Term of Risk Free Rate

Commentary

Professor Bob Officer and Dr Steven Bishop

Prepared for Energy Networks Association, Australian Pipeline Industry Association and Grid Australia

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ValueAdviserAssociates

Level 40, 140 William St
Melbourne Vic 3000

Contact: s.bishop@vaassociates.com.au
0411 195 177

Overview

The Australian Energy Regulator's Issues Paper has requested views and supporting information on:

- whether there should be consistency in the term of the risk free rate used in the CAPM as the risk free proxy and that used to estimate the CAPM; and
- whether the term of the nominal risk free proxy should be equal to the term of the regulatory period, viz. five years.

We argue that consistency should be preserved, regardless of the term of the risk free proxy and that this should be the yield on a ten year maturing risk free proxy. We are not convinced that a reliable MRP could be estimates using a five year Commonwealth bond data over the same long term horizon as can be achieved with the ten year bond, essentially because the market is not as deep and liquid as to year bonds. This is discussed in Section 2 below.

Further, we are of the view that continued use of a ten year maturing proxy for the risk free rate is appropriate and there is not a persuasive case for a change to a maturity of a risk free proxy that matches the regulatory period of five years.

In our opinion, continued use of the ten year maturing proxy for the risk free rate is appropriate for use in the estimation of both the cost of debt and the cost of equity. We have examined the arguments for change to a five year maturing proxy for the risk free rate and are of the view that a case has not been presented that warrants a change. As is discussed in Section 3, to support a move to matching the maturity of the risk free rate with the regulatory period of five years it would be necessary to be of the view that:

- There is an active and deep market for five year proxy for the risk free rate;
- The financing transactions costs that may be imposed on regulated firms are not higher than under current arrangements (ceteris paribus);
- The roll-over risk is not higher as a result of 'going to market' more frequently or at a common point in time than other arrangements under a ten year financing regime;
- The term structure is, on average, upward sloping from five to ten year maturities and passing on the financing risk and transactions cost to consumers does not dampen demand arising from this;
- The market risk premium is estimated using observed historical market returns and the observed yield on a five year proxy for the risk free rate.

We have not seen any evidence presented by those advocating a change from the ten year rate to the five year rate that shows that application would lead to a better regulated price such that the present value principle would yield a closer to zero answer under a five year regime than a ten year regime, all costs and benefits appropriately considered.

Consequently, in our opinion, continued use of the ten year maturing proxy for the risk free rate is appropriate. We have examined the arguments for change a case has not been presented that warrants a change from current practice of using a 10 year maturing proxy for the risk free rate.

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1. Introduction

The Capital Asset Pricing Model ["CAPM"] is a widely used model for pricing risky assets. It defines pricing in terms of an expected rate of return given a view of the expected cash flows from the risk assets. This expected rate of return, in turn, is expressed as being equal to a risk free rate of return plus a premium for bearing the systematic or covariance risk of the asset. Thus the risk free rate plays a central role in the CAPM and its application.

The CAPM is widely used to estimate the weighted average cost of capital for investment decisions and for regulatory price determinations. The weighted average cost of capital reflects the required rate of return (or cost of capital) of debt and equity investors.

The simplest version of the CAPM[1] is single period of undefined tenure. This presents a challenge when in application investment and investment decisions are multi-period and of different maturity. Consequently we have to look beyond the CAPM for guidance on its practical application.

Since both debt and equity issued by firms are risky assets then in principle the expected return of both can be estimated using the CAPM. However, in practice the cost of equity is estimated this way but the cost of debt is usually estimated as a benchmark rate plus a premium for risk. The benchmark rate could be a proxy for the risk free rate of return.

The risk free rate is generally used for two (related) purposes in establishing the cost of capital for price determinations. One is to use as a base reference rate when establishing the cost of debt, the other is an input to the CAPM used to assess the cost of equity.

It is usual to use a government security as a proxy for the risk free rate.[2] However there is a range of government securities that differ by their maturity. The Australian Energy Regulator ["AER"] has raised a number of questions about the appropriate maturity of the proxy for the risk free rate for price determinations and these are set out in its Issues Paper ["Issues Paper"][3]. In particular it raises questions about:

- whether the risk free rate proxy used in the market risk premium ["MRP"] has to be the same as that used to proxy the risk free rate in the first part of the CAPM equation ["consistency position"], and
- whether the maturity of the proxy used for the risk free asset should be the same as the regulatory review period (five years) or continue to be ten years as has been the convention in most Australian regulatory regimes.

In our opinion:

- the consistency position should be maintained, and
- given the current state of theory and evidence, the most appropriate term of the risk free rate should be ten years as is current practice.

In essence we recognise that if the regulatory process was working in a capital market with no transaction costs or no differential transaction costs with deep and liquid markets for the risk free proxy then a possible move to the use of the risk free proxy with a term

[1] The model generally attributed to Sharpe (1964), Lintner (1965), Mossin (1966).

[2] There is no such thing as 'truly' risk-free return, when the finance literature talks of a risk-free rate in the context of the CAPM or debt they mean a rate that reflects low and relatively constant risk such as the rate on government backed (in their currency) paper (debt).

[3] Australian Energy Regulator "Review of the weighted average cost of capital (WACC) parameters for electricity transmission and distribution" August 2008.

equal to the regulatory period may be warranted. However this is not the case. There has not been a persuasive evidence-base case to justify such a possible move.

In our opinion a change in current practice adds regulatory risk to investors. We would be loathe to recommend a change to a 5 year horizon to match the term of the regulatory period for this reason.

This paper addresses a number of the questions raised in Section 4 of the Issues Paper. It is structured to:

- address the question about consistency in the use of the risk free asset in MRP estimation and in the CAPM relationship, and
- address arguments presented for moving to a proxy for the risk free rate with a 5 year rather than a 10 year term or maturity (i.e. move to match the regulatory period).

2. Consistency between the MRP and Risk Free Rate

2.1 The Issue and Response

The required total reward for capital bearing risk and the time value that capital is tied up in assets or projects can be expressed in the cost of capital of the asset or investment. The cost of capital is an input to price determination hearings in a number of regulatory price jurisdictions in Australia. These determinations consider a return on capital to be an appropriate 'cost' of doing business and an estimate of it is built into an assessment of regulatory revenue requirements[4].

The cost of capital is estimated as a weighted average of the cost of debt and the cost of equity. In general this weighted average cost of capital ("WACC") can be expressed as:

$$WACC = k_d \, D/V + k_e \, E/V \qquad (1)$$

Where k_e is the expected return on equity of cost of equity
k_d is the expected return on debt or cost of debt
D/V is the market value of debt as a proportion of the market value of equity and debt
E/V is the market value of equity as a proportion of the market value of equity and debt which is (1 – D/V)
V is the market value of debt plus the market value of equity

The cost of debt is usually estimated as a benchmark risk free rate plus a premium for risk. The cost of equity is similarly calculated but by using the capital asset pricing model ["CAPM"}.

The CAPM equation[5] is:

$$k_e = r_f + [k_m - r_f] \, \beta_e \qquad (2)$$

Where k_e is the expected return on asset e or cost of equity if the asset is equity
r_f is the nominal risk free rate of return
k_m is the expected return on the market portfolio
$[k_m) - r_f]$ is often called the expected market risk premium ["MRP"] being the amount by which investors will be rewarded for bearing the risk of the market portfolio which has a beta of 1
β_e is the risk of asset e relative to the risk of the market or equity beta.

In principle the CAPM could be used to estimate both the cost of debt and the cost of equity since both are risky assets however the cost of debt is based on a risk free rate plus a premium estimated outside the CAPM. Consequently the overall WACC can be expressed as:

$$WACC = (r_f + \text{debt premium}) \, D/V + (r_f + [k_m - r_f] \, \beta_e) \, E/V \qquad (3)$$

From this equation we can see that the risk free rate is generally used for two (related) purposes in establishing the cost of capital for price determinations. One is to use as a

[4] For example the Annual Revenue Requirement(ARR) of a viable company must be equal or greater than the: operating costs + depreciation + cost of capital (the required return on capital times the value of capital) + effective tax.

[5] Using the notation of the issues paper

base reference rate when establishing the cost of debt, the other is an input to the CAPM used to assess the cost of equity. In the latter case it appears as the first term in the CAPM equation and as a deduction for the expected market return to define the market risk premium ("MRP").

Some of the questions asked in the issues paper revolve around whether the risk free rate in equation (3) should be the same (consistency) and what the maturity of the risk free rate should be – in particular, whether it should be reduced from the current ten year maturity proxy for the risk free asset to a five year maturity to match the regulatory period.

In theory all the risk free rate terms in equation (3) should be the same, however what is important is that the cost of debt and equity reflect what investors in the asset require to motive them to invest.

The primary focus of this section is consideration of the need, or otherwise, for consistency in the use of the risk free rate in the CAPM however the general arguments also apply to the cost of debt. A later section considers the arguments as to whether the term should be five or ten years.

The CAPM is a one period model but the time period is not specified. Consequently there are challenges in applying it in practice both in defining an appropriate time period and in dealing with a multi-period decision environment.

Conceptually it is the price setter's horizon that would define the period but typically there is an assumption of some match between the asset life and investors' planning horizon. Since Network assets are long term assets (greater than 50 years to our understanding) our starting point is that the output from the CAPM should capture the long term opportunity cost of investors. We make this point here because there is a statement in the Issues Paper that suggests the CAPM assumes investors have a short term horizon. It is stated on page 35 of the Issues Paper:

> *". . .even for a CAPM that assumes a short-term investor horizon."*

The CAPM is silent about the investor horizon so, in our view, it is inappropriate to make the claim that it assumes a short-term investor horizon. From a theoretical perspective, an equally strong claim can be made that it assumes a long term horizon.

The risk free rate appears twice in the CAPM relationship and it is the same rate. At the theoretical level there is no debate that it is a risk free rate and that it should be the same in both parts of the equation.

The Issues Paper raises a question about the appropriateness of the term of the risk free rate used in setting regulated prices at fixed terms. In short, whether the term of the government security (representing the risk free security) should be a five year bond, matching the five year regulatory period, or a ten year bond on which most estimates of the MRP has been made.

The issues paper states on page 35;

> *". . . the significance of the consistency issue has been questioned by Lally as well as Davis, primarily on the basis that the traditional method for estimating a long-run historical MRP provides an imperfect proxy for the forwrd-looking MRP parameter as strictly required by the CAPM.*

It appears that the reason the question has been raised is as a result of commentary by Davis (2003)6 and Lally (2006)7 and, by inference, it is appears to be argued that it is acceptable to use a different proxy for the risk free rate in different parts of equation (3) above.

We turn to Davis (2003) in an attempt to understand the basis of the argument. Davis (2003) p11 argues that:

> *"There are a number of arguments which can be advanced against the strictures advocated by such a [consistency] position.*
>
> *a) The MRP should be forward looking. Historical data provides some benchmark, but should not accepted uncritically.*
>
> *b) The method of estimation of historical MRP figures is subject to much debate. Arithmetic or geometric averages may be used (with significant effects on the result). An approach sometimes used is to compare contemporaneous ten year bond yield to maturity with annual holding period returns on the market portfolio. This has no correspondence with the concept of the MRP in the CAPM which involves comparison of a risk free return and a market return for the same holding period.*
>
> *c) The MRP can be expected to vary over time.*
>
> *d) The historical MRP estimates are derived primarily from a period without dividend imputation and reflect equity returns without franking credits. The MRP estimate required now involves equity returns inclusive of the value of franking credits. While a plausible argument can be advanced those estimates will be equal in magnitude, there is no guarantee that this is the case."*

It is difficult to see how these points relate to the consistency position; they are simply statements about the MRP.

We assume the argument is that because there is measurement error in the historical MRP as well as potential translation error in translating the historical MRP to a forward MRP there is no compulsion to adhere to the consistency position. Perhaps we have misunderstood but it is hard to see any link between the Davis quote and the consistency position on the one hand and to see how the interpretation has any merit.

If our interpretation of the point is correct, we do not see that this supports the potential for introducing a statistical bias by breaking the consistency between the maturity of the risk free proxy and that used for the MRP. This arises if the term structure of interest rates is, on average, not flat. There is a difference between measurement error with no known bias i.e. the expected value of the measurement error is zero, which we believe to be the case in estimating the MRP from historical data, and introducing a bias where the expected value of the error is non zero. A bias is introduced by breaking the consistency position whenever the term structure of observed yields is not flat. Since we are talking about the relative merits of a five year versus a ten year maturing bond then we are interested in the shape of the curve between these two bonds. The Davis argument for using a five year bond rate as a risk free rate rather than a ten year rate appears to be that the term structure is not flat consequently a logical conclusion of his position is that the regulatory

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[6] pp 11-12

[7] pp 68-70

[10] Or the any instability is catered for.

process should introduce a bias by replacing the ten year bond with a five year bond but not doing this in the MRP estimate.

Davis goes on to argue:

> *A more significant argument however is based on noting that government securities markets have changed markedly over the past twenty years, and that historical MRP estimates are based largely on data prior to this time. Interest rates were significantly less volatile. In this context, a ten year bond might be interpreted as a zero beta asset, since monthly or annual holding period yields on the bond would have relatively little variability. However, in a market where interest rates have significant short term variability, holding period returns on a ten year bond will fluctuate, and some part of this variability will be systematic. Preliminary estimates I have made indicate a beta for ten year government debt, assuming a monthly holding period return as is common in beta calculations, of as high as 0.35. This implies that the ten year bond can no longer be treated as a zero beta asset as required for calculation of the MRP. It would be inappropriate to apply an estimate of the MRP derived from comparison of market returns and those on a (then) zero beta asset, to the rate of return on an asset which is now a non zero beta asset."*

Firstly, we don't see that Commonwealth Bonds having systematic risk in itself is an issue. Although it is worth pointing out that, held to maturity, the yield on the government security is nominally risk free. If the Bond is not risk-free (neither zero variance nor zero beta) that doesn't render its use inappropriate for estimating a MRP or cost of capital – it only reinforces the need for consistency.

Finance theorists will be aware that the 'risk free' rate is not being used here to identify a market portfolio on an efficient frontier, which is its primary role in the CAPM derivation. In its practical application, it is a benchmark rate to which a premium is added. Consistency minimises any potential bias – it is not essential that the risk free proxy be risk free provided its use in regulated pricing is consistent and the underlying risk is stable[10]. The MRP is the slope of the security market line as described by equation (2). Only two points on the line are required to assess the slope. These can be the market return and the risk free asset. In this case the slope is $(k_m - r_f)/(1 - 0)$. Here the beta or risk of the market is 1 and that of the risk free rate is 0. If the proxy for the risk free rate did not have a beta of 0 then the slope can still be estimated by appropriate substitution. It should provide the same answer as if a risk free rate existed. However practical application requires known values for the systematic risk (beta) of the risk free proxy or substitute.

Secondly, in the quote above, Davis expresses concern about the risk free proxy becoming more risky over time (higher systematic risk). If so, he appears to be arguing that 'risk free' benchmark is changing in nature. If we understand the argument, we would expect that an outcome of this situation is that the MRP based on historical data would be understated in recent times relative to a risk free rate. Why? If the risk free rate proxy has systematic risk then the return it should be earning to compensate investors for risk would be higher in the more recent period – thus the MRP relative to a risk free proxy would be understated. On the other hand, if the systematic risk of the proxy has fallen recently relative to historical rates (e.g. it is negative) then care must be taken to ensure that this is expected to continue and that an appropriate premium is added.

Davis (2005) examines the behaviour of the beta of Bonds from 1983 to 2004. His study does not cover earlier periods, we assume due to data challenges, so the work does not test his hypothesis about the change in risk from the prior period. The paper does show an

increase in the beta in the period circa 1995 to 1997 but a decline from early 2001 and it becoming negative.

These arguments and evidence are not strong enough to suggest we should be moving away from the consistency position nor substituting a five year proxy for the risk free rate as an alternative to the ten year proxy.

2.2 Illustration of need for consistency

If a different maturity bond was used as a proxy for the risk free rate it would be necessary to re-estimate the MRP on a consistent basis.

Mixing the risk free rate used to estimate the MRP and that used as the first term in the CAPM can lead to a clear bias. To illustrate, Table 1 below shows the required rate of return under the CAPM for five different levels of beta – from 0.5 to 1.5 but it mixes the risk free rates. It uses estimates of the MRP over the period 1959 to 2005 from Brailsford et al. The MRP estimated using Bonds is 6.3% and 6.8% for Bills. We hasten to point out the illustration considers short term bills versus ten year bonds, not five year bonds versus ten year bonds. This is because an historical MRP is not available based on five year bonds.

The example uses 6% as the measure of 'current' the risk free rate (maturity undisclosed at this point). To this has been added a risk premium equal to beta times an MRP of 6.3%[11] based on ten year Commonwealth Bonds in one case and beta times an MRP of 6.8% for Treasury bills in the other case. These estimates of the MRP are taken from Brailsford et al (2008) based on the period 1958 – 2005 and exclude any adjustment for imputation tax benefits. The last column identifies the difference between a cost of capital derived from the Bond MRP versus the Bills MRP given the risk free rate proxy and beta.

If the 6% current risk free rate used as an input was a **short term Bill rate** then the best estimate of the cost of capital under different betas will be the "Bills' Column. It is best because there is consistency in the use of the risk free rate proxy. In this case, use of a ten year Bond based MRP of 6.8% would be inappropriate and understate the cost of capital by the column headed 'Difference.' Investors would not be compensated for the risk being borne.

If, on the other hand, the 6% was **a long Bond term rate** then the ten year Bonds column would be the best estimate of the cost of capital. Inappropriately using the Bill based MRP of 6.8% would overstate the cost of capital by the column headed "Difference."

Table 1: Estimates of cost of capital using CAPM but with a different r_f as risk free rate and used in estimating MRP

Beta	CAPM required return relative to:		
	10 Yr Bonds	Bills	Difference*
0.50	9.2%	9.4%	0.3%
0.75	10.7%	11.1%	0.4%
1.00	12.3%	12.8%	0.5%
1.25	13.9%	14.5%	0.6%
1.50	15.5%	16.2%	0.8%

Columns may not add due to rounding

[11] We are using the numbers from Brailsford et at which report the decimal point. This does not mean that we condone its use. This is different from making a conscious decision to introduce a bias by using a Bill or a 5 year maturing bond as the risk free rate and a MRP using a 10 year bond.

Mixing the short term rate as the proxy for the risk free rate with a MRP estimated from historical data using the yield on a ten year maturity bond will, on average, understate the required cost of capital.

Whether a similar outcome can arise from using a five year bond rather than a ten year bond is unclear. It is unclear because we do not have any evidence about the difference between an MRP based on a five year bond versus a ten year bond. It may be positive as for the Brailsford Bond versus Bill case but we have no evidence at this time and that is essential. It could be that the term structure between Bills and five year bonds is upward sloping but flat between five and ten years (or even downward sloping in the latter case if five year bonds are less liquid than ten year bonds). Evidence is required. We anticipate that this may be challenging to obtain as the market for five year bonds is not as deep or as liquid as that for ten years over a long history.

We now turn to some directional evidence.

Indicative data on Government bond yields from January 1972 to July 2008 does show an average yield difference between ten year and five year bonds of 18 basis points with there being more positive than negative differences. This suggests that the MRP relative to a five year bond will be slightly higher than for a ten year bond.

Using this indicative data, Table 2 estimates the difference in the cost of capital for different betas under a ten year bond regime and a five year bond regime. The assumptions here are:

Current yield on 10 year maturing Commonwealth Bonds	6.0%
Current yield on 5 year maturing Commonwealth Bonds	5.8% (a difference of 18 bp rounded to 20)
MRP relative to 10 year Bonds	6.3%
MRP relative to 5 year Bonds	6.5% (20bp difference)

Table 2: Cost of capital for different betas under a ten year risk free rate regime compared with a five year risk free rate regime and being consistent between the risk free rate used and the estimation of MRP

Beta	CAPM cost of capital relative to:		
	10 Yr Bonds	5 Yr Bonds	Difference
0.50	9.2%	9.1%	0.1%
0.75	10.7%	10.7%	0.0%
1.00	12.3%	12.3%	0.0%
1.25	13.9%	13.9%	-0.1%
1.50	15.5%	15.6%	-0.1%

As is to be expected, there should be no difference in the cost of capital for a business with a beta of 1 under either regime. Being consistent in the estimation of the MRP and the definition of the risk free rate ensures this.

However Table 2 shows no difference at a beta of 0.75 (although the ten year regime gives a higher cost of capital of 5 basis points that doesn't show up due to rounding) and a lower rate under the ten year regime with a beta of 1.5.

These two examples, using notional data, demonstrate that there is likely to be minimal difference in the cost of equity estimated with use of either a five or a ten year bond as a proxy for a risk free rate provided there is consistency in its use in the MRP, however mixing rates can lead to a larger difference.

Clearly the assumptions can drive the outcome of examples, one key assumption is the difference in the five and ten year maturing bond rates is an average of 20 basis points (rounded). Clearly this will vary over time but we have chosen an average.

There has not been a study of the MRP using five year maturing Commonwealth Bonds to our knowledge but from our review of data available, it is likely that the MRP would be in the order of 20 basis points higher. Naturally this would be offset by a lower risk free rate in a CAPM calculation making no difference in a cost of capital estimation if the beta was 1. It makes around a five basis point difference at a beta of 0.75. As we note below this needs to be considered in light of the potential additional transaction costs arising from hedging to five year Bonds compared with ten i.e. two rather than 1 transaction.

In finalising our comment on consistency, we note the conceptual point about the need for consistency has been acknowledged in the Issues Paper and it quotes the Tribunal for the GasNet decision (paragraph 46). In our view the Tribunal has summarised the position of finance theorists well:

> *"While it is no doubt true that the CAPM permits some flexibility in the choice of the inputs requried 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." and*
>
> *"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 refernce to a regulatory period of five years. The CAPM is not a model which is intended to work in this way"*

We consider the Tribunal weighed up the body of relevant material well to be satisfied that the use of a ten year Commonwealth Bond rate was the correct use of the CAPM in the circumstances of long lived assets. We recognise that the regulatory jurisdiction of GasNet is different from the AER, but the principle should apply regardless.

Clearly the argument of mixing the term of the risk free rate in different parts of the CAPM equation is flawed as it will introduce a 'known' bias if the yield curve is upward sloping.

3. Term of Risk Free Rate

3.1 Background and Setting

In the introduction we noted that the CAPM is a model used to estimate the required return on risk assets. Since both debt and equity issued by firms are risky assets then in principle the expected return of both can be estimated using the CAPM. However, in practice the cost of equity is estimated this way but the cost of debt can be estimated directly as a reference rate with an adjustment for default risk i.e. it is often estimated as some benchmark rate plus a premium for risk. The benchmark rate can be a government security rate (a "risk free rate" of return).

Further, we noted that the simplest version of the CAPM is single period. This presents a challenge when applying it to investment and investment decisions that are multi-period and of different maturity. Consequently we have to look beyond the CAPM for guidance on its practical application – particularly for selecting an appropriate maturity for the proxy for the risk free rate.

Given the CAPM is a one period pricing model then conceptually the appropriate period is the price setter's horizon that would define the period. However typically there is often an implicit assumption of some match between the asset life and investor's planning horizon. Ideally, the maturity of the CAPM should be the maturity of the planning period for which the CAPM is to be used to estimate an expected or required return. This means that if the planning horizon is a long term investment then a long term government bond is the appropriate maturity to use. That is, the rate of return we are attempting to estimate for regulated network assets is that appropriate for long term investments.

This point is consistent with the general guideline that firms should match the length of their financing maturity with the life of the asset. The notion applies to financing with debt as well as equity. In addition to matching the investors' horizon with the asset horizon it minimises:

- roll over risk, the risk of not being able to raise the capital at all. Recent examples are Centro Properties and Babcock and Brown who could raise debt at the time of roll-over – shareholders in these companies experiencing a very high cost as a result of this
- transaction costs associated with raising capital, and
- interest rate changes that can cause profitability to be different from what was expected and expose the business to 'bankruptcy' costs.

Given the long term nature of the underlying assets and the relative depth and liquidity of the ten year market, we support the use of a ten year maturing proxy for the risk free rate. In the absence of regulation, the present value of the benefits would need to be greater than the present value of the costs to warrant any other outcome.

An additional guideline for selecting inputs to cost of capital estimation is the 'quality' of the observed yields. It has been conventional in Australia for academics and practitioners to use ten year Commonwealth Bond Yields as the proxy of the risk free rate as it is a highly liquid security which provides a good reflection of the expected yield on a long term government security. For example, Officer (1989) used it to estimate the MRP because it is was the most liquid security providing the best available reflection of the expected yield on a long term low risk investment.

Trading in ten year Commonwealth Bonds is a relatively liquid and 'deep' market and, unlike the shorter term, it is not as directly affected by changes in monetary policy. While we do nor have definitive data in this regard, we note that from the supply side, nearly

70% of the dollar value of tenders in the last 13 years have been over ten years – see Table 3. Further, 79 of the 124 tenders (79%) over this time have been over ten years in maturity.

Table 3: Treasury bond tenders August 1996 to August 2008 ($M)

Over I yr and up to 3 yrs	Over 3 yrs and up to 5 yrs	Over 5 yrs and up to 7 years	Over 7 yrs and up to 10 yrs	Over 10 yrs and up to 15 yrs	Over 15 yrs
0	6,203	8,303	1,902	34,703	0
0%	12%	16%	4%	68%	0%

Source: Table E05, RBA website

Since August 1996 there have been 111 occasions when Treasury Bonds of any maturity have been issued. Table 4 shows the maturity structure of bonds issued on each occasion. Of the 111 occasions in which Tenders have been called (and successful) 79 have been over ten years with 21 over 3 years and up to five years. This says the primary market for treasury bonds is deepest at the long end. There were 90 occasions when 3 – five year bonds were not issued thereby making it challenging to buy bonds of this maturity in the primary market. They become available in the secondary market when the passage of time makes longer term bonds of shorter maturity but we have not accessed any statistics on the amount of trading in five year to maturity bonds and therefore cannot comment on the availability of these for acquisition by firms.

Table 4: Bonds participating in each tender event, August 1996 to August 2008

Over I yr and up to 3 yrs	Over 3 yrs and up to 5 yrs	Over 5 yrs and up to 7 years	Over 7 yrs and up to 10 yrs	Over 10 yrs and up to 15 yrs	Over 15 yrs
0	21	18	6	79	0

Source: Table E05, RBA website

Brailsford et al have estimated an MRP using both ten year Commonwealth Bonds as well as using short term Treasury bills. They document challenges in the quality of the data in both series however they point out that in reference to their bills return series:

> *". . .since December 2002, the Commonwealth government has temorarily suspended issues of Treasury notes."* [12]

Consequently they also selected ten year maturing Bonds as the basis of their MRP estimate given concerns about the quality of the data at the shorter end of the yield curve. The consistency position would dictate the use of a ten year risk free rate proxy to use with their estimate of the MRP.

Essentially for these reasons, the ten year bond rate is the most widely used as a proxy for the risk free rate in long term investment decisions in Australia. The MRP derived in this way has been the basis for all regulatory hearings in Australia and, the emerging picture from survey work is that it is also general commercial practice to use this as a benchmark rate, certainly for cost of equity estimation.

We think that the Tribunal in the GasNet case summarised the situation well (para 48):

> *"The Tribunal is satisfied that the use by GasNet of a ten year Commonwealth Bond rate to determine a Rate of Return on equity*

[12] See also Reserve Bank of Australia Table E09 Commonwealth Government Securities on issue which confirms this statement.

under s8.30 of the code was a correct use of the CAPM and was in accordance with the conventional use of a ten year bond rate by economists and regulators where the life of the assets and length of the investment approximated thirty years in the MRP calculation and the risk-free rate."

Thus, in our view, the onus of proof is that retaining a ten year maturing instrument as a proxy for the risk free rate is both theoretically and practically a more sustainable position. Use of the 10 year rate is common practice among academics and practitioners.

3.2 Should the term of the risk free proxy match the regulatory period?

The Issues Paper asks for views and evidence on matching the maturity of the risk free proxy with the regulatory period of five years.

We support a view that the natural starting point is to take a long term financing view when financing long term Network assets. Under these circumstances the cost of capital of interest is that which reflects the requirements of a long term investor. This leads us to recommend the use of the ten year maturing instrument as a proxy for the risk free rate, despite this being shorter than the life of the assets, on the grounds that it is the longest term risk free proxy that trades in relatively deep and liquid market. A proxy of this maturity should be used for estimating the market risk premium using historical data and as the basis for the risk free rate when estimating both the cost of equity and the cost of debt. We are also aware that its use is common practice in non-regulated businesses[13] and by regulators in Australia. Table 4.1 on page 28 of the Issues Paper shows that all electricity and gas distribution determinations listed used a risk free proxy of ten year maturity.

We have no objection to using a five year rate if the term structure was flat. In theory, under conditions of a flat yield curve across the Bonds of interest, no transaction costs and deep and liquid markets in the Bonds we have no objection to matching the term of the regulatory period and the term of the risk free rate. The five year rate and the ten year rate would be the same. However, in practice, these conditions do not hold and we would object to the use of a five year rate unless it can be shown that the benefits outweigh the costs. Further, as noted above, current practice is to use ten year Commonwealth Bonds as the proxy for the risk free rate.

We noted above that a move from the ten year proxy regime to a shorter financing horizon for the network assets exposes the firm to a number of risks and costs:

- Roll over risk, the risk of not being able to raise the capital at all;
- Transaction costs associated with raising capital; and
- Interest rate changes that can cause profitability to be different from what was expected and expose the business to 'bankruptcy' costs.

The present value of the additional benefits would need to be greater than the present value of the costs to warrant such a move. A danger of moving to a five year view of the maturity of the risk free rate proxy is that it imposes or implies a financing strategy on regulated firms whereby the costs could be greater than the benefits and these costs are passed to consumers through cash flow compensation by the regulatory process. This has the potential to disadvantage users in a competitive environment and dampen demand in the presence of inelastic demand.

[13] Value Adviser Associates have reviewed the proxy for the risk free rate used by professional valuers when preparing Independent Experts Reports. At the time of writing, the analysis showed that of the 27 different experts reviewed, 24 used the 10 year government bond rate with the other 3 not making it clear what was used.

We do not see any formal quantification of these costs and benefits to appropriately assess the impact of a change. The Issues Paper cites Davis as arguing that a strategy:

> *"to pursue long-term debt may reflect a desire to minimise transaction costs of debt issuance or to avoid an increase in the debt premium" … "does not necessarily require the use of long term debt, as it can also be achieved with a combination of short-term debt and appropriate hedging measures." (p31).*

However hedging is not costless and long term credit spreads still need to be covered. It is a matter of fact as to which financing strategy best meets the matching guideline at the lowest overall cost to the entire regulatory system.

The AER Issues Paper states that (p31):

> *". . . financing strategy is and should be at the discretion of the regulated entity. Provided the regulator commits to resetting interest rates (and cash flows) at the end of the regulatory period, and the firm refinances in the specified averaging period, the exposure to interest rate risk will be minimised to the greatest extent possible"*

There is an acknowledgement here that the regulatory process implies or could impose a particular financing strategy for the firm and, by implication, that this is the most cost efficient (regardless of whether the firm or customers bear this cost). It requires the firm to refinance or at least hedge in the averaging period and assumes the financing or hedging facilities will be available. It also requires that firms know in advance what this period will be, that the funds are available and that there are no price effects due to all regulated firms refinancing in a short period of time. Anecdotally we point to the experience of Centro Properties and Babcock and Brown as examples of two firms that could not refinance when required, despite the underlying assets being of good quality[14]. We are also advised that Corporates have been unable to issue debt instruments in recent months, again largely as a fall out from the sub prime crisis. Being unable to refinance dramatically increases the probability of experiencing what finance theory calls bankruptcy costs (witness the re-rating of the equity in these firms).

It is interesting to extend the argument. Suppose regulatory price determinations were annual, would it be recommended that funding be rolled over annually? We are of the view that this would not make any sense.

We refer to Bloomberg data summarised in the joint industry associations' response to the Issues Paper. Included in that response is data on the maturity and time of debt raisings and maturity of outstanding debt. It is evident that Network businesses use long term debt (a weighted average maturity of 11.4 years) and spread debt raisings over time. Spreading debt raising over time helps to mitigate rollover risk as well as to minimise the adverse pricing (interest rate) effects that could arise from being 'vulnerable" i.e. requiring a large quantity of debt at a point in time.

While the maturity structure of debt is 'long' we are also advised that most Network regulated businesses will endeavour to hedge interest rate risk over the regulatory period. Despite these hedging strategies, the overall interest rate that will be paid will need to reflect a long term credit spread and we are advised that there is a maturity structure in

[14] See, for example, the article entitled "Centro growth stays solid in all sectors," Australian Financial Review 21 May 2008 p 62 where the opening paragraph says "Rental and sales growth appear to have remained solid across Centro Properties Group's portfolio in the face of the US economic trouble and the doubts over he company's future.

the credit spread i.e. long term debt rates are higher than short term rates due to at least any term structure in the risk free proxy and also in the credit spread.

Immediately after the quote above, the Issues Paper then points out that the AER believes financing strategy is and should be at the discretion of the regulated entity. Consequently we hasten to point out that care must be taken to ensure that use of a five year maturity structure to match the regulatory period does not imply that regulated businesses should change financing strategy to five year maturing debt as this could impose a high level of rollover risk. In our opinion, the regulatory process should allow firms the opportunity to select the most efficient financing strategy – one that minimises all direct and indirect costs (the latter arising under distress if funds cannot be raised or raised at 'reasonable' rates).

The arguments as to why it is more appropriate to match the term of the risk free proxy and the regulatory period appear to be related to:[15]

1. Risk minimisation arising from matching maturity of debt with maturity of assets can also be achieved by a combination of short term debt and appropriate hedging measures (p31 Issues Paper);
2. There are no debt instruments with a maturity long enough to enable firms to match asset maturity and debt maturity, therefore the use of ten year risk free rate will not eliminate refinancing risk;
3. The use of a ten year bond rate provides compensation for risks that regulated firms do not bear. Two arguments have been presented in this regard:
    - It is argued the yield on ten year bonds is generally above that on five year bonds to compensate for liquidity / inflation risks i.e. it is not explained by the rational expectations view. If this differential is included in the allowed cost of capital then regulated companies will be rewarded for risks they do not bear because the reset eliminates this risk;
    - The systematic risk of ten year Commonwealth Bonds is higher than that of five year bonds (Davis (2005). This suggests that yield on ten year bonds is higher than the appropriate ten year risk free rate thus use of ten year bonds as the risk free proxy may over-compensate firms. Use of a five year bond will serve to reduce this potential over-compensation.

The first argument assumes the cost of using short term debt and appropriate hedging is lower than using long term debt. However firms do raise long term debt and must cover the long term cost of debt – hedging part of the portfolio does not avoid this cost. In an active market we would expect the cost of alternative methods of financing to equilibrate otherwise one would dominate i.e. fund 'raisers' would be attracted to the lowest cost form of financing thereby potentially increasing the price through demand until it matched the price of other forms of fund raising. As noted above, regulated businesses arrange funding on a long term basis. This exposes the provider of funds to long term credit risk and it is essential that the regulated businesses recover this cost. It does not go away as a result of hedging over the five year period.

The second argument is that debt with a similar life to the life of the assets is generally not available, so ten year maturing debt does not solve the maturing matching need. We do not see how this argument supports a five year risk free rate. This is even worse at matching the life than ten year debt. If five year debt was used would double the refinancing relative to ten year debt. It will compound the issue not alleviate it.

With respect to the third argument, moving from the current regulatory pricing regime based around the use of a ten year Commonwealth Bond as a proxy for the risk free rate requires a careful analysis of the costs and benefits to the entire system, taking into account the impact on demand as well as immediate cash flow effects on firms. The

[15] See Issues Paper pp 30 -33.

potential move, if adopted, will impose refinancing risks and transaction costs (see AER quote above that firms should re-finance in the averaging period). While the first order effect of compensating regulated firms for the transaction costs may be cash flow neutral for them, the pass onto consumers may dampen demand and have second order effects. We believe the case has to be evaluated carefully and it be clearly shown that the move to a five year bond as a proxy for the risk free rate is more efficient than the current use of ten year bond or another instrument with a ten year maturity.

At this time, the arguments are purely hypothetical. The extent of an additional compensation has not been established. Our indicative estimation of the average difference between the yield on a ten and five year Bond is 18 basis points (see section 2.2 above). Nor has the additional cost of transacting been quantified. We understand that the manager / arranger fees on bank debt vary from 50 to 110 basis points. On the face of it these transaction costs alone will be greater than any yield differential benefit.

The choice of term would not be an issue if the term structure was flat between the maturities of interest. Further, it is also likely that if the term structure is explained by the rational expectation hypothesis then the choice of term is unlikely to matter since the likelihood of the structure being upward and downward sloping would be similar with the term structure, on average, being flat.[16]

Davis (2003) argues for the use of a five year rate on the grounds that with an upward sloping yield curve and with five yearly price determinations which reset interest rates and allow recovery of transaction costs, regulated businesses may be compensated for risk to which they are not fully exposed.

Critical to this argument is that there is, on average over time, a premium to ten year maturity bonds over five year maturity bonds and that there are no demand effects from passing on transaction costs and risks to customers. Is this the case? It is possible that the term structure between five and ten years is flat on average and that any long term difference between the ten year rate and the bill rate (e.g. the 50 basis points implied by Brailsford) is determined by the difference between the bill rate and the five year rate alone.

Davis (2003) does not commit to stating that the difference between the five year maturing bond rate and ten year maturing bond rate is positive. For example he states (p10)

> *"This demonstates that using a maturity for the risk free asset which exceeds the regulatory hoizon, provides excess returns* ***if it is believed*** *that there typically is a positive term premium in the yield curve which is unrelated to interest rate expectations." (emphasis added).*

We would go a little further and say that this condition would have to exist on average at regulatory reset periods. It is possible for the average term structure to be flat between five and ten years on average across regulatory reset periods.

We noted above that RBA Yield data shows an average of 18 basis points difference between the yield on ten year and five year bonds from January 1972 to present – upward sloping but small. If this is of benefit to those regulated then the challenge is to show that this is not offset by the exposure to additional transaction costs and rollover risk.

Davis (2005) presents evidence on the systematic risk of 10, 5 and 2 year government debt using data from the period 1979 to 2004. He finds the debt betas are positively related to

[16] See Davis (2003) p five "Except in the unrealistic case where interest rates are expected to forever increase or forever decrease, expectations of future interest changes can be positive of negative and average out over the long run to zero."

the duration of the debt. He also finds they are subject to significant time series variation. The betas for all maturities appear to be negative at the end of the time series.

The cost of debt is estimated by adding a premium to a benchmark rate. If there is consistency in the calculation of the premium and the use of the benchmark any under or over estimation of the cost of debt should be minimised. It is not essential that the proxy be risk free but there may be a challenge if the benchmark has varying risk such that the averaging process around the premium does not remove any potential bias.

If the argument is that 5 year firm debt really is lower systemic risk than 10 year firm debt then financing with 5 year debt will tend to lower the systemic risk passed to debt providers. The result will be that, for any given level of gearing, the residual systemic risk attached to equity will be higher – implying a higher equity beta is required when assuming financing with 5 year debt than financing with 10 year debt. This is simply a statement of the Modigliani-Miller proposition regarding the conservation of risk – if you transfer less risk to debt holders then you are left with more risk for equity providers. There will be a need to revisit the cost of equity if the change to a five year horizon induces a change in the debt profile of regulated businesses.

At this time we are of the view that more work needs to be done to establish whether over unreasonable compensation arises from the Davis finding.

3.3 Summary of Term of Risk Free Rate Discussion

In summary, in our opinion, the stronger argument than matching the maturity of the risk free asset with the regulatory period is that the pricing decision is in relation to providing adequate returns to long lived assets. Therefore the time between investment decisions is much longer than the period between pricing decisions and as a consequence a long term instrument as a surrogate for the risk free rate is more appropriate.

If the planning period of the company is longer than the periods between regulatory decisions, it is inappropriate to use the five year rate as distinct from a longer term rate such as the ten year rate. The longer term will better reflect the investment horizon of the company which is the relevant term and not that of the regulators. A moving ten year rate should be used if regulatory periods are considerably shorter than the ten year period. In short, there is no sound justification for the use of a five year rate.

The argument for a term consistent with the regulatory period would be correct if the entity, at the time they purchased the assets, were guaranteed that they would get compensation for the required return based on a five year benchmarked fixed interest security and at the end of the five years, if they choose to walk away from the asset, they would be fully compensated. In these circumstances, from the perspective of the owner of the asset, it is a five year asset even though its economic life might be greater.

Network companies are not in this position. When a company commits funds to purchase an asset, it is typically long-term, for infrastructure assets probably considerably longer than the term of the ten year Government Bond that is used for a surrogate risk-free rate, in turn, used as an appropriate benchmark. When it makes the purchase, it has to consider making the purchase of that asset or the opportunity cost of investing in other assets of comparable risk and duration, or whether the risk and duration has adequate compensation for the alternative investments. Even though it knows that the allowed rate of return on the asset will be reset at regular periods, it does not have the luxury of having those rates prescribed to it at the time of the purchase of the asset. Nor does it have the luxury of knowing that it can walk away from the asset if it finds such compensation unsatisfactory i.e. there is no guarantee that there is a secondary market that will return at least the RAB. The risk to the infrastructure owner is the risk faced by the purchaser of a long-term asset. The nature of the risk may be affected by the regulatory regime but

nonetheless it is still committed to the asset unless it is offered full compensation should they choose to walk away or sell the asset. For these purposes full compensation implies at least the replacement cost of the asset or its optimal deprival value under the same set of conditions i.e., the same regulatory regime that was expected at the time the asset was purchased. The asset is the underlying physical asset, systems, processes, people etc that provide a service that customers pay for. The regulatory system affects the size of the cash flows but it is not the asset so it cannot be argued that the asset has a 5 year life equal to the regulatory period.

We refer to a paper prepared Lally (2002). The examples that Lally uses in his paper to demonstrate the argument for using a five year bond rate are equally applicable to using the changes in the ten year rate at each regulatory period. To use a rate with a time span equal to the regulatory period requires showing the assets of the company are not at risk, they will be totally protected or "insured" by the regulator. Moreover, this five year rate is inconsistent with the MRP and therefore inconsistent with the CAPM. Although the difference in the market risk premium estimated using five year rates relative to ten year rates would not have a profound influence on the ultimate value, it misses the point. The rate used has to be consistent with the assets' cost of capital and because the assets are long lived the ten year rate is likely to be more consistent with the cost of capital than a five year rate. Also, the longer term investment will show a greater premium because of the normal shape of the yield curve than a shorter term investment.

Further support for using a ten year rate is that the market is much deeper in ten year risk free securities issued by government than five year securities and therefore the estimates are more reliable. See Tables 3 and 4 above. Moreover, all the estimates of the MRP generally have used ten year bond yields to estimate the MRP and to re-estimate for the five year premium would require a great deal more work than has been done to date on that particular premium.

The Issues Paper has requested views and supporting information on whether the term of the nominal risk free proxy should be equal to the term of the regulatory period, viz. five years. We note that if this was the case then it would be necessary to be of the view that:

- There is an active and deep market for the five year proxy for the risk free rate;
- The financing transactions costs that may be imposed on regulated firms are not higher than under current arrangements (ceteris paribus);
- The roll-over risk is not higher as a result of 'going to market' more frequently than other arrangements under a ten year financing regime;
- The term structure is, on average, upward sloping from five to ten year maturities and passing on the financing risk and transactions cost to consumers does not dampen demand arising from this;
- The market risk premium is estimated using observed historical market returns and the observed yield on a five year Commonwealth Bond or other proxy.

We have not seen any evidence presented by those advocating a change from the ten year rate to the five year rate that shows that the change would result in better pricing decisions such that application of the present value principle would yield a closer to zero answer under a five year regime than a ten year regime, all costs and benefits appropriately considered.

Consequently we have do not believe a case has been presented that warrants a change from current practice.

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