# The term of the risk-free rate

FINAL REPORT PREPARED FOR AURIZON NETWORK

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# The term of the risk-free rate



Contents

# 1 Executive summary

## 1.1 Instructions

1 Frontier Economics has been retained by Aurizon Network to provide an updated analysis of issues relating to the term of the risk-free rate proxy for use in the CAPM within the regulatory setting. In particular, we have been asked to:

a. Summarise the key points of contention in relation to the term of the risk-free rate; and

b. Consider recent Tribunal and Court decisions and recent regulatory developments that are relevant to this issue.

## 1.2 Overview of key issues and conclusions

2 When setting the allowed return on equity for Aurizon Network, the QCA's approach has been to use the CAPM:

$$r_e = r_f + \beta(r_m - r_f)$$

where 4-year government bond yields are used in the first instance of the risk-free rate and 10-year government bond yields are used in the second (i.e., when estimating the market risk premium).

3 The evidence to support the consistent use of the 10-year government bond yield throughout the CAPM formula has strengthened over time. A brief summary of that evidence is:

a. Standard market practice is to use a 10-year risk-free rate, which best matches the long investment horizon of infrastructure investments.[1] Decisions of the Australian Competition Tribunal[2] and the Federal Court of Australia[3] give more weight to this evidence. That is, these decisions have confirmed that the role of the regulatory regime is to provide investors with a return commensurate with the return that they would require from an investment in an infrastructure business, and the evidence suggests that the computation of that required return would begin with a 10-year risk-free rate;

b. The NPV=0 principle implies that the discount rate should be the correct one for the cash flows being considered so that the correct

[1] We set out a number of independent expert reports and determinations from other regulators in Section 2 of this report.

[2] ACT, Application by GasNet Australia (operations) Pty Ltd, [2003] ACompT 6.

[3] Australian Energy Regulator v Australian Competition Tribunal (No 2) [2017] FCAFC 79.

present value will be obtained. This implies that the term of the risk-free rate should match the horizon over which the cash flows that asset owners would receive are uncertain and subject to risk. As noted above, infrastructure investments have a long horizon and the 10-year risk-free rate best matches that long horizon. Dr Lally, who has previously been engaged by the QCA to consider and respond to submissions concerning the term of the risk-free rate and has advocated that the term for the risk-free rate match the regulatory period, accepts that uncertainty extends beyond the end of each regulatory period[4];

c. Using two different estimates for the same parameter in the same formula is internally inconsistent and should be avoided. In the current market conditions, the effect is material – the difference between 4-year and 10-year government bond yields has varied in the 50 to 70 basis point range throughout 2017; and

d. The standard Australian regulatory approach is to estimate the risk-free rate using the yield on 10-year government bonds consistently throughout the CAPM formula.

## 1.3 Required returns in a commercial setting

4 When computing the return that is required on investments in infrastructure assets, the standard approach adopted by independent expert valuation firms and other market participants is to set the risk-free rate equal to the yield on 10-year government bonds. This is relevant because:

a. the infrastructure assets that are subject to regulation by the QCA must compete for capital with other infrastructure investments; and

b. there is evidence that the market approach is to use a 10-year risk-free rate even when assessing regulated infrastructure assets, including those regulated by the QCA.

5 The QCA has previously stated that its role is not to replicate the returns that would be received by a similar firm operating in a workably competitive market, but rather that its regulatory intervention has the effect of reducing risk and therefore the return that investors should require from the firms that benefit from QCA regulation.

[4] Lally, M., 2015, "Review of submissions on the MRP and the risk-free rate," Capital Financial Consultants Ltd, 12 May.

6 We present new evidence of the opposite conclusion being reached in other regulatory jurisdictions, including findings by the Australian Competition Tribunal and the Federal Court.

7 We also present new evidence that market participants apply the standard approach of using the 10-year government bond yield when analysing and valuing firms that own and operate regulated assets that are subject to four- or five-year regulatory re-sets – including businesses that are regulated by the QCA.

8 We show that a situation in which a regulator allows a return less than the return that is required by similar firms operating in workably competitive markets has unfavourable implications for allocative efficiency.

9 We conclude that Aurizon Network's previous submission that the risk-free rate in the CAPM should be set to the yield on 10-year government bonds is strengthened by new evidence that:

a. The Tribunal and Federal Court have found that allowed returns should be based on a benchmark firm operating in a workably competitive market and market practice in that setting is to use a 10-year term for the risk-free rate; and

b. Market practice is to use a 10-year term for the risk-free rate even when evaluating regulated assets, including assets regulated by the QCA.

## 1.4 The NPV=0 principle

10 The NPV=0 criterion is that the discount rate should be the correct one for the cash flows being considered. In our view, this is self-evident – if the correct discount rate is applied to the cash flows, the correct present value will be obtained.

11 In relation to equity, under the CAPM the discount rate is the sum of the risk-free rate and a risk premium. The risk premium is estimated as a constant amount per year, but the risk-free rate varies depending on the time horizon that is used. Longer time horizons are usually associated with higher rates.

12 Thus, the question is which time horizon is appropriate for the cash flows being considered. In our view, the answer to this question is that, since regulated assets have long lives, a long time horizon and a long-term risk-free rate should be used. That is, infrastructure assets have a long investment horizon that is best matched with the longest available risk-free rate, which is the 10-year rate in the Australian market. The long-term risk-free rate is usually estimated as the yield on 10-year government bonds, those bonds having the longest-term available in the Australian market. This the standard approach adopted in finance textbooks.

13 There would be an exception to this approach if the market value of the regulated asset at the end of the regulatory period was known with certainty right from the beginning of the regulatory period. In that case, the horizon of the cash flows would be limited to the length of the regulatory period. This is because the value

of the asset could be derived as the present value of cash flows over the regulatory period and the known value of the asset at the end of the regulatory period. That is, if the asset owner knew what cash flows would be received for each year of the regulatory control period, and if they also knew with certainty what the market value of the asset would be at the end of the regulatory period, the present value of the asset could be computed without considering cash flows beyond the end of the regulatory period.

14 SFG (2014) note that several reports authored by Dr Lally show that if the market value of the asset at the end of the period is known with certainty the appropriate discount rate requires the term of the risk-free rate to be set equal to the length of the regulatory period.

15 Lally (2015) recognises that the value of the asset at the end of the regulatory period is *not* known with certainty. Consequently, the mathematical derivations in the various Lally reports are not useful because they all assume that the value of the asset at the end of the regulatory period *is* known with certainty.

16 In response to submissions made about the limitations of the derivations in previous reports prepared by Dr Lally, Lally (2015) now suggests that the term of the risk-free rate should still be set equal to the length of the regulatory period even though the value of the asset at the end of the regulatory period is not known with certainty. He suggests that this uncertainty is accommodated in the risk premium that is added to the risk-free rate.[5]

17 However, there are two quite separate issues:

a. The *horizon* of the cash flows, which is determined by the time over which the future cash flows are uncertain;[6] and

b. The *risk* of the cash flows, which is determined by the extent to which those cash flows are uncertain.

18 That is, there is the horizon over which cash flows are uncertain and then there is the quantum of that uncertainty. For regulated assets there are long-term uncertain cash flows and that is what determines the horizon of the risk-free rate.

19 The quantum of that uncertainty determines the amount of risk premium to be added. The adding of a premium for risk has no bearing on the horizon over which there are uncertain cash flows.

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[5] Lally (2015), p. 7.

[6] As noted above, infrastructure assets have a long investment horizon that is best matched with the longest available risk-free rate, which is the 10-year rate in the Australian market.

## 1.5 Consistency between risk-free rate and MRP

20 In the CAPM formula, the risk-free rate appears in two places. The standard approach in practice is to use the same value for the risk-free rate in both places.

21 In its 2003 GasNet decision,[7] the Australian Competition Tribunal has addressed the question of whether two different values could be used in the two places where the risk-free rate appears in the CAPM equation. The Tribunal held that proper implementation of the CAPM "requires a consistent use of the value of $r_f$ in both parts of the CAPM equation where it occurs."[8]

22 Even if the difference between the regulatory-term and 10-year government bond yields are small *on average*, they can be very large at the time of a particular determination. For example, during 2017 the difference between the yield on 4-year (the term of Aurizon Network's regulatory period) and 10-year government bonds has varied in the range of 50 to 70 basis points.

23 We conclude that the standard approach should be adopted, which involves using the 10-year government bond yield consistently throughout the CAPM equation.

## 1.6 Consistency with regulatory practice

24 The standard Australian regulatory approach is to estimate the risk-free rate using the yield on 10-year government bonds.

25 In explaining its position, the AER cites:

a. The *GasNet* decision;

b. Evidence of commercial practice; and

c. Submissions from Incenta (2013)[9] relating to the fact that the use of a shorter term would only be justified if the end-of-period asset value was guaranteed from the outset.

26 IPART has also lengthened the term of its risk-free rate from five years to ten on the basis of the same evidence considered by the AER.[10] IPART has recently affirmed its intention to use a 10-year term for the risk-free rate.[11]

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[7] ACT, Application by GasNet Australia (operations) Pty Ltd, [2003] ACompT 6.

[8] ACT, Application by GasNet Australia (operations) Pty Ltd, [2003] ACompT 6, Paragraph 46.

[9] Incenta, 2013, Term of the risk-free rate for the cost of equity, June.

[10] IPART, 2013, Review of WACC Methodology, December, p. 12.

[11] IPART, July 2017, Review of our WACC method: Issues Paper, p. 14.

27 The ESC,[12] ESCoSA[13] and the ICRC and ACT Industry Panel[14] also use a 10-year risk-free rate.

28 We conclude that the dominant regulatory approach in Australia, which is directed to estimating the returns required by equity investors investing in long-lived assets, is to set the term of the risk-free rate equal to 10 years.

[12] ESC, 2016, Melbourne Water Price Review 2016 Final Decision, June.

[13] ESCoSA, 2016, SA Water Regulatory Determination 2016 Final Determination, June.

[14] ACT Industry Panel, 2014, Review of the ICRC 2013 Price Direction, December.

# 2 Commercial practice

## 2.1 Overview

29 The key themes of this section of the report are as follows:

a. When computing the return that is required on investments in infrastructure assets, the standard approach adopted by independent expert valuation firms and other market participants is to set the risk-free rate equal to the yield on 10-year government bonds. This is relevant because:

   i. the infrastructure assets that are subject to regulation by the QCA must compete for capital with other infrastructure investments; and

   ii. there is evidence that the market approach is to use a 10-year risk-free rate even when assessing regulated infrastructure assets, including those regulated by the QCA;

b. The QCA has previously stated that its role is not to replicate the returns that would be received by a similar firm operating in a workably competitive market, but rather that its regulatory intervention has the effect of reducing risk and therefore the return that investors should require from the firms that benefit from QCA regulation. We present new evidence of the opposite conclusion being reached in other regulatory jurisdictions;

c. We present new evidence that market participants apply the standard approach of using the 10-year government bond yield when analysing and valuing firms that own and operate regulated assets that are subject to four- or five-year regulatory re-sets – including businesses that are regulated by the QCA.

## 2.2 Background and context

30 In a previous submission to the QCA, SFG (2014)[15] set out evidence of independent expert valuation firms and other market participants using the yield on 10-year government bonds as an estimate of the risk-free rate when using the CAPM to estimate the required return on equity. That report concluded that:

[15] SFG Consulting, 2014, The term of the risk free rate, November.

> …the independent expert evidence supports the use of a 10-year term to maturity when estimating the risk-free rate.[16]

31 The QCA addressed this point in its UT4 Draft MAR Decision,[17] based on advice from Lally (2015).[18] In his advice to the QCA, Dr Lally concluded that the QCA should not be concerned with the required return that market participants *do* use when valuing assets, but rather with the return that *should* be efficiently required:

> …the QCA is not engaged in valuing equities but in periodically setting the allowed rate of return in order to cover a business's efficient costs, and this is equivalent to satisfying the NPV = 0 principle. Since the exercises are different, what is appropriate in one case need not be appropriate in the other.[19]

32 The thrust of this argument is that the QCA's role is to set an allowed return on equity that represents what it considers to be the appropriate compensation that investors would require for the risks involved, whereas the market evidence provides an indication of the returns that investors actually do require.

33 The QCA expanded on this point in its UT4 Draft MAR Decision, suggesting that its form of regulatory control may serve to lower risk (and consequently the required return on equity) relative to unregulated firms:

> Economic regulation necessarily involves choosing a form of regulation and ancillary mechanisms, for example cost pass-throughs, review triggers, and the frequency of resets, that helps to achieve economic efficiency and meet specific regulatory objectives. The package of regulatory arrangements affects risk and the cost of capital and is designed to compensate the firm to support efficient investment.
>
> Benchmarking a competitive market outcome is one of the tools we apply in forming a view on what is an economically efficient outcome. However, we do not consider we must select a 10-year term for the risk-free rate simply because this is the more common approach used for non-regulated entities.[20]

34 In the following two sub-sections, we provide new evidence on this point in two respects:

a. The question of the appropriate regulatory benchmark has recently arisen in other Australian regulatory jurisdictions. In the context of the AER and IPART jurisdictions, it has been decided that the appropriate regulatory benchmark is to replicate the outcomes of a workably competitive market. We show that, for firms that operate in a workably competitive, the use of a 10-year risk-free rate is standard practice; and

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[16] SFG (2014), Paragraph 27.

[17] The QCA's UT4 Final MAR Decision affirms its draft decision, but contains less detailed analysis.

[18] Lally, 2015, Review of submissions on the MRP and the risk-free rate, 12 June.

[19] Lally (2015), p. 5.

[20] UT4 Draft MAR Decision, p. 20

b. In any event, the market practice is to use a 10-year risk-free rate for regulated firms – that practice is not confined to unregulated firms.

## 2.3 The regulatory benchmark in other jurisdictions

### *The National Electricity and Gas Rules*

35 The National Electricity Rules and National Gas Rules both require the allowed rate of return used in regulatory determinations to meet the allowed rate of return objective as follows:

> The allowed rate of return objective is that the rate of return for a [Service Provider] is to be commensurate with the efficient financing costs of a benchmark efficient entity with a similar degree of risk as that which applies to the [Service Provider] in respect of the provision of [services].[21]

36 This provision requires the regulator to consider the characteristics of a "benchmark efficient entity." In their 2013 Rate of Return Guidelines, the AER and ERA both defined the benchmark efficient entity to be a regulated firm. For example, the AER set out its proposed definition as follows:

> The AER's proposed conceptual definition of the benchmark efficient entity is a pure play, regulated energy network business operating within Australia.[22]

37 In explaining its proposed definition of the benchmark efficient entity, the AER explained that its approach was to consider:

> the risk exposure of the businesses we regulate, after taking into account the risk and the mitigating impact of the regulatory regime.[23]

38 The AER further explained the source of potential differences between regulated and unregulated businesses. This included the AER's conclusions that:

a. The effect of regulation itself is to reduce risk:

> Regulated service providers are able to earn more stable cash flows relative to most unregulated businesses. These cash flows are regularly updated at resets to reflect required revenue (including changes due to shifts in demand and expenditure drivers) and therefore have similar business risks. Regulated service providers are also provided with some protection to their cash flows during regulatory control periods (e.g. pass through provisions and reopeners).

b. Regulated firms may adjust their business practices to align with regulatory allowances (e.g., the regulated firm may depart from the

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[21] NER 6.5.2(c), 6A.6.2(c) and NGR 87(2)(3).

[22] AER, 2013, Rate of Return Guideline, p. 7.

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

otherwise efficient approach to managing its debt portfolio in order to more closely align with the regulatory allowance):

> Regulated service providers may align their business practices to the regulatory regime. This may lead to a different risk exposure than that faced by an unregulated firm.

39 The Tribunal summarised the AER's submissions on this point as follows:

> The AER contended that, although economic regulation seeks to achieve certain outcomes consistent with a workably competitive market, if the BEE is assumed to compete in a workably competitive market, then the regulatory framework in which the concept of that entity is employed would be otiose. It emphasises the words on the RoR Objective that the BEE is to be taken to have "a similar degree of risk" to the relevant DNSP. Because of their monopoly position, each of the regulated service providers is insulated from comparative risk and is provided with regulated rates of return for capital and debt. Thus, it is argued, the rates of return of investors for investing in regulated service providers is "commensurately lower". Moreover, it is said, to adopt the alternative view is to depart from the NEO and the NGO, and is to detract from their achievement, because the regulatory environment alters the risk profile of the relevant regulated service provider. It also means, it is said, that the BEE must be a regulated entity because it is otherwise an entity with a risk profile different from, rather than similar to, the risk profile of the regulated DNSP or network provider.[24]

40 The Tribunal concluded that:

> The AER's analysis of the definition of the RoR Objective involves a degree of circularity[25]

in that it would essentially allow the AER to set any level of allowed return of its choosing, with the only requirement being that the AER would have to explain why that allowed return was appropriate in light of the form of regulation that the AER had applied.

41 The Tribunal also noted that the AER's approach would have little need for any objective external benchmarks because regulated firms would be considered to be in a different risk class due to the very fact of their regulation.

42 Rather, the Tribunal noted the AER's own submission in a previous case that the role of the regulatory regime is:

> …to reproduce, to the extent possible, the production and pricing outcomes that would occur in a workably competitive market in circumstances where the development of a competitive market is not economically feasible... [26]

43 The Tribunal ruled that the AER had erred and directed the AER to remake its decision in terms of the return that would be required by a firm, similar to the regulated firm, but which operates in a workably competitive market.

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[24] PIAC-Ausgrid, Paragraph 920.

[25] PIAC-Ausgrid, Paragraph 921.

[26] PIAC-Ausgrid, Paragraph 80.

44 The AER appealed the Tribunal's decision to the Full Federal Court.[27] The Court held that the Tribunal had made no error on this point. The Court concluded that:

> …while it is true that the standard control services provided by the service provider are regulated services, this does not mean that, by force of that fact, the benchmark efficient entity must, correspondingly, be fixed with the character of a regulated entity. The service provider is a regulated entity, not the benchmark efficient entity.[28]

45 The Court further explained that:

> …in our view, it is not appropriate to characterise the benchmark efficient entity as either a regulated or an unregulated entity. The allowed rate of return objective does not do so, and there is no need to do so. The allowed rate of return objective confers on the benchmark its particular, necessary and defining characteristics: it must be efficient and it must face "a similar degree of risk" as that which applies to the particular service provider in question in relation to the provision of standard control services. **But the attribution of the relevant "efficiency" (i.e., in respect of financing costs) is to be gauged by the disciplines of a workably competitive market (i.e., an unregulated market)**.[29]

46 In summary, the Tribunal and Court have established that the allowed rate of return (i.e., the compensation for the efficient financing costs of the benchmark efficient entity) must be "gauged by the disciplines of a workably competitive market (i.e., an unregulated market)."

### *IPART*

47 The IPART Act requires that, in its pricing decisions for government monopoly businesses, IPART must have regard to a number of considerations including:

> the appropriate rate of return on public sector assets, including appropriate payment of dividends to the Government for the benefit of the people of New South Wales,
>
> the need for greater efficiency in the supply of services so as to reduce costs for the benefit of consumers and taxpayers.[30]

48 We note that the requirement to consider the efficiency of the supply of services is similar to the requirement in the QCA Act to promote the economically efficient operation of services.[31]

49 As part of the current review of its approach to estimating the WACC, IPART has proposed to retain the following definition of the benchmark efficient entity:

> Our current definition of the benchmark efficient entity is "a benchmark firm operating in a competitive market and facing similar risks to the regulated business". The

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[27] Australian Energy Regulator v Australian Competition Tribunal (No 2) [2017] FCAFC 79.

[28] AER v ACT, Paragraph 536.

[29] AER v ACT, Paragraph 537. Emphasis added.

[30] NSW Independent Pricing and Regulatory Tribunal Act 1992, s 15(c) and (e).

[31] QCA Act, s 59E.

> underlying rationale for this definition is that if the regulated utility was subject to competition instead of regulation, then it would be able to pass only efficient capital costs through to customers.[32]

50 IPART's rationale is that in a competitive market prices are constrained by competition, so where there is no competition because the assets are a natural monopoly prices must instead be constrained by regulation. Consequently, the objective of regulation should be to replicate the outcomes that would have occurred under competition:

> This is consistent with our price setting objective, which is to attempt to replicate the disciplines of a competitive market. [33]

51 IPART goes on to note that the actual costs of a regulated business may differ from the efficient and prudent costs because the form of regulation may create an incentive for the business to deviate from the efficient approach:

> The competitive market would limit prices to the level of efficient and prudent costs. This could differ from the costs incurred by the actual business. [34]

52 In this regard, IPART specifically notes that a regulated firm may be driven to adopt a financing strategy to mirror the strategy that underpins the regulator's allowance, even if that strategy differs from what would otherwise be efficient and prudent:

> A regulated firm has the option to change its financing strategy in response to how the regulator sets the WACC.[35]

53 This observation picks up on the Tribunal's circularity point above – where the assumed financing strategy that underpins the regulatory allowance drives the regulated firm to adopt that financing strategy, which in turn leads the regulator to observe regulated firms adopting that financing strategy, resulting in the regulator concluding that is the efficient financing strategy.

### *Conclusions in relation to the regulatory benchmark*

54 We note from above that IPART seeks to determine the return that would be required by the regulated firm if it operated in a workably competitive market – if it had been constrained by competition instead of regulation. The Tribunal and Federal Court have recently ruled that the same approach must be adopted by the AER. We note that, in both cases, the workably competitive benchmark is a general principle that applies to all firms subject to regulation – it is not specific to any particular industry.

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[32] IPART, July 2017, Review of our WACC method: Issues Paper, p. 14.

[33] IPART, July 2017, Review of our WACC method: Issues Paper, p. 14.

[34] IPART, July 2017, Review of our WACC method: Issues Paper, p. 14.

[35] IPART, July 2017, Review of our WACC method: Issues Paper, p. 15.

55 Under that approach evidence on required returns of otherwise similar, but unregulated, firms that operate in competitive markets would be relevant.

56 The QCA's previous approach has been to adopt a theoretical perspective that considers regulated firms to require a different return to firms operating in a workably competitive market – due to them being subject to a regulatory re-set process. This approach is inconsistent with the approach of IPART and the application by the Tribunal and the Federal Court of the regulatory regimes applying to gas and electricity, which interpret the regulatory task as being to set the allowed return to replicate the outcomes of workable competition.

## 2.4 Commercial practice is to use a long-term discount rate even for regulated firms

57 In this subsection of the report, we show that the dominant practice of market practitioners and valuation professionals is to set the term of the risk-free rate to 10 years on the basis that this is the longest observable term for Australian government bonds. This practice is consistent with the view that infrastructure investments, including those subject to regulation, are long-lived investments with a long period over which cash flows are uncertain. It is also consistent with the view that regulated infrastructure investments must compete for equity capital with similar unregulated investments, for which the required return undoubtedly begins with a 10-year risk-free rate.

58 For example, the standard approach used in independent expert valuation reports is to set the risk-free rate equal to the yield on 10-year government bonds. These reports usually contain a statement to the effect that the use of a 10-year term assumption is standard practice among valuation professionals in Australia.

59 Importantly, independent experts uniformly adopt a ten-year term when determining the risk-free rate for infrastructure assets, including regulated infrastructure assets across a range of different industries. In this section of the report, we present examples from a range of independent experts covering a number of different infrastructure firms including regulated and unregulated businesses. These examples indicate that the use of a 10-year risk-free rate is common practice across experts, industries, and whether or not the firm is regulated.

60 For example, in its 2014 report for Envestra Ltd, a firm that owns and operates regulated gas distribution networks, Grant Samuel noted that:

> The ten year bond rate is a widely used and accepted benchmark for the risk free rate. Where the forecast period exceeds ten years, an issue arises as to the appropriate bond to use. While longer term bond rates are available, the ten year bond market is the deepest long term bond market in Australia and is a widely used and recognised benchmark. There is a limited market for bonds of more than ten years. In the United States, there are deeper markets for longer term bonds. The 30 year bond rate is a widely used benchmark. However, long term rates accentuate the distortions of the yield curve on cash flows in early years. In any event, a single long term bond rate

> matching the term of the cash flows is no more theoretically correct than using a ten year rate. More importantly, the ten year rate is the standard benchmark used in practice.[36]

61 In its 2010 report for Prime Infrastructure, a business that included the DBCT coal terminal regulated by the QCA and WestNet rail regulated by the ERA, Grant Samuel included the passage above and also noted that:

> Ten year bonds are the accepted market benchmarks globally and are typically used as a proxy for the long term risk free rate where the forecast period exceeds ten years and there is no liquid market for longer term bonds.[37]

62 In its 2017 report for DUET Ltd, a business that owns and operates gas and electricity distribution networks, including a mix of regulated and unregulated assets, KPMG stated that:

> …the risk free rate is calculated with reference to Australian government securities with a ten year term to maturity.[38]

63 Similarly, in its 2015 report for Energy Developments Ltd, a business that owns and operates a number of unregulated electricity generation assets, Deloitte used the yield on 10-year government bonds on the basis that:

> The frequently adopted proxy for the risk free rate is the long-term Government bond rate.[39]

64 Incenta (2013)[40] also conclude that the dominant commercial practice is to use a 10-year term for the risk-free rate:

> In conclusion, we recommend using a 10 year risk free rate for estimating the cost of equity, and for this rate to be applied consistently to estimate the market risk premium…our view is based on achieving consistency with the practice of valuation professionals for whom the use of a 10 year term for the risk free rate is widespread, and consistency with our observations of how investors actually value regulated infrastructure assets.[41]

65 In summary, even if the appropriate benchmark is a regulated asset and the appropriate allowed return is one that reflects any effects of regulation itself, the evidence above suggests that investors use a 10-year risk-free rate when determining the required return on *regulated* assets.

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[36] Grant Samuel Independent Expert Report for Envestra Ltd, March 2014, Appendix 3, p. 4.

[37] Grant Samuel Independent Expert Report for Prime Infrastructure Ltd, October 2010, Appendix 1, p. 7.

[38] KPMG Independent Expert Report for DUET Ltd, March 2017, p. 174.

[39] Deloitte Independent Expert Report for Energy Developments Ltd, September 2015, p. 57.

[40] Incenta, 2013, Term of the risk-free rate for the cost of equity, June.

[41] Incenta (2013), p. 13.

# 3 The NPV=0 criterion

## 3.1 Overview

66 The NPV=0 criterion is that the discount rate should be the correct one for the cash flows being considered. In our view, this is self-evident – if the correct discount rate is applied to the cash flows, the correct present value will be obtained.

67 In relation to equity, under the CAPM the discount rate is the sum of the risk-free rate and a risk premium. The risk premium is estimated as a constant amount per year, but the risk-free rate varies depending on the time horizon that is used. Longer time horizons are usually associated with higher rates.

68 Thus, the question is which time horizon is appropriate for the cash flows being considered. In our view, the answer to this question is that, since regulated assets have long lives, a long time horizon and a long-term risk-free rate should be used. As set out above, this is consistent with the view that infrastructure investments, including those subject to regulation, are long-lived investments with a long period over which cash flows are uncertain. It is also consistent with the view that regulated infrastructure investments must compete for equity capital with similar unregulated investments for which the required return undoubtedly begins with a 10-year risk-free rate.

69 The long-term risk-free rate is usually estimated as the yield on 10-year government bonds, those bonds having the longest-term available in the Australian market.

70 This the standard approach adopted in finance textbooks. For example, Koller et al (2015) provide the following advice:

> Use longer-term bonds; they will be better in line with the time horizon of corporate cash flows.[42]

Similarly, Damodaran (2001) recommends that:

> In practice, using a long-term government rate (even on a coupon bond) as the riskless rate on all the cash flows in a long-term analysis will yield a close approximation of the true value.[43]

Pratt (2001) also recommends the use of a long-term risk-free rate (20 years in the US market) because:

> It most closely matches the often-assumed perpetual lifetime horizon of an equity investment,

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[42] Koller, T., M. Goedhart and D. Wessels, 2015, Valuation: 6th University Edition, Wiley, p. 290.

[43] Damodaran, A., 2001, Corporate Finance: Theory and Practice: 2nd Edition, Wiley, p. 188.

and because:

> It matches the longest-term bond over which the equity premium is measured in the Ibbotson Associates data series.[44]

That is, Pratt links the term of the risk-free rate to the term that was used when estimating the MRP.

71 There would be an exception to this approach if the value of the regulated asset at the end of the regulatory period was known with certainty right from the beginning of the regulatory period. In that case, the horizon of the cash flows would be limited to the length of the regulatory period. This is because the value of the asset could be derived as the present value of cash flows over the regulatory period and the known value of the asset at the end of the regulatory period.

72 SFG (2014) note that several reports authored by Dr Lally show that if the value of the asset at the end of the period is known with certainty the appropriate discount rate requires the term of the risk-free rate to be set equal to the length of the regulatory period.

73 Lally (2015) recognises that the value of the asset at the end of the regulatory period is *not* known with certainty.[45] Consequently, the mathematical derivations in the various Lally reports are not useful because they all assume that the value of the asset at the end of the regulatory period *is* known with certainty.

74 Lally (2015) now suggests that the term of the risk-free rate should still be set equal to the length of the regulatory period even though the value of the asset at the end of the regulatory period is not known with certainty. He suggests that this uncertainty is accommodated in the risk premium that is added to the risk-free rate.[46]

75 However, there are two quite separate issues:

a. The horizon of the cash flows, which is determined by the time over which the future cash flows are uncertain; and

b. The risk of the cash flows, which is determined by the extent to which those cash flows are uncertain.

76 That is, there is the horizon over which cash flows are uncertain and then there is the quantum of that uncertainty. For regulated assets there are long-term uncertain cash flows and that is what determines the horizon of the risk-free rate.

77 The quantum of that uncertainty determines the amount of risk premium to be added. The adding of a premium for risk has no bearing on the horizon over which there are uncertain cash flows.

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[44] Pratt, S.P., 2002, Cost of Capital: Estimation and Applications: 2nd Edition, p. 60.

[45] Lally (2015), p. 7.

[46] Lally (2015), p. 7.

78 We expand on these points in the remainder of this section.

## 3.2 What does NPV=0 mean?

79 In its Market Parameters Decision, the QCA concluded that when estimating the risk free rate component of the regulated rate of return, it will:

> …align the term of the risk-free rate with the term of the regulatory cycle.[47]

80 The basis for this position is that aligning the term of the risk-free rate with the term of the regulatory period means that the net present value of expected cash flows to a regulated entity is equal to the regulated asset base. Dr Lally refers to this as the NPV = 0 principle. We agree that it is appropriate to estimate prices such that the present value of expected cash flows is equal to the asset value. However, we agree with Incenta (2013) in that:

> In this context, the NPV=0 principle says nothing more than that the discount rate should be the correct one for the cash flows being considered.[48]

81 That is, the NPV=0 principle does not say that the term of the risk-free rate must be equal to the length of the regulatory period. Rather, the NPV=0 principle says that the term of the risk-free rate should be appropriate for the cash flows that are being considered by investors.

82 The approach set out in the Market Parameters Decision is based on the notion that investors need only consider the cash flows through to the end of the regulatory period because the end-of-period market value of the regulated asset is known with 100% certainty from the outset – thus, there is no need to consider any subsequent cash flows. However, as set out above, it now seems accepted that the end of period market value of the assets is *not* certain, and that investors will consider all cash flows that the asset might generate over its life (as is the case with all other assets).

## 3.3 Key assumptions and their implications

83 The Market Parameters Decision and the UT4 Decision assume that the only way in which the NPV = 0 principle is satisfied is if the term to maturity of the risk-free rate proxy is set equal to the term of the regulatory period. This is said to follow from the notion that investors need only consider the cash flows through to the end of the regulatory period because the end-of-period market value of the regulated asset is known with 100% certainty from the outset.

84 The second last paragraph of the example makes this clear:

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[47] QCA, 2014, Market Parameters Decision, Sub-section 3.5, p. 14, Paragraph 2.

[48] Incenta, 2013, Term of the risk-free rate for the cost of equity, June, p. 6.

> The correct analytical process (i.e. underlying equations 5-7 above) recognises that the revenues to be received at the end of the second year **will be known** at the end of the first year, and therefore will have a value at the end of the first year of $.20m – **regardless of what the one-year risk free rate is in one year.** So, the discount rate to be applied now to this $.20m value arising in one year **with certainty** is the current one-year risk-free rate of 5.0%.[49]

85 Thus, the analysis in the Market Parameters and UT4 decisions relies on the value of the asset at the end of the regulatory period being known with certainty from the outset.

## 3.4 The NPV=0 principle and the end-of-period market value

86 The Queensland Treasury Corporation (QTC) (2014)[50] has submitted that the Market Parameters approach is analogous to assuming that the asset can be sold at the end of the regulatory period for an amount equal to the regulatory asset base. The Market Parameters Decision disagrees with that point on the basis that it "makes no assumption about assets being sold."[51] However, QTC was making a quite different point. The issue is not about whether or not the asset will be sold at the end of the regulatory period. The issue is about the market *value* of the asset at the end of the period – whether the asset is sold or not.

87 That is, if the asset owner knew what cash flows would be received for each year of the regulatory control period, and if they also knew with certainty what the market value of the asset would be at the end of the regulatory period, the present value of the asset could be computed without considering cash flows beyond the end of the regulatory period. Two points are relevant here:

a. It is the market value of the asset that must be known at the end of the regulatory period. Knowing the RAB (or any other input that is one of the relevant considerations in determining cash flows beyond the current regulatory period) will be insufficient. To effectively convert the regulated asset into a bond requires that the market value of the asset must be known; and

b. The market value is the same whether the investor chooses to sell or retain the asset. That is, the question is about whether the market value at the end of the regulatory period is known with certainty, not about whether investors might, or might not, choose to sell at the end of the regulatory period.

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[49] QCA, 2014, Market Parameters Decision, pp. 45-46. Emphasis added.

[50] Queensland Treasury Corporation, 2014, The risk-free rate and the market risk premium, 20 January.

[51] QCA, 2014, Market Parameters Decision, Appendix B, p.47.

88 QTC make the point that the foundation for setting the term of the risk-free rate equal to the length of the regulatory period is that the market value of the asset at the end of the regulatory period is known with 100% certainty right from the beginning of the regulatory period. The asset has the same value whether or not the owner chooses to sell it.

89 We note that it is not just ourselves and QTC who have submitted that setting the term of the risk-free rate to the length of the regulatory period is only consistent with the NPV=0 principle if the end-of-period market value of the asset is 100% certain from the outset. The same submission has been made by:

a. Incenta (2013); and

b. Officer and Bishop (2008)[52]

and has been accepted by the AER[53] and IPART.[54]

90 For example, Incenta (2013) state that the argument is that the regulatory cash flows have:

> …similar characteristics to a 5 year bond, in that an investment exists at the start of the period, delivers coupons during the period and **delivers a certain residual value** (equivalent to a return of principal from a bond) at the end of the period.[55]

## 3.5 The Lally certainty assumption

91 The QCA's approach to the term of the risk-free rate (and the overall return) and to the NPV=0 principle is based on the work of Dr Lally. In particular, Lally (2012)[56] is very clear about the assumption that serves as the foundation for all of his derivations. He assumes that the regulatory process is such that the market value of the regulated assets at the end of each regulatory period is not subject to any risk:

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[52] Officer R. and S. Bishop, 2008, "Term of the Risk-Free Rate – Commentary," *Value Advisor Associates*, September.

[53] The AER addressed this specific question in its 2013 Draft Rate of Return Guideline Explanatory Statement pp 181-184. This led the AER to adopt a 10-year risk-free rate in its Draft Guideline. The AER affirmed that approach, and the reasoning that led to it, in its Final Rate of Return Guideline Explanatory Statement at p. 49. The AER has adopted a 10-year risk-free rate in every subsequent decision.

[54] IPART addressed these issues in its 2013 WACC Review Final Decision at pp. 11 and 19. IPART has adopted a 10-year risk-free rate in every subsequent determination.

[55] Incenta, 2013, p. 6, emphasis added.

[56] Lally, M., 2012, The risk free rate and the market risk premium, Report for the Queensland Competition Authority, 23 August.

> …the output price will be reset to ensure that the value at that time of the subsequent payoffs on the regulatory assets equals the regulatory asset book value prevailing at that time[57]

such that the:

> …payoffs at time 4 [the end of the regulatory period in his example] are certain.[58]

92 Lally (2013)[59] is even more explicit about the fact that the present value principle only requires the term of the return to be set to the length of the regulatory period if the end-of period market value of the asset is known with certainty from the outset. Dr Lally sets out a two-period example in which the regulated asset has a two year life, the initial RAB is $100, depreciation is $50 in each period, and the allowed return in the first period is 5%. Consequently, investors will receive cash flows of:

a. In period 1: $50 depreciation plus a return on capital of $100×5%; and

b. In period 2: $50 depreciation plus a return on capital of $50×$R_{12}$, where $R_{12}$ is the allowed return for the second period, set by the regulator at the end of the first period.

93 Dr Lally then assumes that the market value of the asset at the end of the first period is known for sure right from the beginning of the first period. At the beginning of the first period no one knows what market conditions will prevail at the end of the first period. Consequently no one knows what return investors will require over the second period or what the regulator might allow over the second period. But Dr Lally assumes that the regulator will set the allowed return precisely equal to whatever it is that investors require. This ensures that the market value of the regulated asset at the end of the first period is known for sure right from the outset. Lally (2013, Eq 1) states that:

$$V_1 = \frac{50 + 50\tilde{R}_{12}}{1 + \tilde{R}_{12}} = 50$$

where the $R_{12}$ in the numerator is the regulator's allowed return and the $R_{12}$ in the denominator is the investor's required return.

94 Given that the market value of the asset at the end of the first regulatory period is guaranteed from the outset, the current market value of the asset can be found by discounting the first period regulatory cash flows, plus the known end-of-period market value back over the first regulatory period. Lally (2013) explains that:

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[57] Lally (2012), p. 14.

[58] Lally (2012), p. 10.

[59] Lally, M., 2013, Response to submissions on the risk-free rate and the MRP, Report for the Queensland Competition Authority, 22 October.

> At the end of the first year, the regulated business will therefore receive *V1* = $50m plus revenues to cover regulatory depreciation of $50m and the cost of capital for the first year of $100m(.05). **Since this sum is known at the beginning of the first year** it can be valued using the prevailing risk-free rate, which is 5%. So the value now of *V1*, plus the revenues received at the end of the first year, is $100m as follows:[60]

$$V_0 = \frac{(50 + 100 \times 0.05) + 50}{1.05} = 100$$

where the term in brackets is the regulatory allowed cash flow for the first period and the end-of-period market value is known for sure, $V_1 = 50$.

95 In summary, the assumption that the value of the asset at the end of the regulatory period is already known with 100% certainty at the beginning of the regulatory period is the basis for the derivation of the conclusion that the NPV=0 principle requires the term of the risk-free rate (and the overall return) to be set to the length of the regulatory period. If the market value of the asset at the end of the regulatory period is *not* known with certainty right from the outset, setting the term of the risk-free rate equal to the length of the regulatory period is no longer consistent with the NPV=0 principle.

### What if the end-of-period market value is not certain?

96 If the market value of the regulated asset at the end of the first period ($V_1$) is *not* known with certainty from the outset, the opening market value of the firm would be computed in the standard manner by discounting the expected cash flows over the life of the asset using a discount rate that is appropriate for those cash flows (in terms of risk and duration). The standard valuation calculation in this case is:

$$V_0 = \frac{CF_1}{(1 + R_{02})^1} + \frac{CF_2}{(1 + R_{02})^2}$$

where $R_{02}$ is the investor's required return for a two-period horizon beginning at time 0.[61]

97 That is, if the market value of the regulated asset at the end of the first period ($V_1$) is *not* known with certainty from the outset, investors would value the asset by discounting the expected cash flows over the two-period life of the asset using the two-period discount rate. In this case, the "present value principle" would require

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[60] Lally (2013), p. 47, emphasis added.

[61] Note that it is also theoretically appropriate to discount the first cash flow at the one-period zero-coupon discount rate and the second cash flow at the two-period zero-coupon discount rate. But this is equivalent (by construction) to discounting both cash flows at the two-period coupon rate $R_{02}$ as above. Using a single rate for all cash flows over the life of the asset is also consistent with the uniform market practice.

the regulator to set allowed returns based on the two-period rate, not the (usually lower) one-period rate.

### *There is a difference between the horizon of uncertain cash flows and the quantum of risk*

98 As set out above, Lally (2015) accepts that the end-of-period asset value is not known with certainty and states that the derivations in his reports for the QCA had made that assumption to simplify the analysis. He now suggests that this uncertainty is accommodated in the risk premium that is added to the risk-free rate.[62]

99 However, there are two quite separate issues:

a. The *horizon* of the cash flows, which is determined by the time over which the future cash flows are uncertain; and

b. The *risk* of the cash flows, which is determined by the extent to which those cash flows are uncertain.

100 That is, there is the horizon over which cash flows are uncertain and then there is the quantum of that uncertainty. For regulated assets there are long-term uncertain cash flows and that is what determines the horizon of the risk-free rate.

101 The quantum of that uncertainty determines the amount of risk premium to be added. The adding of a premium for risk has no bearing on the horizon over which there are uncertain cash flows.

102 There are two ways to highlight the difference between the time over which cash flows are uncertain or risky and the quantum of that uncertainty or risk:

a. If it is correct to "cut off" a series of long-run risky cash flows on the basis that the uncertainty after (say) year 4 is all picked up in the beta, that approach could be applied to *any* series of long-run risky cash flows – on the basis that the beta somehow makes up for the fact that the wrong risk-free rate has been used. But such an approach is never used because there is no way of knowing whether or not a particular adjustment to the beta is sufficient to offset the use of a risk-free rate that does not match the horizon of the risky cash flows; and

b. The QCA's process for estimating beta is independent of its choice of the term of the risk-free rate – if the QCA adopted a 10-year or a 1-year risk-free rate, there would be no change to its beta estimate. Consequently it cannot be the case that the beta somehow makes up for the fact that the wrong risk-free rate has

[62] Lally (2015), p. 7.

been used (i.e., a shorter-term risk-free rate has been applied to cash flows that are uncertain and risky over the long-term).

## Conclusion

103 For the reasons set out above, our view is that:

a. The market value of the regulated asset at the end of the regulatory period is not certain right from the beginning of the regulatory period. Thus, the present value of the regulated asset cannot be derived from known cash flows and market values over the regulatory period, but will require information about the expected (uncertain) cash flows from beyond the end of the current regulatory period. Because the derivation of the current value of the regulated asset requires information from beyond the current regulatory period, it will be inconsistent to use a risk-free rate that is restricted to the current regulatory period;

b. Consequently, setting the term of the risk-free rate equal to the term of the regulatory period will *not* be consistent with the NPV=0 principle;

c. Adjusted beta estimates cannot correct for the use of the wrong risk-free rate; and

d. A long-term risk-free rate should be used, which is consistent with the long-term (uncertain) cash flows that determine the value of the asset.

# 4 Consistency between the risk-free rate and the market risk premium

## 4.1 The current practice of the QCA

104 In the CAPM, the market risk premium represents the extent to which the expected return on the market portfolio exceeds the risk-free rate:

$$r_e = r_f + \beta(r_m - r_f).$$

105 The QCA has adopted an estimate of the market risk premium of 6.5% in its Market Parameters Decision and in every subsequent decision. This estimate is formed on the basis of historical market returns, figures reported in survey evidence and independent expert reports, an estimate formed from applying the dividend discount model to analyst dividend expectations, and other market-based information.[63]

106 The QCA makes it clear that its analysis of the market risk premium is made with reference to the yield on 10-year bonds.[64] But when setting the allowed return on equity for Aurizon Network, the QCA uses a four-year risk-free rate in the CAPM equation. The two different risk-free rates are then inserted in different places in the same CAPM equation:

$$r_e = r_{f,4-year} + \beta(r_m - r_{f,10-year}).$$

107 To the extent that the 4-year risk-free rate is below the 10-year risk-free rate at the time of a regulatory determination, the regulated firm will be undercompensated. This is made most obvious when considering a regulated firm with a beta of 1. The CAPM implies that for such firms the required return on equity is equal to the required return on the market portfolio, by definition, so that:

$$r_e = r_m$$

108 However, the inconsistent use of two different risk-free rates in the same equation would result in the allowed return being set as:

$$r_e = r_m - (r_{f,10-year} - r_{f,4-year})$$

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[63] QCA, 2014, Market Parameters Decision, Sub-section 4.3.4, p. 23, Paragraph 3.

[64] QCA, 2014, Market Parameters Decision, Sub-section 4.3.1, p. 20, Footnote 18; and Appendix C, p. 52, Paragraph 4.

which results in a firm of average risk receiving less compensation than the CAPM benchmark for a firm of average risk – in the case where the 10-year rate is above the 4-year rate, as it currently is.

## 4.2 GasNet inconsistency

109 In explaining its reasons for adopting a 10-year term for the risk-free rate, the AER recently had regard to the *GasNet* decision of the Australian Competition Tribunal:

> The Australian Competition Tribunal (the Tribunal) decided in its 2003 GasNet decision that 10 years is the appropriate term of the risk free rate in the CAPM. The Tribunal came to this view on the basis of two reasons:
>
> • as the MRP was estimated using a 10 year risk free rate, consistency demands that a 10 year risk free rate be used in the CAPM, and
>
> • it is a convention of economists and regulators to use a relatively long-term risk free rate where the life of the assets is relatively long.[65]

110 In its GasNet decision, the Tribunal stated that:

> The position of the ACCC was that it was required to make an evaluative judgment for the purposes of s 8.30 as to what the appropriate Rate of Return should be. Its position was that although consistency was desirable, best estimates have to be used when perfect information is not available, and that at various stages of the CAPM, approximations and estimates are required. The ACCC contends that such a use of estimates and approximations does not invalidate the use of the CAPM. While it is no doubt true that the CAPM permits some flexibility in the choice of the inputs required by the model, it nevertheless requires that one remain true to the mathematical logic underlying the CAPM formula. In the present case, **that requires a consistent use of the value of $r_f$ in both parts of the CAPM equation where it occurs** so that the choice was either a five year bond rate or a ten year bond rate in both situations.[66]

111 The Tribunal went on to conclude that:

> The ACCC erred in concluding that it was open to it to apply the CAPM in other than the conventional way to produce an outcome which it believed better achieved the objectives of s 8.1. In truth and reality, **the use of different values for a risk free rate in the working out of a Rate of Return by the CAPM formula is neither true to the formula nor a conventional use of the CAPM**. It is the use of another model based on the CAPM with adjustments made on a pragmatic basis to achieve an outcome which reflects an attempt to modify the model to one which operates by reference to the regulatory period of five years. The CAPM is not a model which is intended to operate in this way. **The timescales are dictated by the relevant underlying facts in each case and for present purposes those include the life of the assets and the term of the investment**.[67]

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

[66] ACT, Application by GasNet Australia (operations) Pty Ltd, [2003] ACompT 6, Paragraph 46, emphasis added.

[67] ACT, Application by GasNet Australia (operations) Pty Ltd, [2003] ACompT 6, Paragraph 46, emphasis added.

112 In summary, the practice of using the 10-year yield to estimate the risk-free rate in one part of the CAPM formula, and the 4-year yield to estimate the risk-free rate in another part of the same CAPM formula is inconsistent with the Tribunal's *GasNet* ruling.

## 4.3 Internal inconsistency

113 In response to submissions that this represents an inconsistency, the QCA has reached the following conclusion:

> [T]he QCA has considered the arguments presented for applying a five-year rate for consistency with the first term in the CAPM and re-estimated the market risk premium using a five-year rate. The results of this analysis reinforce the QCA's conclusion that a market risk premium of 6.5% is reasonable.[68]

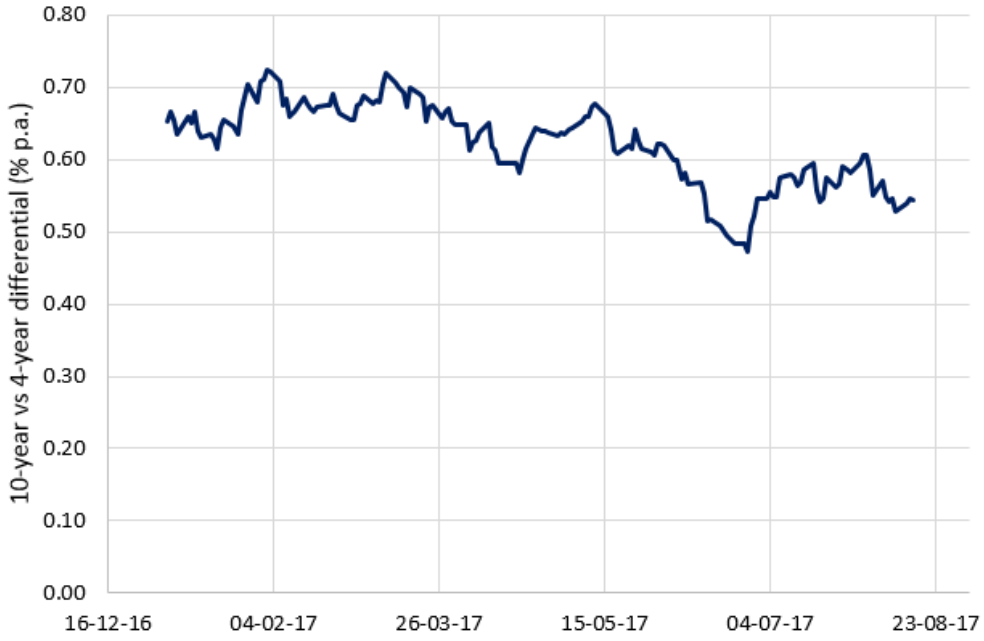
114 This implies that the QCA considers that the average difference between the ten-year and four-year risk-free rates is within the rounding margin that the QCA applies when setting the allowed MRP. However, there are two further issues to consider in relation to this conclusion:

a. There is no need to have any inaccuracy or any inconsistency at all. If the MRP is estimated with reference to the 10-year government bond yield, the 10-year government bond yield would simply be used throughout the CAPM equation; and

b. Even if the difference between the regulatory-term and 10-year government bond yields are small *on average*, they can be very large at the time of a particular determination. For example, during 2017 the difference between the yield on 4-year (the term of Aurizon Network's regulatory period) and 10-year government bonds has varied in the range of 50 to 70 basis points as illustrated in Figure 1 below.

[68] QCA, 2014, Market Parameters Decision, p. 52.

Figure 1: Spread between 10-year and 4-year government bond yields during 2017




*Source: RBA.*

115 Figure 1 shows that, during the course of 2017, the 10-year government bond yield has exceeded the 4-year government bond yield by 50 to 70 basis points. As set out above, internally-consistent application of the CAPM requires that the same risk-free rate must be used in both places in the CAPM formula. Thus, where the MRP is estimated relative to the 10-year rate, the 10-year rate must be used elsewhere in the formula. The inconsistent use of a 4-year rate, rather than the consistent use of a 10-year rate, would result in a material mis-estimation in the order of 50-70 basis points in the current market conditions.

# 5 Consistency with regulatory practice

## 5.1 Leading regulatory practice is to adopt a 10-year term

116 The current Australian regulatory practice is to use a ten-year term to maturity when estimating the risk-free rate. This practice is consistent with the view that infrastructure investments, including those subject to regulation, are long-lived investments with a long period over which cash flows are uncertain. It is also consistent with the view that regulated infrastructure investments must compete for equity capital with similar unregulated investments, for which the required return undoubtedly begins with a 10-year risk-free rate.

117 For example, in its 2013 Rate of Return Guideline, the AER concluded that:

> On balance, we are more persuaded by the arguments for a 10 year term, than the arguments for a five year term.[69]

118 The AER also notes that the Australian Competition Tribunal advocates the use of a 10-year term, as set out above.

119 IPART, which had previously adopted a 5-year term to maturity, announced in 2013 that it would henceforth adopt a 10-year term:

> We agree with stakeholder views that increasing the TTM [term to maturity] from 5 years to 10 years for all industries is more consistent with our objective for setting a WACC that reflects the efficient financing costs of a benchmark entity operating in a competitive market.[70]

120 The ESC,[71] ESCoSA[72] and the ICRC and ACT Industry Panel[73] also use a 10-year risk-free rate.

## 5.2 Regulatory practice is to adopt a 10-year term because the end-of-period market value of the asset is not guaranteed

121 As set out above, the AER has rejected the QCA approach of setting the term of the risk-free rate equal to the term of the regulatory period. The AER recognised that aligning the term of the risk-free rate to the term of the regulatory period is

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

[70] IPART, 2013, Review of WACC Methodology, December, p. 12.

[71] ESC, 2016, Melbourne Water Price Review 2016 Final Decision, June.

[72] ESCoSA, 2016, SA Water Regulatory Determination 2016 Final Determination, June.

[73] ACT Industry Panel, 2014, Review of the ICRC 2013 Price Direction, December.

only justified in the case where the end-of-period market value of the asset is known with certainty from the outset:

> In Lally (2012), the argument for a five year term relies on the 'present value principle'—the principle that the net present value (NPV) of cash flows should equal the purchase price of the investment.
>
> Lally stated that the present value principle is approximately satisfied only if the term of equity matches the regulatory control period. Lally illustrated this point using a numerical example in which there is no risk, so the return on equity equals the risk free rate. The example sets allowed revenues at the beginning of the regulatory control period using the yield to maturity on a five year risk free bond. Lally showed that in this example, the 'present value principle' is approximately satisfied: the NPV of the cash flows is approximately equal to the book value of the assets.
>
> The reason why the principle is satisfied is that the structure of the bond payments and the structure of the regulatory payments are similar…The core intuition behind the argument for a five year term is that the cash flows from the building block model have a similar structure to the cash flows from a five year bond. Put simply, the argument is that an equity investment in a regulated business is—at least in respect of its term—like an investment in a five year bond.
>
> The central issue in the debate about the term of equity, therefore, is the extent to which the cash flows from an equity investment in a regulated business are like the cash flows from a five year bond.[74]

122 However, the AER went on to note that the cash flows from an equity investment in a regulated business are *not* like the cash flows from a five year bond in a very important respect – whereas a bondholder receives a known payment at maturity, the infrastructure equity owner does not. Rather, infrastructure equity (like all equity) is risky and the value of shares five years into the future cannot possibly be known with certainty. Using the same Lally derivation on which the QCA now relies, the AER notes that this necessary precondition does not hold in practice, but only under certain theoretical assumptions:

> In Lally's calculation above, the cash flow in each year is the allowed revenue net of opex and capex, except in the final year, where the closing value of the regulatory asset base (RAB) is included in the cash flow. That is, the assumption is that the investor receives a cash payment equal to the RAB in the final year of the regulatory control period. While under certain assumptions, the market value of equity is equal to the residual value of the RAB, these assumptions may not hold in reality.[75]

123 The AER then cited a report by Incenta (2013) which explains that:

a. The argument that the term of the risk-free rate should be set equal to the length of the regulatory period relies on the end-of-regulatory-period market value of the asset being known with certainty from the outset; and

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[74] AER, 2013, Draft Rate of Return Guideline Explanatory Statement, p. 183.

[75] AER, 2013, Draft Rate of Return Guideline Explanatory Statement, p. 183.

b. Since this necessary precondition does not hold, the term of the risk-free rate should *not* be set to the length of the regulatory period:

> …investors are unlikely to evaluate regulated assets with reference to a 5 year bond because – unlike the case of the bond – the residual value at the end of each 5 year period is inherently risky. This is because the residual value is not returned in cash, but rather comprises a 'value' whose recovery remains at risk from future regulatory decisions and changes in the market (both technological changes and changes to customer preferences).[76]

124 The AER also noted that the same point has been made by Officer and Bishop (2008):

> Officer and Bishop said that the argument for a five year term would be correct only if after five years, in the event that 'they [the owners of the regulated business] choose to walk away from the asset, they would be fully compensated'. Officer and Bishop propose, however, that the owners are not, in reality, guaranteed of such compensation—the problem is that there is no guarantee that the secondary market will deliver a price equal to the value of the equity component of the RAB. [77]

125 The AER concluded that the term of the risk-free rate should be set to 10 years and not to the length of the regulatory period.

## 5.3 Other issues raised by Incenta

126 In concluding that the term of the risk-free rate should be set to 10 years, the AER also cited two other points raised by Incenta. Incenta provided evidence (consistent with that set out above) that the commercial practice is to set the term of the risk-free rate to 10 years:

> First, Incenta presented the results of a survey of market practitioners which asks them whether they use a 10 year or a five year rate for valuing regulated equity. In this survey, 12 practitioners and two independent experts were asked specifically about 'the term of the risk free rate in a CAPM valuation of regulated infrastructure assets with a five year regulatory cycle'. All of those surveyed stated they used a 10 year rate.[78]

127 Incenta also advised that if the term of the risk-free rate was set to less than 10 years, the MRP would need to be re-estimated on a consistent basis:

> Second, Incenta observed that a move to a five year term for equity would have implications for our estimates of the MRP. For example, the evidence relating to historical estimates of the MRP have been calculated using a 10 year risk free rate. If we were to move to a five year term, this historical average may need to be recalculated (or approximated) using a five year risk free rate. The data we currently use to calculate historical averages of the MRP covers a significantly longer period

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[76] AER, 2013, Draft Rate of Return Guideline Explanatory Statement, p. 183.

[77] AER,2013, Draft Rate of Return Guideline Explanatory Statement, p. 183.

[78] AER,2013, Draft Rate of Return Guideline Explanatory Statement, p. 184.

than the data available for the five year risk free rate (which only extends back to the 1970s). [79]

128 The AER concluded that these:

> …additional considerations support not adopting a five year term.[80]

129 The AER then confirmed that it will maintain its use of a 10 year term.

## 5.4 Conclusions in relation to regulatory practice

130 We conclude that the dominant regulatory approach in Australia is to set the term of the risk-free rate equal to 10 years.

[79] AER,2013, Draft Rate of Return Guideline Explanatory Statement, p. 184.

[80] AER, 2013, Draft Rate of Return Guideline Explanatory Statement, p. 184.

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