate of Return Guideline Review Issues Paper:

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[6] The Brattle Group, para 224.

FIGURE 2: DGM MRP ESTIMATES
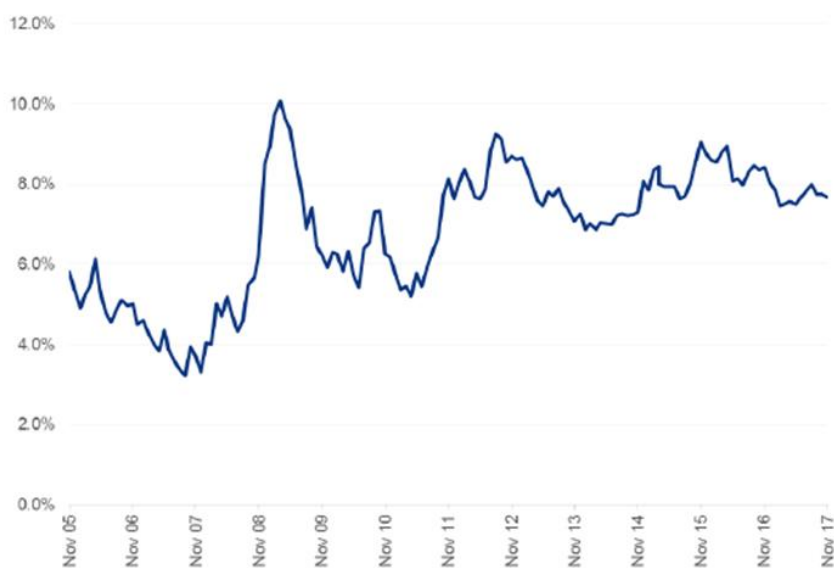
Source: QTC calculations

- The main observations from Figure 2 are as follows:
  - The implied MRP was relatively low in 2005–2007. Realised real equity returns during and just prior to this period were significantly higher than the long-term average, and the average 10-year CGS yield was approximately 6.0 per cent. It is reasonable to expect that investors were requiring a relatively low MRP during this period to provide equity capital, and this is reflected in the DGM estimates.
  - The heightened level of investor risk aversion during the global financial crisis (2008–2009) and the European sovereign debt crisis (2011–2012) is reflected in the relatively high implied MRP estimates during these 'flight-to-quality' periods. The 10-year CGS yield also fell sharply during these periods.
- As the DGM uses the current market value of the market portfolio and consensus forecast dividends, it has no overlap with the *ERm* estimates based on historical data. As such, the DGM is likely to provide useful incremental information that is not captured by the HER and Wright approaches. This is consistent with The Brattle Group's conclusion that[7]:

  *'… these models look at **different parts of the total information available in the market and contribute different insights**. The DGM is predominantly forward-looking and the CAPM (with a historic MRP) relies predominantly on historic data that are used to infer the expected return. **Both contribute to the understanding of investors required return but from different angles.**'*

- QTC is aware that some implementation issues exist with the DGM, however this does not mean zero weight should continue to be given to this approach. In addition to the benefits outlined by The Brattle Group, regulators such as the Independent Pricing and Regulatory Tribunal (IPART) have incorporated DGM estimates into their return on equity approaches. For example, IPART's use of the median estimate from multiple versions of the DGM is a pragmatic way of making use of forward-looking data while reducing the impact of outliers.
- QTC submits that the next stage of the review should involve developing a plausible set of DGM parameters (eg, long-term dividend growth rates and transition paths from short-term to long-term dividend growth) that can be automatically applied as required by the RoRI.

4 Relationship between *ERm* and the 10-year CGS yield

- An important issue to be explored in the review is the relationship between *ERm* and the 10-year CGS yield (and by extension the relationship between the MRP and the 10-year CGS yield).

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[7] The Brattle Group, para 223.

- Under 2018 RoRI the allowed return on equity has fallen point-for-point with the 10-year nominal CGS yield. The returns have fallen to such low levels that the cash flows in the post-tax revenue model (PTRM) are producing significantly negative net profits after tax (NPAT). In our view, this is strong evidence that the allowed return on equity has not been estimated correctly.

4.1.1 Empirical estimates using actual returns

- Due to the high level of noise in realised returns it is unlikely that a statistical analysis of long-term historical returns will be successful in uncovering any relationship(s). For example, the South Australia Centre for Economic Studies (SACES) ran a regression of annual excess equity returns on the 10-year CGS yield using data from 1883–2017. Although the slope coefficient was not statistically different from zero (which is what the HER approach implies) it was also not statistically different from -1.0 (which is what the Wright approach implies)[8]:

  *'It should also be noted however that these standard errors are large and that the test does not have much power. This lack of power undermines the inferences that can be drawn from the data. To illustrate, **the hypothesis that the required rate of return on equity is stable in the face of bond rate changes would imply $\beta=-1$ and the results indicate that we could not reject that assumption with these data.**'*

4.1.2 Time series properties of the DGM outputs

- The time series properties of outputs from the DGM may be more informative because they are not affected by volatile and noisy actual returns. According to The Brattle Group:[9]

  *'All in all, the CAPM is a well-founded and commonly used model that relies primarily on readily available information. However, it can be overly variable (or unstable)—i.e., produce results which are sensitive to exactly when the estimates are done—because changes in interest rates affect the risk-free rate and market volatility affects the beta estimates. **Thus, it is not clear that the MRP or beta remains constant as the risk-free rate changes. Instead, Bloomberg's analyses of the forward-looking MRP show that the MRP increases as the risk-free rate declines, so that the resulting market return moves less than the risk-free rate.**'*

- The DGM-implied MRP estimates produced by IPART are consistent with The Brattle Group's observation. Figure 3 plots the median monthly implied MRP from three different versions of the DGM against the 10-year CGS yield between July 2008–July 2017[10]:

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[8] The South Australian Centre for Economic Studies (July 2018), *Review of issues raised by Frontier Economics in connection with Ausgrid's 2019–24 regulatory proposal*, p. 12

[9] The Brattle Group, para. 149.

[10] https://www.ipart.nsw.gov.au/Home/Industries/Special-Reviews/Regulatory-policy/WACC/Time-series-of-individual-MRP-estimates-monthly-from-July-2008-to-July-2017-16-November-2017. IPART also use the DGM estimates from Bloomberg, but these are not disclosed for copyright reasons.

FIGURE 3: IPART DGM ESTIMATES OF THE MRP
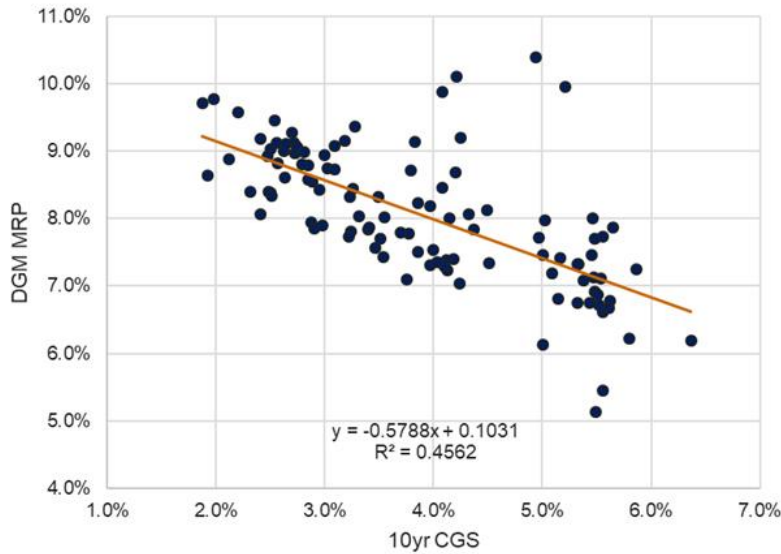
- QTC has used the data in Figure 3 to run the same regression as SACES (ie, regressing the DGM-implied MRP on the 10-year CGS yield). The estimated slope coefficient is **-0.58**, which is statistically less than zero (t-statistic of -9.5) and statistically greater than -1.00 (t-statistic of 6.9).
- Figure 4 plots the DGM estimates of *ERm* against the 10-year CGS yield:

FIGURE 4: IPART DGM ESTIMATES OF ERM
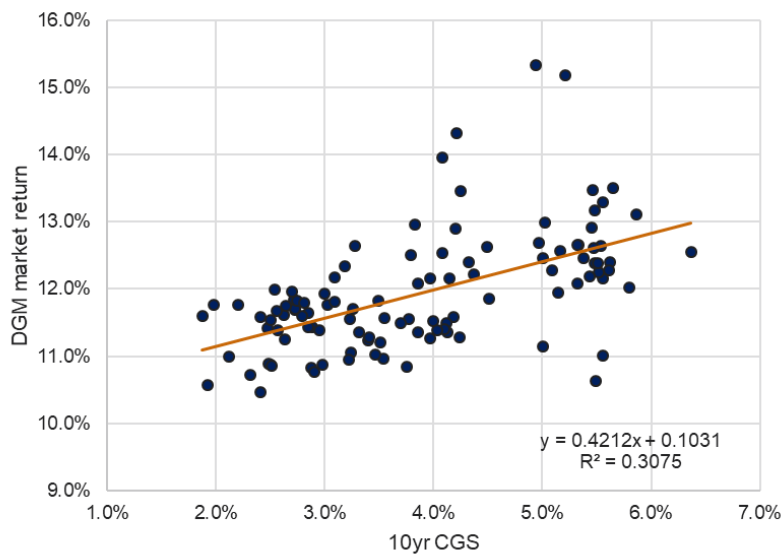
- The estimated slope coefficient is **+0.42**, which is statistically greater than zero (t-statistic of 6.9) and statistically less than 1.00 (t-statistic of -9.5). This indicates that *ERm* moves *less than* point-for-point with the 10-year CGS yield.
- The DGM estimates do not support the extreme implied relationships between *ERm* and the 10-year CGS yield for stand-alone applications of the HER approach or the Wright approach. However, a simple average of the HER and Wright approaches will approximate the less than point-for-point relationship between *ERm* and 10-year CGS yield that exists in the DGM estimates.
- This indicates that if sole reliance was to be placed on using historical data to estimate *ERm*, it would not be appropriate to give 100 per cent weight to the HER approach, which is the current approach in the 2018 RoRI, or Wright approach. Rather, meaningful weight should be given to both approaches.

4.1.3 What do real-world investors and valuation experts do?

- In October 2019 the RBA Governor gave a speech at the Australian National University where he provided some observations on why the hurdle rates required by real-world investors (domestically and offshore) have not fallen in line with interest rates. The key observations from this speech are captured in the following quote[11]:

*'… it is worth noting that despite the **marked decline in global interest rates (and some decline in the cost of equity),** average hurdle rates of return for new investments in many countries have not changed much. It seems that there is a global norm for hurdle rates somewhere around the 13 to 14 per cent mark and it is hard to shift this norm, even at record low interest rates.*

There are a couple of possible explanations for this.

*The first is that the reduction in the cost of borrowing has been offset by a rise in the required risk premium due to the uncertainties that I spoke about. **If this were so, the hurdle rate would be unchanged, with lower interest rates just compensating for the riskier environment**. The second possibility is that some firms have been slow to adjust to the new reality of low interest rates…*

*My view is that there is an element of truth to both explanations: **risk premiums have gone up and, in some cases, hurdle rates of return are too sticky.'***

- There are three conclusions to draw from this quote:
  - The reference to 'some decline' in the cost of equity despite 'marked declines' in global interest rates is consistent with a negative relationship between the true MRP and the risk-free rate.
  - Although the RBA Governor believes that some hurdle rates are 'too sticky', what ultimately matters is what the hurdle rates are. It is clear that real-world investors have not reduced the rates of return required for new investment point-for-point (or at all in some cases) with a falling risk-free rate.
  - The conclusion that 'risk premiums have gone up' is notably different from the reduction in the allowed MRP from 6.5 per cent to 6.1 per cent between the 2013 RoRG and the 2018 RoRI.
- The Australian Financial Review (AFR) reported on the RBA Governor's speech in December 2019. To explore the Governor's observations further the AFR contacted several CEOs of Australian companies to ask the following[12]:

'Have you already lowered your hurdle rates for investment projects in response to lower interest rates? If not, would you be willing to?'

- Some responses from the CEOs are provided below:

*'We haven't lowered our hurdle rates at this time. Although interest rates are an input to our cost of capital, **equity risk premiums have, in our view, gone up, balancing out any benefits from low interest rates.'** (Tabcorp)*

*'Over time we have reduced our hurdle rates based on the theoretical cost of raising debt, **but hurdle rates have not come down as much as some may think, because risk has increased.'** (EnergyAustralia)*

*'We have agreed with our board to **moderately reduce** hurdle rates to prudently reflect the **dual impact of lower interest rates and higher macro-economic risks'.** (Stockland)*

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[11] RBA (29 October 2019), *Some echoes of Melville*, p. 11–12.

[12] Australian Financial Review (11 December 2019*), CEOs on how to get business investing.*

*'Given the current environment, **it's difficult to predict at this stage whether we would lower our hurdle rates for investment projects in response to lower rates**. This is a unique economic situation for Australia - we have never seen rates this low before - but if rates keep falling - then we would have to reassess.' (Adelaide Bank)*

'While we haven't yet changed our hurdle rates, it is certainly something we are thinking about.' (Woolworths)

*'We revised our pre-tax normalised return on equity target to the RBA cash rate plus 14 per cent, **removing the variable impact of interest rates**. This enables us to target a strong return for investors through the cycle'. (Challenger)*

- The responses are consistent with the RBA Governor's observation that required rates of return have not fallen point-for-point (or at all in some cases) with a falling risk-free rate. This can be interpreted as investors acting 'as if' they are giving material weight to a stable (and higher) *ERm* when determining the required rates of return to undertake new investments. This is consistent with a negative relationship between relationship between the MRP and the risk-free rate.

- KPMG conducts and annual survey of valuation experts, investors and corporates to obtain views on how discount rates are determined and used in practice. The 2019 survey found that as at 30 June 2019[13]:

*'Assuming a geared beta of 1.0, **the cost of equity was highest in Australia (8.8%)**. The next highest was in New Zealand (7.4%), followed by the UK (6.8%). Both the Eurozone and United States came in with the lowest cost of equity at 6.5%.'*

- If the 2018 RoRI was applied on 30 June 2019 when the 10-year CGS yield was 1.4 per cent, the estimate of *ERm* would have been 7.5 per cent. This is 1.3 per cent lower than the estimate from the KPMG survey[14]. Consistent with the CEOs interviewed by the AFR, valuation experts have also not reduced their estimates of *ERm* point-for-point with a falling risk-free rate. This is also consistent with a negative relationship between relationship between the MRP and the risk-free rate.

4.1.4 Long-term decline in the inflation risk premium

- As shown in Appendix A, part of the reason for the long-term decline in the risk-free rate is the long-term decline in the inflation risk premium. This is a factor that affects the expected return on a risk-free asset, but not *ERm*. All else equal, this has contributed to a negative relationship between the true MRP and the risk-free rate.

In our view, the time series properties of the DGM outputs, the practices of real-world investors and valuation experts, and a long-term decline in the inflation risk premium do not support the belief that the true MRP is constant and that *ERm* always moves point-for-point with the 10-year CGS yield.

QTC considers the return on equity approach in the 2022 RoRI should produce estimates that move less than point-for-point with the 10-year CGS yield. This can be achieved by giving material weight to each of the HER, Wright and DGM approaches for estimating *ERm*.

5 Next steps

- QTC agrees with the challenges identified by the AER is determining an approach for estimating the allowed return on equity, especially when the approach must be applied automatically and without discretion[15]:

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[13] KPMG (2020), *Valuation Practices Survey 2019: What's it worth? Determining value in the continuing low interest rate environment*, p. 12.

[14] The actual difference is larger because the average utilisation rate in the KPMG survey is 0.36 compared for 0.65 in the AER's MRP estimate.

[15] AER (August 2020), *CAPM and alternative return on equity models - Draft working paper*, p. 1–2

*'Estimating the return on equity is complex and contentious, with experts and regulators reaching different positions on the strengths and weaknesses of different models, how those models should be implemented, and return on equity outcomes. **There is no one 'right answer' to be found.***'*

- QTC agrees there is no one 'right answer', however there will ultimately be a single allowed return on equity in every determination made under the 2022 RoRI. Therefore, it is essential for the estimates to be based on as much relevant data as possible. Giving 100 per cent weight to a single approach for estimating a key CAPM parameter (ie, *ERm*), which is what the 2018 RoRI does, is not an appropriate starting point for the 2022 RoRI review.

- QTC submits the next stage of the review should start with an assumption that the HER, Wright and DGM approaches can all make a valuable contribution to the task of estimating *ERm* within the constraints of a binding RoRI. If there is no one right answer for the return on equity, it is highly likely that no one right approach exists for estimating *ERm*.

- From this starting point stakeholders can focus on how each estimation approach interacts with the other approaches and determine which combinations (ie, weights) are most likely to produce estimates that are robust across a wide range of capital market scenarios that cannot be known when the 2022 RoRI is made.

  – Any proposal to give 100 per cent weight to a single *ERm* estimation approach requires extraordinary evidence in favour of that approach and extraordinary evidence against all other approaches.

- QTC encourages stakeholders to work constructively towards developing a robust approach for estimating the allowed return on equity. Focusing on perceived issues with certain approaches is not be useful because all estimation approaches are imperfect. The next stage of the review will be productive if stakeholders focus on how to best use the different and imperfect approaches that are available to estimate the allowed return on equity.

Appendix A: Inflation risk premium analysis

A.1: Background

- The inflation risk premium (IRP) compensates holders of assets with promised fixed nominal cash flows for *systematic* inflation risk. The sign and size of the IRP depends on the covariance between inflation outcomes and real economic activity:
  - A positive IRP exists when covariance is negative (ie, increasing inflation coinciding with falling real economic activity). A positive premium is required because the real return on assets with fixed nominal cash flows decreases during unfavourable economic states.
  - A negative IRP exists when the covariance is positive (ie, falling inflation coinciding with falling real economic activity). Investors are willing to accept a negative premium because the real return on assets with fixed nominal cash flows increases during unfavourable economic states (ie, the assets act as a hedge against poor equity returns).
- By definition, the IRP does not make up part of the real or nominal *ERm*.

A.2: Data

- There are no long-term estimates of the Australian IRP, however Kim et al (2019) produce model-based estimates using US Treasury bond yield data from 1983–2020 (Figure 5)[16].

FIGURE 5: US MODEL-BASED 10-YEAR INFLATION RISK PREMIUM ESTIMATES
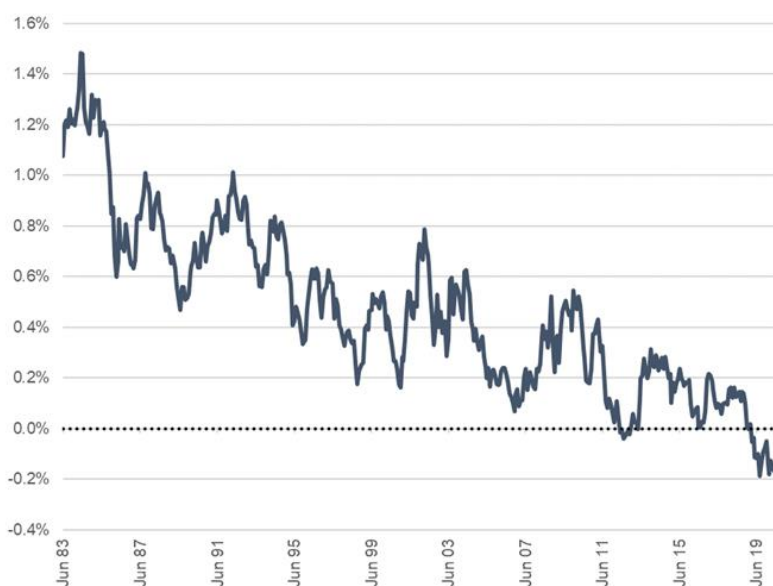
- Although the estimates are based on US data, the same broad trends are likely to be similar for the Australian IRP:
  - The relatively high IRP estimates in the early part of the sample are consistent with the very high inflation outcomes in late 1970s early 1980s, which was also the Australian experience.
  - The standard deviation of year-on-year inflation has been declining in the US and Australia since the early 1980s. This is important because the covariance between inflation and real economic activity is directly affected by the level of inflation volatility.
  - The declining the IRP is consistent with the adoption of inflation targeting by central banks, who have been successful in using monetary policy to bring inflation down. RBA adopted inflation targeting in 1992.
  - The more recent low and negative IRP estimates are consistent with increasing investor concerns about deflation due to lack of effectiveness of monetary policy in stimulating economic activity.

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[16] Kim, Walsh & Wei, May 2019, *Tips from TIPS: Update and Discussions*, FEDS Notes. Washington: Board of Governors of the Federal Reserve System, May 21, 2019, https://doi.org/10.17016/2380-7172.2355.

- The size of the IRP may differ between the US and Australia, however the analysis that follows is based on the difference between the prevailing IRP and the cumulative historical average IRP over time. Therefore, the size of the IRP estimates is less important than the longer-term trend and volatility of the IRP estimates.

A.3: Analysis

- Because the IRP makes up part of the 10-year nominal yield it will also be reflected (as a deduction) from the HERs. As such, the average HER will reflect a deduction for the historical average IRP.

- As the IRP is compensation for the *systematic* inflation risk associated with assets that have fixed nominal cash flows, it will create a bias in the MRP estimate based on HERs. This is because the MRP should represent the difference between *ERm* and the expected return on a *zero-beta* asset.

- If *ERm* is estimated by adding the MRP based on HERs to the prevailing risk-free rate, the difference between the prevailing IRP and the cumulative historical average IRP will be reflected in the final estimate. If the historical IRP is stationary (ie, exhibits no time trend), the net IRP difference should average out to zero over time.

- However, there is a clear long-term downtrend in the IRP (ie, it is not stationary), which means that as time passes the prevailing IRP is more likely to be below the historical average IRP than above it (Figure 6). As a consequence, the net IRP difference is more likely to be negative and will not average out to zero over time.

FIGURE 6: U.S. INFLATION RISK PREMIUM

- Figure 7 shows the net IRP difference on a monthly basis from June 2008–June 2020. The historical average IRP as at June 2008 is based on the average IRP from June 1983–June 2008[17]. Thereafter, an expanding window is used to calculate the historical average IRP, so there is no look-ahead bias in the estimates.

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[17] June 2008 was chosen as the start date to allow the initial value of the historical average IRP to be based on a sufficiently large number of observations.

- The negative net IRP difference effectively means that a negative inflation risk premium is reflected in the *ERm*. However, by definition, the true *ERm* cannot include the IRP because the IRP only applies to the expected return on assets with fixed nominal cash flows. As a consequence, the estimated *ERm* is biased downwards.

- The net IRP difference has been consistently negative and is currently at its lowest value of -0.64 per cent. This means that (all else equal) a mechanical approach of adding the MRP based on HER to the prevailing risk-free rate is under-estimating *ERm* by 0.64 per cent due to the IRP.

- It is unlikely that real-world investors would reflect the IRP in their estimates of required rates of return. As such, he true MRP is likely to have increased (relative to the MRP based on HER) as the nominal risk-free rate has fallen.