# The market risk premium

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# 1 Executive summary

## 1.1 Instructions

1 Frontier Economics has been engaged by Icon Water Limited to advise on an appropriate regulatory estimate of the market risk premium (MRP) to be used in the Capital Asset Pricing Model (CAPM) to determine the allowed return on equity.

2 We have been asked to provide an estimate of the MRP that would promote the efficient investment in, and efficient operation and use of regulated services for the long term interests of consumers in relation to the price, quality, safety, reliability and security of the service, having regard to:

a. an appropriate rate of return on any investment in the regulated industry;

b. the cost of providing the regulated services; and

c. the borrowing, capital and cash flow requirements of people providing regulated services and the need to renew or increase relevant assets in the regulated industry.

## 1.2 Key conclusions

3 Our approach is to have regard to all relevant evidence, including a range of approaches for estimating the MRP. The various estimates of the MRP are summarised in Table 12 below. All of these estimates are consistent with a risk-free rate of 2.8% and a gamma of 0.25.

Table 1: Summary of MRP estimates

| Estimation method | MRP estimate |
|---|---|
| Mean historical excess returns | 6.2% |
| Dividend growth model | 8.2% |
| Wright approach | 8.2% |
| Surveys | 8.1% |
| Independent expert valuation reports | 8.3% |
| Market indicators | 7.0% |

*Source: Summary of estimates from above.*

4 To distil these various estimates into a single regulatory MRP, we begin by separating the approaches according to whether they use historical data or current market prices and forward-looking information.

5 The two approaches that use historical information are the excess returns and Wright approaches. These two approaches represent the end points of a spectrum in that:

a. The historical excess returns approach assumes that the MRP is constant over time, and the total required return on equity rises and falls one-for-one with changes in the risk-free rate; and

b. The Wright approach assumes that the real return on equity is constant over time such that the MRP moves to offset any changes in the risk-free rate.

6 In our view, reality lies between these two extremities. Thus we apply equal weight to each approach and conclude that the historical evidence supports an MRP of 7.2%.[1]

7 The other approaches use current and forward-looking information. For these approaches, we assign the following weights:

a. 50% weight to the DGM estimates, on the basis that DGM estimates are the most reliable form of forward-looking evidence, consistent with the fact that they are commonly given material weight in regulatory determinations;

[1] 0.5×6.2% + 0.5×8.2%=7.2%.

b. 0% weight to survey estimates, because we consider this evidence to be unreliable and inappropriate for the reasons set out in Section 4.4 below;

c. 25% weight to estimates from independent expert valuation reports, on the basis that this is relevant evidence, although somewhat less reliable and not as well accepted as DGM evidence; and

d. 25% weight to estimates from market indicators, for the same reason as above.

8 This weighting produces a forward-looking estimate of 7.9%.[2] We note that this figure would not change materially if some weight were afforded to the prevailing survey estimate of 8.1%.

9 The final step, then, is to distil the historical and forward-looking estimates into a final MRP estimate. To do this, we begin with the historical estimate that reflects the average financial market conditions over the (long) historical periods that are considered. We consider this to be a reliable reflection of the information in the historical data that provides an appropriate starting point estimate.

10 We then consider whether the forward-looking estimates that are based on current market data indicate that the prevailing MRP is higher or lower than the long-run average MRP. At present, the forward-looking MRP estimates indicate that the prevailing MRP is above the long-run historical average. Our approach is to give equal weight to the historical and forward-looking estimates on the basis that:

a. The historical estimates have the advantage of being based on large data sets such that the resulting estimates are statistically precise. Their disadvantage is that they can only reflect the long-run average MRP, which is an issue if the prevailing market conditions differ from the long-run average; and

b. The forward-looking estimates have the advantage of being commensurate with the prevailing market conditions, but they are based on less data, they require some assumptions, and they are less statistically precise.

11 Thus, starting at the long-run historical estimate and moving half way towards the estimate from the forward-looking evidence results in a mid-point estimate of approximately 7.5%. In our view, this represents an estimate that appropriately reflects the data and evidence set out above.

[2] 0.5×8.2%+ 0.25×8.3% + 0.25×7.0%.

# 2 The regulatory task

## 2.1 The role of the market risk premium

12 The market risk premium is defined as the amount by which the required return on a broadly diversified 'market' portfolio exceeds the risk-free rate. That is, the required return on the market portfolio (which is the same as the required return on equity for a stock of average risk) is computed by adding the MRP estimate to the current risk-free rate:

$$r_m = r_f + MRP.$$

13 The resulting estimate of the required return on the market is then used in the Sharpe-Lintner Capital Asset Pricing Model (SL-CAPM) formula to estimate the required return on equity for an asset with risk given by $\beta$:

$$\begin{aligned} r_e &= r_f + \beta\left(r_m - r_f\right) \\ &= r_f + \beta \times MRP. \end{aligned}$$

14 That is, the prevailing required return on equity is computed from estimates of the prevailing risk-free rate, the prevailing MRP and beta.

## 2.2 The ICRC's legislative criteria

15 The objective of the ICRC's price directions is to promote efficient investment in, and use of, regulated services, as set out in the ICRC Act:

> The objective of the commission, when making a price direction in a regulated industry, is to promote the efficient investment in, and efficient operation and use of regulated services for the long term interests of consumers in relation to the price, quality, safety, reliability and security of the service.[3]

16 The ICRC Act also requires the ICRC to have regard to certain matters when making a pricing decision including the following:

> In making a decision…the commission must have regard to…
>
> (d) an appropriate rate of return on any investment in the regulated industry; and
>
> (e) the cost of providing the regulated services; and…
>
> (i) the borrowing, capital and cash flow requirements of people providing regulated services and the need to renew or increase relevant assets in the regulated industry.[4]

[3] ICRC Act, s 19L.

[4] ICRC Act, s 20.

17 In our view, these requirements would be met by the ICRC estimating the market risk premium, and consequently the required return on equity, that reflects the prevailing conditions in the market for equity funds. In our view, the 'appropriate rate of return' is the rate that investors would require in the prevailing market conditions and the relevant 'borrowing, capital and cash flow requirements' are those that would be required in the prevailing market conditions. Estimating the MRP, and setting the allowed return on equity, in this way would create the appropriate incentives for efficient investment.

18 Note that an estimate of the MRP that is commensurate with the prevailing conditions in the market does not imply a short-term focus. For example, a regulator may determine that a 10-year investment horizon is appropriate for the estimate of the MRP. In this case, the regulator should seek an estimate of the 10-year MRP that investors would require in the prevailing market conditions. This is directly analogous to the required return on debt – there is a 10-year debt risk premium that varies with financial market conditions. Estimating a debt risk premium that is commensurate with the prevailing market conditions does not imply a short-term investment horizon – just that the allowed return should be commensurate with the returns that investors would require to commit the required capital at the time of the determination.

19 Moreover, the investment horizon of investors is also relevant to the weight that might be applied to different methods for estimating the MRP. For example, the regulator may consider that a long investment horizon is appropriate. This would lead to more weight being assigned to dividend growth models (which derive an MRP from dividend forecasts over a long horizon) than to evidence from option implied volatilities (because the relevant options have a life of only several months).

## 2.3 Regulatory practice in Australia

20 All economic regulators in Australia use the SL-CAPM to determine the return on equity allowance for businesses they regulate and this has historically been the practice of the ICRC and was used in the 2015 Industry Panel decision.

21 When estimating the MRP, regulators generally seek an estimate that is commensurate with the prevailing conditions in the market. In this regard, the Australian Energy Regulator (AER) stated in its Rate of Return Guideline materials that:

> Evidence suggests the MRP may vary over time. In their advice to the AER, Professor Lally and Professor Mackenzie and Associate Professor Partington have expressed the view that the MRP likely varies over time.[5]

[5] AER, 2013, Rate of Return Guideline: Explanatory Statement, p. 91.

22 In its recent decisions, the AER states that it seeks to estimate:

> ...the prevailing market risk premium[6]

which is:

> ...a forward-looking estimate of the risk premium.[7]

23 The AER also notes that:

> The Sharpe-Lintner CAPM is a forward-looking equilibrium asset pricing model and therefore requires forward looking input parameters.[8]

24 Similarly, the Economic Regulation Authority of Western Australia states that its task is to estimate a "forward-looking MRP"[9] and that:

> For this reason the Authority set out in the Draft Decision that it considers it appropriate to determine a range for the MRP at the time of each decision.[10]

25 That is, the stated regulatory task is to estimate a forward-looking MRP that is commensurate with the conditions in financial markets at the time of each regulatory decision.

26 In its 2013 Review of WACC Methodology, IPART concluded that it would be inconsistent and wrong to pair an estimate of the prevailing risk-free rate (which reflects the prevailing market conditions) with a long-run mean historical estimate of the MRP (which reflects the long-run average market conditions). This led IPART to pair:

a. Historical average estimates of the risk-free rate and MRP, producing an estimate of the average required return on equity; and

b. Estimates of the prevailing risk-free rate and MRP, producing an estimate of the prevailing required return on equity.

27 The notion that the risk premium required by equity holders varies over time as market conditions change is also consistent with the fact that regulatory estimates of the debt risk premium have varied materially over the last 10 years. If the return premium for bearing a certain amount of risk varies materially for debt securities, it must also be the case that the risk premium sought by equity investors also varies over time as market conditions change.

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[6] AusNet Draft Decision, 2016, Attachment 3, p. 57.

[7] AusNet Draft Decision, 2016, Attachment 3, p. 57.

[8] AusNet Draft Decision, 2016, Attachment 3, p. 188.

[9] DBP Final Decision, Appendix 4, 30 June 2016, Paragraph 479.

[10] DBP Final Decision, Appendix 4, 30 June 2016, Paragraph 479.

28 Over the 2011-2012 period, Australian regulators tended to adopt an MRP estimate of 6%, as set out in Table 2 below. These estimates were typically derived with primary reference to evidence of long-run historical excess market returns. Specifically, the 'historical excess returns' estimate of the MRP is obtained by computing the excess return for each year of a long historical period as the observed return on a broad stock index such as the All Ordinaries Index less the risk-free rate estimated as the yield on government bonds over the relevant year. The mean excess return over the historical period is then used as an estimate of the MRP that reflects the average market conditions over the historical period that was used.

Table 2: MRP estimates by Australian regulators over 2011-12

| Regulator | Year | Industry | MRP (Per cent) |
|---|---|---|---|
| ACCC[325] | 2011 | Fixed Line Services (Telecommunications) | 6.00% |
| AER[326] | 2012 | Gas Distribution Network | 6.00% |
| ERA[327] | 2012 | Electricity Distribution/Transmission | 6.00% |
| ERA[328] | 2011 | Gas Transmission | 6.00% |
| IPART[329] | 2012 | Water, sewerage, stormwater drainage and other services | 6.00% |
| QCA[330] | 2012 | Water, sewerage, stormwater drainage and other services | 6.00% |
| ESCOSA[331] | 2012 | Water, sewerage, stormwater drainage and other services | 6.00% |

*Source: Economic Regulation Authority of Western Australia*

29 Over the 2011-2012 period, the risk-free rate of interest (estimated as the yield on Australian government bonds) remained relatively close to its historical average. Thus, a MRP estimate based on historical averages was paired with a risk-free rate close to its historical average to produce an allowed return on equity. In this sense, the prevailing market conditions were consistent with the average historical market conditions and there was relatively little dispute about return on equity allowances.

30 The historical excess returns estimate of the MRP is usually estimated using historical periods of 50 to 100 years. Due to the year-to-year volatility of returns, such a long period is required to obtain a statistically meaningful estimate. Consequently, this estimate is essentially fixed over time as each year adds only one additional observation. Thus, the historical excess returns estimate of the MRP will only be appropriate if the prevailing market conditions are consistent with the average historical market conditions, which was generally accepted to be the case over the 2011-2012 period when government bond yields were close to their average levels.

31 However, since 2012 government bond yields have fallen dramatically to historical lows never before seen in the post-war period. Thus, the prevailing conditions now differ materially from the historical average conditions and this point has been recognised in the regulatory setting. For example, the ERA has recently stated that:

> …the Authority concluded that it is not reasonable to constrain the MRP to a fixed range over time. The random behaviour of the risk free rate in Australia to date, and more particularly, its pronounced decline in the current economic environment, leads to a situation where the combination of a fixed range for the MRP and prevailing risk free rate may not result in an outcome which is consistent with the achievement of the average market return on equity over the long run.[11]

32 In 2013, a number of regulators in Australia—including the AER, the ERA and the Independent Pricing and Regulatory Tribunal (IPART) of New South Wales—undertook major reviews of their rate of return methodologies. These reviews all confirmed that the appropriate regulatory task is to estimate a forward-looking MRP commensurate with the prevailing conditions in the market.

33 In this regard, the AER stated in its 2013 Rate of Return Guideline materials that its task is to:

> …determine an estimate of the 10 year forward looking risk free rate and 10 year forward looking MRP.[12]

34 Similarly, during the 2013 review of its rate of return methodology, IPART concluded that:

> We consider that there is a greater need to estimate the expected MRP using current market data than previously thought, as we have found that:
>
> - There is evidence from a number of sources that the MRP is not constant over time and that at times it may be inversely related to the risk-free rate.
> - Using the long-term average MRP together with the current risk-free rate could be problematic when the risk-free rate and the MRP move in an opposite direction.
>
> Estimating the expected MRP using current market data is not conditional on an inverse relationship between the MRP and the risk-free rate. It is sufficient that the expected MRP is variable. The expected MRP changes over time since investors' risk aversions and perceptions about the average-risk investment change.[13]

35 In summary, regulators in Australia recognise that the MRP varies over time and that the regulatory task is to adopt a forward-looking estimate of the MRP that is

[11] DBP Final Decision, Appendix 4, 30 June 2016, Paragraph 483.

[12] AER, 2013, Rate of Return Guideline: Explanatory Statement, Appendices, p. 108.

[13] IPART, WACC methodology, Research — Interim Report, June 2013, p.28.

commensurate with the prevailing conditions in the market for equity funds. We agree with this characterisation of the regulatory task.

36 Since 2013, a number of regulators have adopted a wider set of approaches to estimating the MRP, which has resulted in recent determinations departing from the estimate of 6.0% that Australian regulators have tended to use in more 'average' market conditions.[14] This is illustrated below in Table 3, which surveys a sample of recent MRP decisions by regulators in Australia.

Table 3: Recent regulatory decisions on MRP

| Regulator | Decision date | Industry | Estimate |
|---|---|---|---|
| QCA | April 2016 | Coal terminal | 6.5% |
| ERA | October 2016 | Rail | 7.4% |
| ESC | June 2016 | Water | 6.0%[15] |
| ESCOSA | June 2016 | Water | 6.0% |
| IPART | February 2017 | Water, rail, light rail & bus, ferry, gas retail | 7.7%/8.4%[16] |
| AER | May 2017 (and every other decision since 2013) | Electricity & gas networks | 6.5% |

*Source: Various regulatory decisions.*

37 The higher recent MRP estimates reflect the view that the decline in government bond yields in recent years has not been matched with a one-for-one decline in the total required return on equity. Rather, the fall in government bond yields has been at least partially offset by an increase in the MRP – resulting in a relatively stable estimate of the required return on equity.

## 2.4 International regulatory practice

38 International regulators have also reached the conclusion that the decline in government bond yields in recent years has been at least partially offset by an

[14] Specifically, conditions in which the risk-free rate has remained close to its historical average level.

[15] Not a current estimate – taken from ACCC Water Pricing Principles.

[16] The 7.7% figure is the midpoint of IPART's long-run historical MRP estimate of 6.0% and its prevailing MRP estimate of 9.3% (selected from within a range of 7.4% to 11.1%). IPART pairs its historical MRP estimate with an historical average risk-free rate of 4.3%, and it pairs the prevailing MRP with the prevailing risk-free rate. This produces estimate of the total required return on equity of 10.3% and 12.1% respectively. IPART then applies 50% weight to each, resulting in a final allowed return on equity of 11.2%. This implies a margin of 8.4% over the prevailing risk-free rate of 2.8%. That is, IPART's most recent determination is that the market cost of equity is 8.4% above the prevailing government bond yield.

increase in the MRP – resulting in a relatively stable estimate of the required return on equity. Some examples are set out below.

### 2.4.1 Ofgem

39 In a report for UK regulator Ofgem, Wright and Smithers (2014)[17] consider how the recent decline in government bond yields might affect the approach to estimating the MRP.

40 They begin with a consideration of the earlier Smithers & Co report by Wright, Mason and Miles (2003),[18] which proposes that the real required return on equity should be assumed to be constant on the basis of data from long-term historical averages of realised stock returns. Wright and Smithers note that this approach (which the AER refers to as the "Wright approach") has been employed consistently by UK regulators since then.

41 Wright and Smithers (2014) conclude that:

> … the [UK's Competition Commission] has given at least some weight to a model in which the expected market return is assumed to have been pulled down by falls in the risk-free rate. In Mason et al we argued against this model, pointing to the lack of any historical stability in the risk-free rate, and hence in estimates of the market equity premium. We believe that recent events have simply added to the weight of evidence against this approach.
>
> In contrast the Mason et al/Ofgem approach implies a counter-cyclical equity premium, which is consistent with some more recent academic research, and with recent patterns in observable proxies for risk premia such as corporate bond spreads. It also has the advantage of providing stability in the regulatory process.
>
> **We conclude that there is no plausible case for any further downward adjustment in the assumed market cost of equity based on recent [downward] movements in risk-free rates**.[19] [Emphasis added]

42 They go on to conclude that:

> Thus both historical and more recent evidence point to the same conclusion: in contrast to the stock return there is no evidence of stability in the risk-free rate, at any maturity. As a direct implication, there is no evidence of stability of the market equity premium. Without such evidence, **there is no empirical basis for the assumption that falls in risk-free rates should translate to falls in expected market returns.** [20] [Emphasis added]

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[17] Wright, S. and A. Smithers, 2014, "The cost of equity capital for regulated companies: A review for Ofgem,"

[18] Wright and Smithers (2014) refer to this earlier paper as "Mason et al." The full reference is Wright, S., R. Mason and D. Miles, 2003, *A study into certain aspects of the cost of capital for regulated utilities in the UK*, Report for UK economic regulators and the Office of Fair Trading, 13 February.

[19] Wright and Smithers (2014), p. 2.

[20] Wright and Smithers (2014), p. 15.

### 2.4.2 Federal Energy Regulatory Commission (FERC): New England rate case

43 In a recent decision, the US Federal Energy Regulatory Commission (FERC) noted that its previous approach had been to adjust the allowed return on equity (ROE) in lockstep with changes in the relevant government bond yield, the practice that has been maintained by the AER since its 2013 Guideline:

> The Commission's practice traditionally has been to adjust the ROE using a 1:1 correspondence between the ROE and the change in U.S. Treasury bond yields—i.e., for every basis point change in the U.S. Treasury bond yield the Commission would adjust the ROE by one basis point.[21]

44 However, FERC concluded that in the prevailing market conditions such an approach "may not produce a rational result,"[22] and that:

> Upon consideration of the record evidence in this proceeding, and in light of the economic conditions since the 2008 market collapse more generally, U.S. Treasury bond yields do not provide a reliable and consistent metric for tracking changes in ROE.[23]

45 The primary reason for FERC's conclusion is that:

> The capital market conditions since the 2008 market collapse and the record in this proceeding have shown that there is not a direct correlation between changes in U.S. Treasury bond yields and changes in ROE. [24]

### 2.4.3 Federal Energy Regulatory Commission (FERC): New York rate case

46 In another recent decision, FERC concluded that inserting the historical excess returns estimate of the MRP into the CAPM is likely to produce an unreliable estimate of the required return on equity:

> Given the recent trends of near-historic low yields for long-term U.S. Treasury bond rates, the CAPM's input for the "risk-free" rate, we find that it is a reasonable assumption that the current equity risk premium (which is added to the risk-free rate to calculate the cost of equity data point that determines the slope of the CAPM curve) exceeds the 86-year historical average used as the consultants' CAPM input.[25]

47 FERC identified the problem with a mechanistic implementation of the CAPM as follows:

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[21] FERC Opinion 531, Docket EL11-66-001, June 2014, Paragraph 159.

[22] FERC Opinion 531, Docket EL11-66-001, June 2014, Paragraph 159.

[23] FERC Opinion 531, Docket EL11-66-001, June 2014, Paragraph 160.

[24] FERC Opinion 531, Docket EL11-66-001, June 2014, Paragraph 158.

[25] FERC Docket ER14-500-000, January 2014, pp. 35-36.

> The current low treasury bond rate environment creates a need to adjust the CAPM results, consistent with the financial theory that the equity risk premium exceeds the long-term average when long-term US Treasury bond rates are lower than average, and vice-versa.[26]

48 FERC allowed a return on equity of 12.5%:

> We find that NYISO's[27] proposed ROE[28] value of 12.5 percent is adequately supported by substantial evidence. [29]

### 2.4.4 Federal Energy Regulatory Commission (FERC): Bangor Hydro rate case

49 In the *Bangor Hydro* case that addresses a range of issues relating to setting the allowed return on equity, FERC noted that it had previously rejected CAPM analyses that were "based on historic market risk premiums." FERC accepted the CAPM analysis in the current case because the present:

> CAPM analysis is based on forward-looking investor expectations for the market risk premium.[30]

[26] FERC Docket ER14-500-000, January 2014, pp. 35-36.

[27] New York Independent System Operator.

[28] Allowed return on equity.

[29] FERC Docket ER14-500-000, January 2014, pp. 35-36.

[30] FERC Docket EL11-66-001, June 2014, p. 71.

# 3 Approaches to estimating the MRP

50 Regulators in Australia have regard to a number of methods for estimating the MRP. In this section, we discuss briefly those methods. In subsequent sections, we document current estimates using each approach, and then we distil the various estimates into a single point estimate of the forward-looking MRP that is consistent with the prevailing conditions in the market for equity funds.

## 3.1 Historical excess returns

51 A number of Australian regulators (including the AER, ERA, QCA and IPART) are explicit that they use, amongst other approaches, mean historical excess returns to set the allowed MRP. This approach involves calculating the average difference between the observed return on the market (proxied by the return on a broad stock index, such as the All Ordinaries Index) and the risk-free rate (proxied by the yield on government bonds) over a long historical period (typically 50-100 years or more). The mean excess return over the historical period is then used as an estimate of the average MRP over that period.

52 By definition, this approach reflects the average market conditions over the historical period that is considered.

## 3.2 Dividend growth model (DGM)

53 The DGM involves forecasting future dividends on the market portfolio and then solving for the discount rate that equates the present value of those dividends with current stock prices. This approach provides a direct estimate of the forward-looking required return on the market portfolio. Subtracting the current risk-free rate then produces a forward-looking estimate of the MRP. A number of regulators, such as the AER, ERA, QCA and IPART use estimates from this approach to inform their MRP determinations.

54 For instance, in its 2013 Rate of Return Guideline materials, the AER stated that the main change to its approach to estimating the MRP was that it intended to apply more weight to DGM estimates of the MRP. In endorsing the use of DGM estimates, the AER stated that:

a. DGM estimates "may reflect current market conditions more closely"; [31]

[31] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

b. "DGMs are recognised financial models that are commonly used in practice;" [32]and

c. "DGMs are suited to the estimation of the rate of return from current market information, as demonstrated by US regulators using them for this purpose." [33]

55 In its Guideline, the AER set out its preferred DGM specification, concluding that:

> …we have greater confidence in the symmetry of this information through time and give these estimates greater consideration than we have in the past. [34]

56 Similarly, in a recent decision in relation to access prices for the Dampier to Bunbury Natural Gas Pipeline, the ERA stated that:

> The DGM is a relevant model for informing the market return on equity and also the forward looking MRP.[35]

and also noted that:

> …the Authority determined that it would give weight to relevant outputs from the Dividend Growth Model (DGM) when estimating the market risk premium (MRP), which is an input to the SL-CAPM.[36]

57 In its 2014 decision on cost of capital market parameters, the QCA stated that:

> The QCA considers that the dividend growth model provides a relevant estimate of the market risk premium, as the inputs involve current financial market data.[37]

58 In the final decision on its 2013 WACC methodology review, IPART concluded that when estimating the MRP its default position would be to give 50% weight to an estimate derived using long-run historical excess returns, and 50% weight to an estimate based on "current market data." The latter estimate is derived using five differently-specified DGMs.[38]

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[32] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

[33] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

[34] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

[35] ERA, Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020, Appendix 4 Rate of Return, 30 June 2016, p.96.

[36] ERA, Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020, Appendix 4 Rate of Return, 30 June 2016, p.52.

[37] QCA, Cost of capital: market parameters – Final decision, August 2014, p.21.

[38] IPART, Review of WACC Methodology, Research — Final Report, December 2013, p.15.

## 3.3 Historical real returns (Wright approach)

59 Another approach for estimating the MRP is what has become known as the "Wright" approach in the Australian regulatory setting. This involves taking the average real return on a broad stock market index over a long historical period and increasing it for expected (forward-looking) inflation to obtain an estimate of the nominal required return on the market. Subtracting the current estimate of the risk-free rate then produces an estimate of the MRP.

60 Implementation of the Wright approach involves the following steps:

a. Estimate the real return on the market portfolio each year for some historical period using the Fisher relation:

$$r_{m,t}^{real} = \frac{1 + r_{m,t}^{nominal}}{1 + inflation_t} - 1;$$

b. Take the average real market return over the relevant historical period; and

c. Use the Fisher relation, and a contemporaneous estimate of expected (forward-looking) inflation to obtain an estimate of the nominal required return on the market:

$$r_m^{nominal} = \left(1 + \overline{r_m^{real}}\right)\left(1 + E[inflation]\right) - 1.$$

61 The Wright approach produces a direct estimate of the required return on the market. The implied MRP can be determined by deducting the contemporaneous estimate of the risk-free rate.

62 The AER computes and publishes Wright approach estimates of the MRP and uses those estimates to cross-check its allowed return on equity.

63 The ERA combines MRP estimates derived using the Wright approach with estimates derived using long-run average historical excess returns to form a combined estimate based on historical data. This estimate is then combined with the ERA's DGM estimates of the MRP to produce a combined range for the MRP. In its latest decision (for regulated rail networks in October 2016) the ERA gave more weight to estimates from the Wright approach than estimates derived using long-run average historical excess returns as it considered it more likely that the MRP changes over time (inversely with changes in the risk-free rate) rather than

remaining fixed.[39] The ERA was not explicit about how much weight it attached to each method.

## 3.4 Survey evidence

64 Another potential source of evidence on the MRP are surveys of finance academics, market practitioners, and/or company executives. The precise questions asked of respondents can vary from one survey to another, but typically the surveys seek to elicit the participants' expectations of the MRP over some future horizon (e.g., over the forthcoming year) or the MRP the participants have actually used in that year (e.g., in valuation exercises).

65 There are a number of potential shortcomings with survey evidence:

a. The quality and reliability of the estimates from surveys depends on the design of the survey. Some surveys are unclear about the question being posed, so responses may be inconsistent (e.g., are the estimates forward-looking or backward-looking?) across respondents. In short, survey questions can be framed poorly or misinterpreted by respondents.

b. The technique used to canvas potential respondents could introduce sampling biases (e.g., by having too small a sample to be reliable or by sampling unqualified participants).

c. The views of survey respondents (which largely tend to be academics) on the required MRP may not reflect the views of investors, and it is investors' views on the required MRP that matter for the purposes of cost of capital estimation.

d. Respondents' views may be outdated if the survey is taken some time before a regulatory determination – as market conditions may have changed.

e. It is usually unclear from surveys how respondents have formulated their estimates of the MRP. If respondents have not used a rigorous framework for reaching a conclusion on the MRP, survey evidence may simply add 'noise' to the estimation process.

f. The surveys almost never ask respondents about the risk-free rate that they would use in conjunction with their estimate of the MRP. In practice, it is common for some practitioners to use relatively stable estimates of the risk-free rate and MRP. Thus, in the current market conditions a practitioner may use long-run average

[39] ERA, Determination on the 2016 Weighted Average Cost of Capital for the Freight and Urban Railway Networks, and for Pilbara railways, 28 October 2016, pp.13-14.

> estimates of both the MRP and risk-free rate. Relative to estimates that reflect the prevailing conditions, the MRP estimate is likely to be too low and the risk-free rate estimate is likely to be too high. These differences may largely cancel such that the headline estimate of the required return on equity is broadly consistent with the current conditions. However, if a survey asks only about the MRP estimate, and then pairs that estimate with the (lower) contemporaneous risk-free rate, the result is an estimate of the required return on equity that is biased downward relative to that practitioner's actual practice.

66 IPART and ESCOSA do not use survey evidence, largely for the reasons set out above. For instance, in a March 2015 report to the SA Treasurer on cost of capital issues, ESCOSA rejected the use of survey evidence on the grounds that such evidence is

> ...unreliable because it is solely based on opinion.[40]

67 Only two regulators in Australia have any regard to survey evidence.

68 In its Rate of Return Guideline, the AER stated that it would use survey evidence as a cross-check on MRP estimates derived by direct reference to long-run average historical excess returns and the DGM. In its Guideline, the AER formed a combined range from its historical excess returns and DGM estimates and then used a collection of evidence, including survey evidence, to select a point estimate from within that range. However, as with most 'cross-checks' used by regulators, it is unclear what impact, if any, such evidence actually has on the final estimate of the MRP. The AER indicates that it has some limited regard to surveys, although the AER states that it:

> ...consider[s] this evidence less informative than historical averages and DGM estimates.[41]

69 The QCA uses survey-based estimates as one of four key pieces of evidence when deriving the MRP. Consequently, survey evidence plays a more important role in the QCA's methodology.

## 3.5 Estimates by valuation experts

70 Another potential source of evidence are the MRP estimates used in independent expert valuation reports. These estimates are likely to be more useful than surveys because they are being used for the same purpose as in the regulatory setting – as an input in the estimation of the required return on equity. Moreover, independent

[40] ESCOSA, SA Water Regulatory Rate of Return 2016 – 2020 — Final report to Treasurer, March 2015, p.64.

[41] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 96.

expert valuation reports are prepared for a commercial purpose in the context of live commercial transactions. This means that there is arguably a commercial incentive for these MRP estimates to be 'accurate'.

71 However, the information in independent expert valuation reports must be interpreted carefully. Recent studies of MRP estimates used in independent expert valuation reports have shown that while it has been common to adopt a headline MRP between 6.0% to 6.5% over the past decade or so, since the GFC many experts have applied an 'uplift' (explicit or implicit) to either the risk-free rate estimate (over and above prevailing government bond yields prevailing at the time) or to their overall cost of equity estimate.[42]

72 For example, at a time when the prevailing government bond yield is 3%, an independent expert report might adopt a headline MRP estimate of 6% and a risk-free rate of 5%, giving an overall estimate of the required return on market equity of 11%. In the regulatory setting, the task is to estimate the MRP that would be combined with the prevailing government bond yield to produce an estimate of the prevailing required return on equity. In this example, the expert report suggests that an MRP of 8% should be used. That figure, when combined with the prevailing government bond yield of 3% produces the 11% return on equity that the expert considers to be commensurate with the prevailing conditions in the market. Combining the headline MRP figure of 6% with the prevailing government bond yield of 3% produces a return on equity of 9%, which is materially inconsistent with the view of the independent expert.

73 In its Rate of Return Guideline, the AER stated that it would have regard to MRP evidence from independent valuation reports. The AER stated that independent expert valuation reports "should play a role in our estimation of the expected return on equity," [43] cautioning that they must be contemporaneous:

> Expert reports are credible, verifiable, and clearly sourced. Against this, expert reports are not released at regular intervals. Consequently, some estimates may be out of date. [44]

74 As part of its 2013 review of WACC parameters, the consultant appointed by the QCA recommended that independent expert reports should be used with surveys of academics and practitioners, equally weighting the two sources as a means of identifying current market views:

> In respect of alternative methods for estimating the MRP, I consider that the survey-based MRP estimates should draw upon those from recent reports by independent

[42] See, for instance: SFG Consulting, Evidence on the required return on equity from independent expert reports, 24 June 2013; HoustonKemp, The cost of equity: response to the AER's draft decisions for the Victorian electricity distributors, January 2016.

[43] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 28.

[44] AER, 2013, Rate of Return Guideline, Explanatory Statement, Appendices, p. 28.

> valuation experts as well as from the Fernandez surveys with averaging over the results from these two sources,[45]

and the QCA has accepted that recommendation in its recent decisions.

## 3.6 Conditioning variables

75 A number of observable variables have been identified in the finance literature, and by some regulators in Australia, as possible indicators of different market conditions and, therefore, as indicators of the MRP in those market conditions. These indicators are referred to as 'conditioning variables.'

76 For example, the AER considers three such conditioning variables:[46]

a. The ASX200 implied volatility index (VIX), which estimates investors' expectations of volatility of the Australian stock market embedded within ASX200 put and call options;

b. The spread between the yield on State government debt and the yields on Commonwealth Government Securities (i.e., 'credit spreads'); and

c. Dividend yields.

77 In its Rate of Return Guideline the AER stated that it would give "limited consideration"[47] to conditioning variables and other regulators' estimates:

> We also give some consideration to conditioning variables and other regulators' MRP estimates. These sources of evidence are subject to various limitations and should be used with caution.[48]

78 In recent regulatory decisions, the AER stated the following about how it uses conditioning variables to inform its MRP estimates:

> We do not consider conditioning variables provide reliable estimates on their own. However, this information is relevant and may be useful for indicating changes in prevailing market conditions.[49]

79 In other words, the AER uses conditioning variables to provide only directional evidence on the MRP. [50] Specifically, the AER considers whether the prevailing

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[45] Lally (2013), "Response to submissions on the risk-free rate and the MRP," Report for the QCA, 22 October, p. 3.

[46] AER, 2103, Rate of Return Guideline, Explanatory Statement Appendices, section D.4; AusNet Final Decision, 2017, Attachment 3, pp. 81 and 231.

[47] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[48] AER, 2013, Rate of Return Guideline, Explanatory Statement, p. 97.

[49] AusNet Draft Decision, 2016, Attachment 3, p. 208.

[50] AusNet Final Decision, 2017, Attachment 3, pp. 81 and 231-232.

level of each conditioning variable is significantly above, significantly below or near the long-run historical mean level as a way of assessing whether investors' prevailing perceptions of market risk over the relevant forward-looking investment horizon are higher or lower than average.

80 In addition to the three conditioning variables considered by the AER, the ERA also has regard to interest rate swap spreads.[51] Like the AER, the ERA uses conditioning variables to provide directional evidence on the MRP.

81 IPART uses conditioning variables more directly to inform its estimate of the MRP. IPART considers four conditioning variables, of which only one is in common with the indicators used by the AER and the ERA:[52]

a. The risk-free rate (i.e., 10-year government bond yields estimated by the RBA);

b. The difference between 10 year and 2 year government bond yields estimated by the Reserve Bank of Australia (i.e., the 'term spread');

c. The difference between the UBS all maturities credit yield and the UBS treasury yield (i.e., the 'corporate spread'); and

d. The dividend yield on the All Ordinaries Index.

82 IPART uses these indicators to estimate the MRP using the following steps:[53]

a. First, for each of these variables, IPART constructs a distribution of historical values;

b. Next, using these distributions of past outcomes, IPART calculates the percentile of the prevailing value for each indicator. For instance, in January 2013, IPART found that the risk-free rate was at the 99$^{th}$ percentile of the risk-free rate distribution, the term spread was at the 61$^{st}$ percentile, the corporate spread was at the 67$^{th}$ percentile and the dividend yield was at the 75$^{th}$ percentile;

c. IPART then computes the average percentile across the distributions (i.e., $(99 + 61 + 67 + 75)/4 \approx 75$);

d. Finally, IPART applies this average percentile to an assumed uniform range for the MRP (i.e., 3% to 9%) to obtain an estimate of the MRP (i.e., $3\% + 0.75 \times (9\% - 3\%) = 7.5\%$). This range assumes that the MRP is uniformly distributed about the long-run historical average excess return of 6%, and an observation from a

[51] ERA, Final Decision on Proposed Revisions to the Access Arrangement for the Dampier to Bunbury Natural Gas Pipeline 2016 – 2020, Appendix 4 Rate of Return, 30 June 2016, p.107.

[52] IPART, Review of WACC Methodology, Research — Final Report, December 2013, Appendix B.

[53] IPART, Review of WACC Methodology, Research — Final Report, December 2013, Appendix B.

survey of the academic literature that there are few estimates of the MRP below 3% or above 9%.

83 IPART then uses this MRP estimate, derived using conditioning variables (along with estimates derived using five differently-specified DGMs), to arrive at an overall 'prevailing' estimate of the MRP.

## 3.7 Adjustment for dividend imputation

### 3.7.1 Rationale for adjustment

84 The regulatory models that are used in Australia require an estimate of the MRP that includes the assumed benefit of dividend imputation tax credits. The regulator then uses this *with-imputation* estimate of the MRP to determine the total required return on equity. The regulator then deducts the assumed value of imputation credits when setting the firm's allowed revenues. In an imputation system, equity holders receive their return in three ways: dividends, capital gains, and imputation credits. In the regulatory setting, the allowed return on equity must be sufficient for the firm to be able to generate the required dividends and capital gains. This is supplemented by imputation credits to provide equity holders with the total return that they require.

85 Consider the following example, where a firm has $10 billion of assets and an assumed capital structure of 40% equity and 60% debt. Suppose the regulator estimates that the total required return on equity is 8% and the required return on debt is 5%. In this case, the equity holders require a total return of $320 million[54] and the debt holders require an interest payment of $300 million.[55]

86 To provide the required return to equity holders, the regulated firm would be allowed revenues to enable it to generate a pre-tax profit of $712.90 million, as set out in Table 4 below.

[54] 8%×40%×10 billion.

[55] 5%×60%×10 billion.

Table 4: Disaggregation of return to equity

| Symbol | Item | Amount ($ million) |
|---|---|---|
| A | Pre-tax profit | 657.54 |
| B | Interest | 300.00 |
| C=A-B | Taxable income | 412.90 |
| D=0.3xC | Tax paid | 123.87 |
| E=A-B-D | Dividend paid | 289.03 |
| F=0.25xD | Value of credits | 30.97 |
| G=E+F | Total return to equity | 320.00 |

*Source: Frontier Economics calculations.*

87 The way the Australian regulatory framework operates is that the regulator will first estimate the total required return to equity, which is $320 million in the example above. Then the regulated firm will be allowed revenues that are sufficient for the firm to pay a fraction of $\frac{1-T}{1-T(1-\gamma)}$ of that return to equity holders. In the example above, the allowed revenues were sufficient to enable the firm to pay a return of:

$$\left[\frac{1-T}{1-T(1-\gamma)}\right]320 = \left[\frac{1-0.3}{1-0.3(1-0.25)}\right]320 = 289.03,$$

with the remainder of the return assumed to come in the form of imputation credits.

88 The starting point for this process is an estimate of the *total* required return on equity, including the assumed value of imputation credits – the $320 million figure in the above example. The standard approach in the Australian regulatory setting is to estimate this *with-imputation* required return on equity using the CAPM with an MRP estimate that includes the estimated value of imputation credits. That is, we require a *with-imputation* estimate of the MRP – the $320 million figure in the example above. The regulatory model essentially begins with that figure and then works its way up the table above to the allowed pre-tax profit of $657.54 million. Note that pre-tax profit will be sufficient for the firm to pay a return of only $289.03 to its shareholders – the total required return of $320 million minus the regulator's estimate of the value of imputation credits, $30.97 million.[56]

[56] The regulatory model gives effect to this reduction of $30.97 million via an adjustment to the corporate tax allowance. That is, but for this deduction in relation to the assumed value of imputation credits, the firm would be able to recover an additional $30.97 million in after-tax profits that it could distribute to its shareholders.

### 3.7.2 Adjustment to historical returns

89 Historical stock returns are used in the excess returns approach and the Wright approach, as described above. The databases of historical returns include dividends and capital gains only, so the estimated value of imputation credits must be added in order to obtain an estimate of the total *with-imputation* return on the market.

90 The approach that is generally adopted for adjusting historical returns is to obtain data on the "franking credit yield"[57] from the Australian Taxation Office and to multiply by the estimated value of the credits that are distributed to equity holders, known as "theta."[58] For example, if the franking credit yield is 1.5% and theta is estimated to be 0.35, the return from dividends and capital gains would be increased by 0.35×1.5%=0.53%. The AER, ERA and QCA have explained the mechanics of this "grossing-up" in detail in their decisions. Of course, such an adjustment would be made only to data points after the introduction of imputation in 1987.

### 3.7.3 Adjustment to forward-looking estimates

91 Two approaches are used by Australian regulators to make an adjustment for imputation credits to the forward-looking estimates of the MRP, such as the DGM estimates. We refer to these as the "AER" and "IPART" approaches after the main proponents of each one.

#### *AER approach*

92 The AER's implementation of the DGM is to add the estimated value of imputation credits to the forecast future dividends. To do this, the AER estimates (on the basis of historical data) that 75% of all dividends are franked. Every dollar of franked dividend has $\frac{T}{1-T}$ dollars of imputation credits attached to it, and each dollar of credits is assumed to have a value of theta, as above. Thus, for a corporate tax rate of 30% and a theta of 0.35, we have and adjustment of:

$$0.75 \times \left[\frac{0.3}{1-0.3}\right] \times 0.35 = 0.1125.$$

93 Thus, the forecast dividends are increased by 11.25% to account for the value of imputation credits. Depending on the dividend growth rate assumption, and on

[57] The ratio of imputation credits distributed to the market value of equity.

[58] Note that the gamma parameter is the product of (a) the proportion of created credits that are distributed to equity holders, and (b) the value of distributed credits. The current market value estimate of gamma is 0.25, which is the product of a distribution rate of 70% and a value of distributed credits of 35%.

whether a two-stage or three-stage model is used, this adjustment for imputation can add in the order of 50-60 basis points to the estimate of the MRP.

### IPART approach

94 The IPART approach to DGM estimates is to first estimate the *ex-imputation* required return on the market, making no upward adjustment for imputation credits. That estimate is then converted into a with-imputation estimate by making the same adjustment as is used in the regulatory model:

$$r_{m,with-imp} = r_{m,ex-imp} \div \left[\frac{1-T}{1-T(1-\gamma)}\right]$$

95 For example, for an ex-imputation required return on the market of 10%, the IPART approach would produce an estimate of the with-imputation required return of:

$$r_{m,with-imp} = 10\% \div \left[\frac{1-0.3}{1-0.3(1-0.25)}\right] = 11.1\%.$$

96 Thus, this adjustment adds approximately 1% to the estimate of the required return on the market and the same amount to the estimate of the MRP, which is estimated by subtracting the relevant estimate of the risk-free rate form the *with-imputation* estimate of the required return on the market.

97 The advantages of the IPART approach are:

a. It can be applied to any ex-imputation estimate of required returns, such as those provided in independent expert valuation reports; and

b. It ensures that the estimate of the ex-imputation required return, that forms the basis of allowed revenues under the Australian regulatory framework, is consistent with the market evidence. This is because the upward adjustment that is made to include the estimated value of credits is identical to the downward adjustment that is applied in the regulatory model to remove the estimated value of credits before setting the allowed revenues.

# 4 A forward-looking estimate commensurate with prevailing market conditions

98 As set out in Section 2 above, our view is that the regulatory task is to estimate a forward-looking MRP that is commensurate with the prevailing conditions in the market for equity funds, and this view accords with the current practice of a number of regulators in Australia. In this section, we present estimates of the MRP using:

a. Long-run average historical excess returns;
b. The DGM;
c. The Wright approach;
d. Survey evidence;
e. Evidence from valuation experts; and
f. Conditioning variables.

99 We then combine estimates derived using these different approaches to arrive at an overall estimate of the MRP that is commensurate with prevailing market conditions.

## 4.1 Long-run average historical excess returns

100 We have estimated the mean historical excess return over various historical periods as set out in Table 5 below.

Table 5: Mean historical excess return estimates

| Historical period | Mean excess return |
|---|---|
| 1883-2016 | 6.5% |
| 1937-2016 | 5.7% |
| 1958-2016 | 6.2% |
| 1980-2016 | 6.0% |
| 1988-2016 | 5.4% |

*Source: Common data set used for regulatory determinations, Frontier Economics calculations, estimates consistent with a gamma of 0.25.*

101 In constructing these estimates, we have adopted the following estimation approaches:

a. All historical periods run through to the end of 2016 to reflect the latest available data;

b. The period start dates are those that have been traditionally adopted by a number of Australian regulators. The relevant data is available back to 1883. The quality of the available data increased in 1937 and again in 1958. The period beginning in 1980 reflects the deregulation of the Australian economy and 1988 is the first year after dividend imputation was introduced. For the reasons explained below, we consider that the periods beginning in 1980 and 1988 are too short to obtain statistically reliable estimates, but we report them for completeness and for comparison with other regulatory determinations;

c. We report arithmetic means, consistent with Australian regulatory practice. For example, we note that the QCA considers arithmetic means on the advice of its consultant:

> if historical average returns are used, they should be arithmetic rather than geometric averages.[59]

On this point, we also note that in its recent decisions the AER has stated that:

> We consider both geometric and arithmetic averages of historical returns. However, we consider there may be evidence of bias in the geometric averages. Therefore, our range for historical returns is based on arithmetic averages.[60]

but also that:

> We consider both geometric and arithmetic averages of historical returns. However, we are aware of evidence that there may be a bias in the geometric averages. We take this into account when forming our result and baseline estimate, and as such our range for historical returns is based on arithmetic averages and informed by geometric averages.[61]

d. Our approach is to apply the NERA adjustment to better match the dividends paid in the early part of the historical sample – for

[59] Lally, M., 2012, *The risk-free rate and the market risk premium*, Report for the Queensland Competition Authority, 23 August, p. 5, repeated at pp. 32 and 34.

[60] AusNet Draft Decision, 2016, Attachment 3, p. 59.

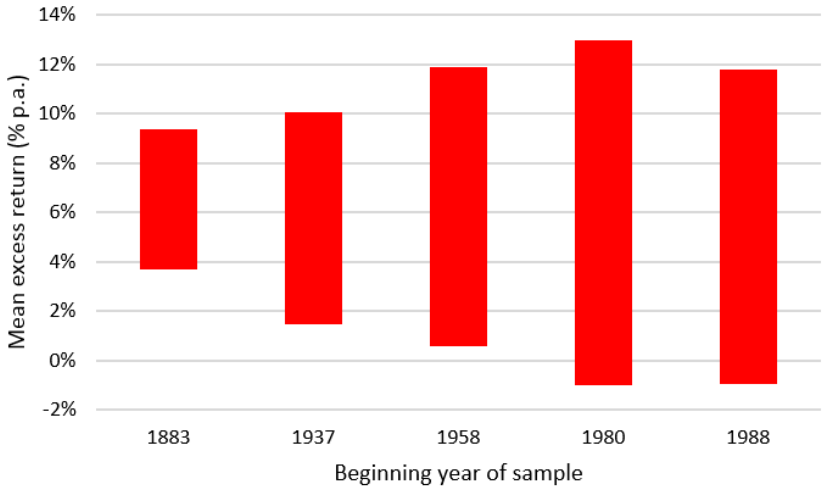
[61] AusNet Final Decision, 2017, Attachment 3, p. 77.

the reasons set out in SFG (2014)[62] and because those corrected estimates have now been adopted by commercial data vendors.[63]

e. All estimates are consistent with a gamma of 0.25, as set out in Section 3.7.2 above.

102 We note that the longer-run estimates are more statistically precise, as set out in Figure 1 below which shows standard 95% confidence intervals for the MRP estimates from various different historical periods. The estimates for the two short periods that begin in the 1980s are so statistically imprecise that they are unable to confirm whether or not the MRP is positive,[64] and for that reason we place little weight on them. The estimate based on the longest period for which data is available is clearly the most statistically precise estimate.

Figure 1: Historical excess return estimates for different estimates of theta




*Source: Frontier Economics calculations.*

103 Finally, and crucially, we note that these estimates are commensurate with the average market conditions over the various historical periods and therefore may

[62] SFG, 2014, *The required return on equity for regulated gas and electricity network businesses*, June, pp. 49-52. The issue here is that the return estimates for the early years of the sample period used the average dividend yield taken only over those companies that paid dividends, so an adjustment is required to reflect the proportion of firms that pay dividends. Two such adjustments have been proposed. Brailsford, T., J. Handley and K. Maheswaran, 2008, "Re-examination of the historical equity risk premium in Australia," *Accounting and Finance* 48, 73-97 apply a single estimate from 1966 to all prior years. NERA, 2013, *The market, size and value premiums*, June apply estimates sampled uniformly from within the periods in question, so is unquestionably more accurate and more appropriate.

[63] For example, see Credit Suisse Global Investment Returns Sourcebook.

[64] That is, the confidence interval includes zero, and even negative estimates of the MRP.

not be commensurate with the prevailing conditions.[65] For example, the prevailing 10-year government bond yield is now 2.8%. The average 10-year government bond yields over the various historical periods used to estimate the MRP are set out in Table 6 below.

Table 6: Mean 10-year government bond yields

| Historical period | Mean 10-year government bond yield |
|---|---|
| 1883-2016 | 5.5% |
| 1937-2016 | 6.5% |
| 1958-2016 | 7.4% |
| 1980-2016 | 8.0% |
| 1988-2016 | 6.4% |

*Source: RBA, Regulatory data set, Frontier Economics calculations.*

104 Of course, there are many dimensions to "market conditions" and many variables can be used to provide an indication of whether the prevailing conditions differ from the historical average market conditions. We consider that the 10-year government bond yield is the most directly relevant and important indicator because it is the figure that is added to the MRP estimate to produce the allowed return on equity.

105 Our view is that MRP estimates based on mean historical excess returns are relevant evidence and should be given some weight, while recognising the concerns about whether the prevailing market conditions differ from the average conditions over the various historical periods. For the reasons set out above, we place most weight on the longer periods due to the statistical imprecision of the estimates from shorter periods. In our view, this evidence supports an MRP estimate of 6.2% – giving most weight to the longest data period (from 1883) and some weight to the sample periods beginning in 1937 and 1958.

## 4.2 DGM estimates

106 A number of variations of the DGM are used in practice. These variations differ in terms of the assumptions that are made about the long-run growth rate in future dividends. Specifications differ in terms of the level of long-run growth that is

[65] Unless, of course, it is simply assumed or asserted that investors always require the same MRP in *all* market conditions. But such an assumption would be untenable as it is inconsistent with the clear evidence from debt markets that the 10-year risk premium varies materially with market conditions.

used and in terms of when long-run perpetual growth is assumed to begin. For this reason, we consider a number of specifications of the DGM.

### 4.2.1 AER specification

107 We begin by considering the specifications adopted by the AER in its 2013 Guideline and used in all of its subsequent decisions. The AER considers two-stage and three-stage DGMs. In both cases, the AER uses analyst forecasts of dividends two years into the future. The two-stage model assumes that a long-run growth rate begins immediately in Year 3 and all subsequent dividends will grow at that rate. The three-stage model assumes that dividend growth tapers from the short-run growth implied by the analyst forecasts to the assumed long-run growth rate over years 2 to 10, and that all dividends after Year 10 grow at the assumed long-run growth rate. Whereas the AER has stated that it considers the three-stage model to be more reliable,[66] we note that the two approaches produce similar estimates in the current market conditions.

108 The AER adopts three different assumptions for the long-run growth rate. These figures are obtained by estimating the long-run GDP growth rate and making various deductions based on some empirical evidence that, in the United States, the growth rate in corporate earnings has been lower than the growth rate in GDP. However, that evidence is now quite dated. SFG (2014)[67] show that there has been no difference, in Australia or the US, between GDP and corporate earnings growth rates since 1991 when central banks began explicitly adopting policies designed to maintain inflation at moderate levels. For this reason, we consider the AER's DGM estimates to be conservatively low.[68] At a minimum we would focus on the AER estimates based on a 5.1% growth rate as that involves the smallest deduction from the estimate of GDP growth.

109 Finally, we note that the AER makes an upward adjustment to incorporate the estimated value of dividend imputation credits, as set out in Section 3.7.3 above.

110 We have updated the AER's DGM estimates through to the end of December 2016 and report the results in Table 7 below. All estimates are consistent with a gamma of 0.25 and a risk-free rate of 2.8%. For the reasons set out above, we focus on estimates that are based on the 5.1% growth rate and note that the resulting estimate of the MRP is approximately 7.8%.

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[66] JGN Draft Decision, 2014, Attachment 3, Appendix C, p. 222.

[67] SFG, 2014, *Alternative versions of the dividend discount model and the implied cost of equity*, Report for Jemena Gas Networks, May.

[68] That is, a higher dividend growth rate, more akin to the GDP growth rate, would produce higher estimates of the MRP.

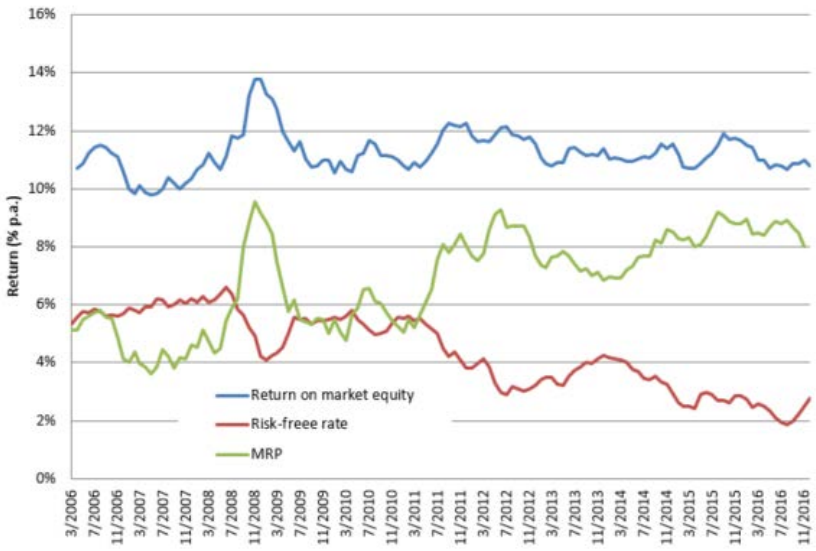
Table 7: Contemporaneous estimates of the MRP from the AER's DGM approach

| Growth rate (%) | Two-stage model MRP (%) | Three-stage model MRP (%) |
|---|---|---|
| 3.8 | 6.58 | 6.74 |
| 4.6 | 7.35 | 7.41 |
| 5.1 | 7.84 | 7.82 |

*Source: AER DGM specification, data through to December 2016, consistent with gamma of 0.25.*

111 The DGM approach first derives the required return on equity for the market portfolio and then subtracts the prevailing risk-free rate to obtain an estimate of the MRP. Figure 2 below shows the components of the AER's DGM estimates over the last 11 years. The figure shows that the headline estimate of the required return on equity has been remarkably stable over time, hovering between 10% and 12%, but for a brief increase at the peak of the GFC. This stability in the overall required return on equity implies that, over recent years, the MRP has risen so as to offset the fall in the risk-free rate. That is, even though the risk-free rate has declined materially since the 2013 Guideline, the required return on equity has remained stable – and this is manifest in an increased estimate of the MRP. The AER has responded to this evidence by assigning progressively less (but unspecified) weight to its own DGM estimates as they indicate that the MRP has increased to offset the fall in government bond yields – leaving a stable required return on equity.

Figure 2: Components of AER DGM estimates of MRP




*Source: AER DGM specification, data through to December 2016, consistent with gamma of 0.25.*

### 4.2.2 IPART specification

112 IPART considers a number of DGM specifications developed by the Bank of England, Damodaran and Bloomberg.[69] IPART's most recent WACC update uses data through to the end of 2016 and reports a prevailing MRP of 9.3% to be paired with a prevailing risk-free rate of 2.8%.[70] This estimate is also consistent with a gamma of 0.25, using IPART's adjustment set out in Section 3.7.3 above.

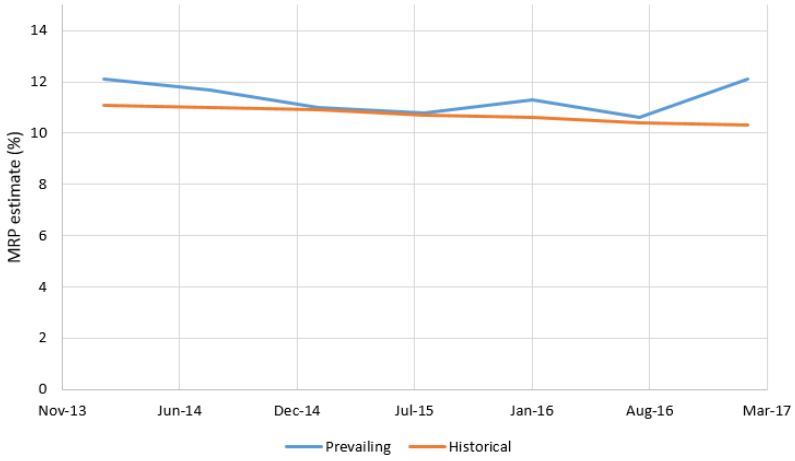
113 We note IPART use two approaches for setting the allowed return on equity:

a. Pairing the prevailing risk-free rate with an estimate of the prevailing (forward-looking) MRP; and

b. Pairing the historical average risk-free rate with an historical average estimate of the MRP.

114 We note that these two approaches have produced remarkably consistent estimates of the total required return on equity – over time and compared to one another – as shown in Figure 3 below. The historical estimates, being based on long-term averages, are naturally slow to change over time. And the prevailing estimate of the MRP tends to vary over time in a way that largely offsets changes in the risk-free rate. Both estimates have been within (or are very close to) the 10% to 12% range since IPART began using this approach in 2013.

Figure 3: IPART estimates of the total required return on the market




*Source: IPART biannual WACC estimates.*

[69] IPART, 2013, Review of WACC Parameters, p. 15.

[70] IPART, 2017, WACC Biannual update: February 2017, p. 3.

### 4.2.3 Bloomberg estimate

115 Bloomberg also publishes estimates of the prevailing MRP that are based on a version of the DGM. The Bloomberg MRP estimate varied closely around 7% at the end of December 2016 and is currently at 7.0%.[71] In both cases, these estimates corresponded to a risk-free rate estimate of 2.8%.

116 Although the Bloomberg estimates have the advantage of being completely independent of the regulatory process, the ICRC has noted that the Bloomberg estimates tend to be more volatile, possibly due to asynchronous estimates of forecast dividends and current share prices.[72]

117 We also note that the Bloomberg estimates make no adjustment for the value of dividend imputation tax credits, so are ex-imputation estimates. Applying the IPART adjustment for imputation, with gamma set to 0.25, results in a with-imputation estimate of 8.0%.[73]

### 4.2.4 Summary of DGM estimates

118 This section presents three current DGM estimates of the MRP that are consistent with a risk-free rate of 2.8% and with a gamma of 0.25:

a. The AER estimate of 8.2%;

b. The IPART estimate of 9.3%; and

c. The Bloomberg estimate of 8.0%.

119 For the remainder of this report, we adopt the central estimate of 8.2%, noting that we consider this to be a conservative estimate for the reasons set out in Section 4.2.1 above.

## 4.3 The Wright approach

120 We summarise the prevailing Wright estimates of the MRP in Table 8 below. We adopt the same historical periods as for the historical excess returns in Section 4.1 above. All estimates are based on forward-looking expected inflation of 2.5% and all are consistent with a risk-free rate of 2.8% and a gamma of 0.25.

[71] As at 31 March 2017.

[72] ICRC, 2016, *Issues paper: Regulated water and sewerage services prices 2018-23*, p. 27.

[73] (0.071+0.028)/0.903-0.028.

Table 8: Wright estimates of the MRP

| Historical period | Mean real market return | Implied nominal return (2.5% expected inflation) | MRP (2.8% nominal risk-free rate) |
|---|---|---|---|
| 1883-2016 | 8.8% | 11.6% | 8.8% |
| 1937-2016 | 7.1% | 9.8% | 7.0% |
| 1958-2016 | 8.6% | 11.3% | 8.5% |
| 1980-2016 | 9.5% | 12.2% | 9.4% |
| 1988-2016 | 6.4% | 11.4% | 8.6% |

*Source: RBA, Common data set used for regulatory determinations, Frontier Economics calculations, estimates consistent with a gamma of 0.25.*

121 As for historical excess returns above, we give more weight to the longer-term estimates on the basis of their statistical precision and reliability. In particular, we give most weight to the longest data period (from 1883) and some weight to the sample periods beginning in 1937 and 1958. We consider that this evidence supports an estimate in the order of 8.2%.

## 4.4 Survey evidence

122 The AER summarises the results of a number of surveys in its recent final decisions and concludes that those surveys support an (ex-imputation) MRP estimate of approximately 6.0%.[74] The AER has stated recently that:

> ...market risk premium estimates, from surveys published since 2013, cluster around 6.0 per cent. [75]

123 The QCA has also reached such a conclusion in its recent decisions.[76]

124 Since those decisions, the results of a new survey have been distributed, relating to data collected in early 2017. The relevant outcomes of that survey are summarised in Table 9 below.

[74] AusNet Final Decision, 2017, Attachment 3, Table 3-, p. 241.

[75] Update for FD or use 'AusNet Final Decision, 2017, Attachment 3, p. 3-241.

[76] QCA, 2014, Aurizon Network UT4 Draft Decision, p. 232.

Table 9: Recent survey outcomes

| Survey | Number of responses | Mean (%) | Median (%) |
|---|---|---|---|
| Fernandez et al (2017) | 26 | 7.3% | 7.6% |

*Source: Fernandez, P., V. Pershin and I.F. Acin, Discount rate (risk-free rate and market risk premium used for 41 countries in 2017: A survey, ssrn.com/abstract=2954142.*

125 Our view is that surveys of this type should be given no material weight because:

a. There is no information about the qualifications or expertise of the respondents;

b. There is no information about the survey response rate, or about whether there is any bias in the response rates of different groups;

c. The survey does not ask respondents about what they use the MRP for (e.g., classroom examples or pricing infrastructure assets);

d. The survey does not ask respondents whether they use the MRP in the CAPM, or some other model;

e. The survey does not ask the respondents whether they pair their MRP response with the contemporaneous government bond yield or a higher number (as is the observed practice of many independent expert valuation professionals);

f. The survey does not ask participants whether they have grossed-up their estimate for some assumed value of imputation credits, and if so what estimates of gamma have been used; and

g. There is no information about when the survey was conducted, or about the level of government bond yields at the time the survey was conducted.

126 If the survey estimates are to be used, they must be adjusted to incorporate the estimated value of dividend imputation tax credits. By way of example, the QCA has recently concluded that the median survey estimate should be adopted and that the adjustment for imputation requires the addition of approximately 80 basis points.[77]

> Without an adjustment, the survey evidence supports a median market risk premium estimate of 6.0%. With an adjustment, the survey evidence supports an estimate of 6.8%.

127 Thus, the QCA approach leads to a current MRP estimate of 8.4%. That estimate reflects the QCA's gamma estimate of 0.47. Using the QCA approach, but with a

[77] QCA, 2014, Aurizon Network UT4 Draft Decision, p. 232.

gamma of 0.25 produces an MRP estimate of 8.1%. Using the IPART approach to adjust for imputation credits produces an MRP estimate of 8.7%.

128 Although we recommend placing little weight on these survey responses, we report the 8.1% figure as a conservative prevailing estimate when tabulating the various estimates below.

## 4.5 Evidence from valuation experts

129 We have conducted a search for independent expert valuation reports that were released after 2016 and which pertained to transactions in excess of $100 million. Since independent experts generally apply consistent approaches over time, we consider only one report per expert firm. This process produced four recent independent expert reports, as set out in Table 10 below.

Table 10: Recent independent expert valuation reports

| Company name | Independent expert | Report date | Transaction value ($ millions) |
|---|---|---|---|
| Ethane Pipeline Income Fund | Lonergan Edwards[78] | 31/03/2016 | 122 |
| Pacific Brands Ltd | Grant Samuel[79] | 20/05/2016 | 1,055 |
| Patties Foods Ltd | Deloitte[80] | 15/07/2016 | 197 |
| STW Communications Group Ltd | KPMG[81] | 29/02/2016 | 338 |

*Source: Connect 4.*

130 All four experts set the required return on equity materially above the figure that would be obtained from inserting the current government bond yield and a 6.5% MRP into the SL-CAPM formula. The independent expert reports achieve the higher estimates of the required return on equity in three different ways:

a. By using an estimate of the MRP higher than 6.5%;

b. By using a risk-free rate above the contemporaneous government bond yield; and

c. By applying an ad hoc increase to the mechanistic CAPM estimate.

131 For example, Grant Samuel begins with a mechanistic CAPM estimate of the required return on equity using the contemporaneous government bond yield and

[78] Lonergan Edwards, 2016, Independent Expert Report on Ethan Pipeline Income Fund, April.

[79] Grant Samuel, 2016, Independent Expert Report on Pacific Brands Ltd, May.

[80] Deloitte, 2016, Independent Expert Report on Patties Foods Ltd, July.

[81] KPMG, 2016, Independent Expert Report on STW Communications Group Ltd, March.

a MRP based on historical excess returns, concludes that the outcome is implausible in the prevailing market conditions, and makes a material upward adjustment.

132 Lonergan Edwards state:

> In our view, the application of the current (very low) government bond yields and long-term average MRP is inappropriate in the context of determining required equity rates of return (discount rates). Theoretically, the anomalous currently low government bond interest rates could be allowed for by increasing the MRP. However, as it is difficult to reliably measure short-term movements in the MRP, we have instead increased the risk-free rate for the purposes of estimating required rates of return.[82]

133 KPMG also use a risk-free rate that is higher than the contemporaneous government bond yield. They specifically note that the MRP and risk-free rate must be considered jointly and not in isolation:

> …the individual variables should not be considered in isolation but rather be viewed as components appropriate for the construction of a discount rate as a whole…Consideration of these components in isolation may result in an inappropriate discount rate being determined.[83]

134 For this reason, we consider the sum of the risk-free rate and MRP and define that to be the "required market return." We then subtract the contemporaneous government bond yield to obtain an estimate of the "effective MRP." These calculations are set out in Table 11 below.[84]

Table 11: The effective MRP used in recent independent expert valuation reports

| Independent expert | Required market return | Contemporaneous government bond yield | Effective MRP |
|---|---|---|---|
| Lonergan Edwards | 10.0% | 3.1% | 6.9% |
| Grant Samuel | 11.2% | 2.5% | 8.7% |
| Deloitte | 9.6% | 1.8% | 7.8% |
| KPMG | 10.4% | 2.4% | 8.0% |

*Source: Connect 4.*

[82] Lonergan Edwards, 2016, p. 47.

[83] KPMG, 2016, p. 85.

[84] Grant Samuel applies an upward adjustment at the WACC level. To find the required return on the market, we simply strip out the return on debt component for the case where beta is set to 1.

135 The evidence in Table 11 is that independent experts are using estimates of the effective MRP[85] between 6.9% and 8.7%.

136 Moreover, the MRP figures set out in Table 11 are ex-imputation estimates. Consequently, they must be grossed-up to reflect the estimated value of imputation credits.

137 On the issue of imputation credits, Lonergan Edwards states specifically that its WACC parameter estimates have been derived:

> …without adjustment for imputation.[86]

and Grant Samuel conclude that:

> While acquirers are undoubtedly attracted by franking credits there is no clear evidence that they will actually pay extra for them or build it into values based on long term cash flows. Accordingly, it is Grant Samuel's opinion that it is not appropriate to make any adjustment.[87]

138 Our preferred approach is to use estimates of the risk-free rate and MRP that are commensurate with the prevailing conditions in equity markets. We note that the mean estimate of the required return on the market, over the four expert firms above, is 10.3%. Since these are ex-imputation estimates, they must be grossed-up to include the estimated value of imputation credits. Taking the conservative approach of adopting the QCA adjustment of 80 basis points produces an average estimate of the with-imputation required return on the market of 11.1%. Subtracting the prevailing 10-year government bond yield of 2.8% then produces an estimate of the MRP of 8.3%.

## 4.6 Conditioning variables

139 The final MRP estimation approach that we consider is based upon five economic indicators that the empirical finance literature has shown to be related to the MRP. This is one of the forward-looking estimates of the MRP that is used by IPART in its biannual WACC updates. The five market indicators are:

a. The risk-free rate (proxied by the yield to maturity on 10-year government bonds);

b. The term spread (proxied by the difference in yield to maturity on 10- and 2-year government bonds as reported by the RBA);

[85] That is, the MRP that would be added to the prevailing government bond yield to be consistent with the independent expert's estimate of the required return on the market portfolio.

[86] Lonergan Edwards, 2016, p. 45.

[87] Grant Samuel, 2016, p. 11.

c. The corporate debt spread (proxied by the difference in the yield to maturity on 10-year BBB rated corporate bonds and 10-year government bonds as reported by the RBA);[88]

d. The dividend yield (proxied by the market capitalisation weighted dividend yield on the All Ordinaries Index); and

e. The implied volatility of the ASX200 derived from share price index options and sourced from Bloomberg.

140 At the end of each month for each indicator, we estimate the percentile for that indicator based upon the historical distribution for that indicator. We then use this percentile to estimate the MRP within a uniform range of 3% to 9%. For example, if a particular indicator is in the 75th percentile, relative to its historical distribution, that would imply a MRP estimate of 7.5%.[89] We then compute an average MRP estimate from all five indicators, averaged over the current and preceding months and then adjust for the value of imputation credits[90] based on a gamma of 0.25. Our estimate as at December 2016 is 7.0%, commensurate with a 2.8% risk-free rate.

## 4.7 Overall MRP estimate

141 The various estimates of the MRP are summarised in Table 12 below. All of these estimates are consistent with a risk-free rate of 2.8% and a gamma of 0.25.

[88] The RBA has made revisions to its estimated corporate bond yield series. There is a short period during the global financial crisis for which the RBA does not report yields on BBB corporate bonds with 10 years to maturity. So for this period we use the RBA yield estimates for BBB corporate bonds with 7 years to maturity. This is not troublesome for our MRP analysis because using the market indicators approach we refer to the rank of the corporate bond spread relative to its historical distribution. We don't use the corporate bond yield itself.

[89] 3%+0.75(9%-3%).

[90] Using the IPART approach.

Table 12: Summary of MRP estimates

| Estimation method | MRP estimate |
|---|---|
| Mean historical excess returns | 6.2% |
| Dividend growth model | 8.2% |
| Wright approach | 8.2% |
| Surveys | 8.1% |
| Independent expert valuation reports | 8.3% |
| Market indicators | 7.0% |

*Source: Summary of estimates from above.*

142 To distil these various estimates into a single regulatory MRP, we begin by separating the approaches according to whether they use historical data or current market prices and forward-looking information.

143 The two approaches that use historical information are the excess returns and Wright approaches. These two approaches represent the end points of a spectrum in that:

a. The historical excess returns approach assumes that the MRP is constant over time, and the total required return on equity rises and falls one-for-one with changes in the risk-free rate; and

b. The Wright approach assumes that the real return on equity is constant over time such that the MRP moves to offset any changes in the risk-free rate.

144 In our view, reality lies between these two extremities. Thus we apply equal weight to each approach and conclude that the historical evidence supports an MRP of 7.2%.[91]

145 The other approaches use current and forward-looking information. For these approaches, we assign the following weights:

a. 50% weight to the DGM estimates, on the basis that DGM estimates are the most reliable form of forward-looking evidence, consistent with the fact that they are commonly given material weight in regulatory determinations;

[91] 0.5×6.2% + 0.5×8.2%=7.2%.

b. 0% weight to survey estimates, because we consider this evidence to be unreliable and inappropriate for the reasons set out above;

c. 25% weight to estimates from independent expert valuation reports, on the basis that this is relevant evidence, although somewhat less reliable and not as well accepted as DGM evidence; and

d. 25% weight to estimates from market indicators, for the same reason as above.

146 This weighting produces a forward-looking estimate of 7.9%.[92] We note that this figure would not change materially if some weight were afforded to the prevailing survey estimate of 8.1%.

147 The final step, then, is to distil the historical and forward-looking estimates into a final MRP estimate. To do this, we begin with the historical estimate that reflects the average financial market conditions over the (long) historical periods that are considered. We consider this to be a reliable reflection of the information in the historical data that provides an appropriate starting point estimate.

148 We then consider whether the forward-looking estimates that are based on current market data indicate that the prevailing MRP is higher or lower than the long-run average MRP. At present, the forward-looking MRP estimates indicate that the prevailing MRP is above the long-run historical average. Our approach is to give equal weight to the historical and forward-looking estimates on the basis that:

a. The historical estimates have the advantage of being based on large data sets such that the resulting estimates are statistically precise. Their disadvantage is that they can only reflect the long-run average MRP, which is an issue if the prevailing market conditions differ from the long-run average; and

b. The forward-looking estimates have the advantage of being commensurate with the prevailing market conditions, but they are based on less data, they require some assumptions, and they are less statistically precise.

149 Thus, starting at the long-run historical estimate and moving half way towards the estimate from the forward-looking evidence results in a mid-point estimate of approximately 7.5%. In our view, this represents an estimate that appropriately reflects the data and evidence set out above.

[92] 0.5×8.2%+ 0.25×8.3% + 0.25×7.0%.

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