6 August 2007

Mr Chris Pattas
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Dear Chris

Real Risk Free Rate: SP Ausnet and ElectraNet Revenue Resets

The Energy Users Association of Australia (EUAA) appreciates the opportunity to provide a submission to the Australian Energy Regulator (AER) on the issues raised in both the SP Ausnet and ElectraNet revenue reset applications on the potential bias in Treasury Indexed Bonds as a proxy for the real risk-free rate.

As you no doubt will agree, this is a complex issue that needs thorough examination by the AER. To assist the EUAA in preparing our submission, we commissioned Professor Martin Lally, Associate Professor, School of Economics and Finance, Victoria University of Wellington, to provide expert comment on the NERA work and the arguments advanced by SPAusnet and ElectraNet. A draft copy of Professor Lally's report is attached.

You will note in the report that Professor Lally rejects the proposition advanced by NERA that indexed insured bonds are a better proxy for the real risk free rate than government bonds and their resulting conclusions that there should be an 86 basis point increase in the

real cost of equity and a 20 basis point increase in the real cost of debt. Professor Lally considers that the arguments are invalid as:

- Firstly, a reduction in the supply of an asset or an increase in the demand for it has no bearing upon its suitability as a proxy for the risk free asset within the context of the CAPM. These are "simply part of the financial landscape and are entirely consistent with the CAPM."
- Secondly, the relevant criteria for choosing a risk free asset within the context of the CAPM are that the asset is risk free, liquid, that there are no restrictions upon the purchase of the asset by investors, and that investors are not attracted to or repelled from the asset for reasons other than the probability distribution over its return. Overall, based on these criteria government bonds would seem to be a much better proxy for the risk free asset than NERA's preferred alternative as they are more consistent with them.
- Thirdly, even if it were true that insured bonds were a better proxy for the risk free asset than government bonds, this conclusion would both raise the risk free rate within the CAPM and lower the market risk premium. NERA, in Professor Lally's opinion, wrongly judges the latter effect to be zero and therefore overestimates the increment to the cost of equity for a regulated firm.

We believe that the arguments advanced by Professor Lally support the continued use of the government bonds as the appropriate proxy and are strongly opposed to the acceptance of the proposition put forward by SP Ausnet that the current approach leads to the "use of biased raw yields" and that there should be an 86 basis point increase in the real cost of capital and a 20 basis point increase in the real cost of debt.

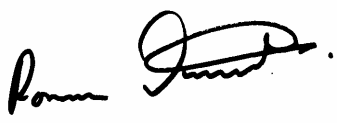
It is not clear from your email seeking submissions as to what action the AER is intending in response to SP Ausnet's letter of 31 May 2007. Our understanding is that, as the WACC parameters are set in the National Electricity Rules, the only issue that can be addressed without a Rule Change is the issue of the increase of 20 basis points in the real cost of debt and that SP Ausnet and Electranet have both included this increase in their revenue reset applications. As Professor Lally clearly demonstrates the premise on which this increase is based is fundamentally flawed and the EUAA strongly

opposes the increase of 20 basis point increase in the real cost of debt contained in the revenue reset applications.

We do, however, agree with the statement in the SP Ausnet letter of 31 May 2007 namely that “the weighted average cost of capital for regulated infrastructure businesses is an issue of critical importance for the energy industry”. As you are aware the EUAA considers that the WACC parameters are extremely generous to transmission network service providers at the cost of end users and, in particular, large end users. We are aware that the AER is to undertake a review of the WACC parameters in 2009 but, as SP Ausnet and Electranet have opened the issue in their reset applications, we consider that the AER should not limit itself to the consideration of the risk free rate but should also address all other aspects that can be varied within the National Electricity Rules
Professor Lally is undertaking some further work on this aspect and we propose to bring forward further submissions in respect of both SP Ausnet and Electranet when that information is available.

We would appreciate if the AER could treat this submission as confidential at this time.

Yours sincerely



Roman Domanski
Executive Director

ABSOLUTE AND RELATIVE BIASES IN GOVERNMENT BOND YIELDS

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5 August 2007

EXECUTIVE SUMMARY

NERA has argued that nominal and indexed government bonds are poor proxies for nominal and real risk free assets, and that upward adjustments should be made to the costs of equity and possibly also the costs of debt on account of this. In particular, they favour an upward adjustment of 66 basis points for the nominal cost of equity. Also, in so far as expected inflation is estimated from the difference in yields on nominal and indexed government bonds, they favour an 86 basis point increase in the real cost of equity and a 20 basis point increase in the real cost of debt. They also believe that reductions in the supply of, and increases in the demand for, government bonds aggravate the problems here.

These arguments are invalid, for the following principal reasons. Firstly, a reduction in the supply of an asset or an increase in the demand for it has no bearing upon its suitability as a proxy for the risk free asset within the context of the CAPM. Changes in the demand for or supply of assets, and therefore in the equilibrium prices for them, are simply part of the financial landscape and are entirely consistent with the CAPM.

Secondly, the relevant criteria for choosing a risk free asset within the context of the CAPM are that the asset is risk free, liquid, that there are no restrictions upon the purchase of the asset by investors, and that investors are not attracted to or repelled from the asset for reasons other than the probability distribution over its return. Nominal government bonds trivially violate the first requirement, and also the fourth requirement on account of their value as collateral. Indexed government bonds may also violate the second requirement on account of relatively low liquidity. However, NERA's preferred alternative (insured corporate bonds) violates all of these requirements. Thus, government bonds would seem to be a much better proxy for the risk free asset than NERA's preferred alternative.

Thirdly, even it were true that insured bonds were a better proxy for the risk free asset than government bonds, this conclusion would both raise the risk free rate within the CAPM and lower the market risk premium. NERA wrongly judges the latter effect to be zero and therefore overestimates the increment to the cost of equity for a firm.

1. Introduction

NERA (2007a, 2007b) has recently argued that yields on Australian government nominal and indexed bonds are downwardly biased estimates of the nominal and real risk free rates, and therefore upward adjustments are warranted. This paper seeks to review their work. Section 2 summarises their arguments concerning nominal bonds. Section 3 reviews them. Section 4 summarises their arguments concerning indexed bonds. Section 5 reviews these arguments. Section 6 concludes.

2. NERA's Arguments Concerning Nominal Bonds

NERA presents five significant arguments concerning nominal Australian government bonds. Firstly, they argue that Australian government bonds have unique features that lower their yields, most particularly their high liquidity, their value as collateral securities, and their "simplicity" (NERA, 2007a, page 33). Secondly, they argue that the supply of Australian government bonds has fallen (NERA, 2007a, Figure 5.1), that this has induced a fall in the yield to maturity (ibid, page 40), and this yield is therefore below the true risk free rate. Thirdly, they argue that "insured bonds" (corporate bonds coupled with a credit default swap) are a better proxy for the risk free rate because they lack these unique features of government bonds (ibid, page 35). Fourthly, they argue that the yields on these insured bonds exceed those on government bonds by 66 basis points (NERA, 2007b, section 2.3). Fifthly, in so far as the market risk premium is estimated by historical averaging, they argue that no adjustment is required to the market risk premium because the historical average downward bias in yields on government bonds would have been small (ibid, section 3.2).

Although NERA do not explicitly link the first and second arguments, the first argument underpins the second, i.e., without the first argument concerning the uniqueness of government bonds, any reduction in their supply would be inconsequential. Consequently, the role of the second argument is merely to amplify the first, i.e., the recent reduction in the supply of government bonds aggravates the (alleged) downward bias in the yields on government bonds (as an estimator for the

risk free rate) that already exists simply on account of their unique features of high liquidity etc.

3. Review of NERA's Arguments Concerning Nominal Bonds

3.1 Introduction

Much of what is claimed by NERA in the previous section is uncontroversial. In particular, it is uncontroversial that the supply of Australian government bonds has fallen in recent years. It is also uncontroversial that a reduction in the supply of a bond that is unique in certain respects will induce an increase in its price and therefore a reduction in its yield to maturity. It is also uncontroversial that government bonds differ from insured bonds in various ways, including those described by NERA, and that the effect of these differences would be to generate higher yields on insured bonds than on government bonds.

The principal controversial question here is whether insured bonds or government bonds are the better proxy for the risk free asset. If NERA are correct in asserting that insured bonds are the better proxy, then it might be important to assess the extent to which their yields currently exceed those on government bonds, and it might be important to assess whether the historical average difference was smaller. However, if government bonds are the better proxy, then it becomes irrelevant to what extent the yields on insured bonds are currently higher and it also becomes irrelevant whether the historical average was lower.

3.2 The Appropriate Choice of the Risk Free Asset

To assess this question, it is necessary to consider the context within which the risk free rate is being sought. This context is that of the Capital Asset Pricing Model (CAPM: see Sharpe, 1964; Lintner, 1965; Mossin, 1966). The CAPM embodies the concept of a risk free asset, but it does not designate any particular asset of this type. In choosing an asset to provide the risk free rate, the only explicit requirement within the CAPM is that the rate of return on that asset be free of risk. There is an implicit requirement relating to liquidity, i.e., a very illiquid asset would be unsuitable because illiquidity is (inter alia) a manifestation of high transaction costs and the CAPM assumes that there are no transactions costs. In addition, there is an implicit requirement that no investor faces restrictions upon the purchase of this asset because

the model assumes that no such restrictions exist. In addition, there is an implicit requirement that investors are not attracted to or repelled from the asset for reasons other than the probability distribution on its return, because the model assumes that investors choose portfolios solely according to their return distributions. However, the model does not impose any requirements whatsoever (whether explicit or implicit) relating to the *supply* level of the risk free asset, i.e., it does not require the supply of the risk free asset to meet some minimum level, as NERA seems to believe. This follows from the fact that the supply of the risk free asset is exogenous to the CAPM (see Mossin, 1966, pp. 772-773; Hirshleifer, 1970, pp. 299-300). Thus, whilst a reduction in the supply of government bonds may lower their yield, it does not disqualify such bonds as a suitable proxy for the risk free asset within the context of the CAPM.

Consider the following example. Suppose that the supply of government bonds is 60% of GDP and the yield to maturity is 5%. Furthermore, these bonds satisfy all of the requirements for a risk free asset stated or implied in the CAPM, i.e., they are risk free, liquid, free of purchase restrictions, and devoid of characteristics other than their return that attract or repel investors. In addition, the expected return on the market portfolio is 11%. Accordingly, the risk free rate would be 5% and the market risk premium (being the expected return on the market portfolio net of the risk free rate) would be 6%. Now suppose that the supply of government bonds falls to 5% of GDP and their yield to maturity thereby falls to 4%. The reduction in supply does not disqualify government bonds as a suitable proxy for the risk free rate. So, the risk free rate has fallen to 4%. The expected return on the market portfolio might also fall by 1%. If it does, the market risk premium remains 6%. If the expected return on the market portfolio does not change, then the market risk premium rises to 7%. So, changes in the supply of an asset may change the expected returns on some assets but they do not change the definition of the risk free asset and therefore do not disqualify an asset that previously qualified as a good proxy for the risk free rate.

In summary, the CAPM asserts or implies that the following properties should be satisfied by the risk free asset:

(a) the return on the asset is certain
(b) the asset is liquid

(c) there are no restrictions upon the purchase of the asset by any investor

(d) investors are not attracted to or repelled from the asset for reasons other than the probability distribution on its return.

Australian government bonds do not satisfy the first requirement, but the possibility of default would seem to be very low. The effect would be that the yield on government bonds overestimates the risk free rate. In respect of the second and third requirements, Australian government bonds would seem to satisfy these. In respect of the fourth requirement, NERA (2007a, page 33) suggests that this is not met, because government bonds are desired not merely because of their return but also because they can be used as collateral and because of their "simplicity". The point concerning collateral is uncontroversial, and the effect would be that the yield on government bonds underestimates the risk free rate. However, the reference to the "simplicity" of government bonds is perverse. If government bonds are simple, as opposed to complex, then investors fully understand their probability distributions and can act accordingly. Thus, requirement (d) is satisfied rather than violated. By contrast, if an asset is complex, some investors may be unable to comprehend its actual probability distribution and therefore may be repelled from the asset on grounds other than its actual probability distribution. Requirement (d) would then be violated. Thus, it is not the simplicity of an asset that should disqualify it as a good proxy for the risk free rate but its complexity.

Turning to insured bonds, they do not seem to satisfy *any* of these four requirements. In respect of default risk, Hull et al (2004) note that "insured bonds" are not insured against loss of accrued interest and are subject to the possibility of default by the "insurer". They go on to argue that the latter effect is extremely small (ibid, page 2800) but they do not characterise the former effect in that way. Consequently, insured bonds may be subject to non-trivial default risk. The yield on these bonds therefore overestimates the risk free rate. In respect of liquidity, Blanco et al (2005, p 2259) notes that corporate bonds are relatively illiquid, particularly outside the US, and insured bonds are therefore relatively illiquid. Remarkably, NERA (2007a, page 33) do acknowledge the superior liquidity of government bonds but interpret this as grounds for not using government bonds as the proxy for the risk free asset! Since liquidity is a desirable feature of an asset, the effect of illiquidity is to raise the yield and therefore to overestimate the risk free rate. In respect of restrictions upon the

purchase of assets, Blanco et al (2005, p 2278) notes that "fund managers are often not permitted to trade CDS contracts either by national law or mandate". The effect of this would be to raise the yield on these bonds, and therefore to overestimate the risk free rate. Finally, in respect of investors being attracted to or repelled from assets for reasons other than the probability distribution of their returns, NERA (2007b, p 8) apparently approvingly quotes from a Financial Times article to the effect that "CDS are derivatives, and derivatives still make many people nervous". If this is true, the effect of it would be to raise the yield on insured bonds, and therefore to overestimate the risk free rate.

In summary, a reduction in the supply of an asset has no bearing upon its suitability as a proxy for the risk free asset within the context of the CAPM. The relevant criteria are otherwise and Australian government bonds satisfy two of the four requirements. In respect of the two violations, the effect of one of them is to generate yields on these bonds that overestimates the risk free rate whilst the effect of the other is to induce an underestimate. By contrast, insured bonds violate all four requirements for a risk free asset, and the effect in all cases is that the yield on these bonds overestimates the risk free rate. Accordingly, Australian government bonds would seem to be a much better proxy for the risk free asset than insured bonds within the context of the CAPM.

3.3 Adjustments to the MRP

Having argued in the previous section that government bonds are a better proxy for the risk free asset than insured bonds, it does not then matter whether the average historical difference in yields is less than it currently is, let alone zero. However, if one were to conclude that insured bonds constituted the better proxy, then it might matter whether the average historical difference in yields is less than it currently is, and in particular whether that difference is zero. The argument is as follows. Since the generally employed equity beta in Australian regulatory determinations is 1, then the cost of equity for a regulated firm is

$$k_e = R_{f0} + \phi \qquad (1)$$

where R_{f0} is the current risk free rate and ϕ is the market risk premium. If the market risk premium is estimated from historical average outcomes (of market returns net of risk free rates), then the estimate for k_e (denoted $\hat{k}_e$) is as follows

$$\hat{k}_e = R_{f0} + (\overline{R}_m - \overline{R}_f)$$

where $\overline{R}_m$ is the historical average market return and $\overline{R}_f$ is the historical average risk free rate. Thus, if the yield margin for insured over government bonds has not changed over time, then any switch from the use of government bonds to the use of insured bonds will raise the current risk free rate and the historical average risk free rates by the same amount, with zero net effect upon the estimated cost of equity. On the other hand, if the historical average yield margin is zero, as argued by NERA, then a switch to the use of insured rather than government bonds will raise only the current risk free rate, and therefore will raise the estimated cost of equity for a regulated firm. In view of this, we review NERA's argument that the average historical difference in yields on insured versus government bonds is zero along with NERA's presumption that the market risk premium is estimated through historical averaging.

NERA's argument is reflected in NERA (2007b, Figure 3.1). The argument is motivated by a belief that the yield margin for insured over government bonds is negatively related to the level of government bonds relative to GDP. So, NERA has regressed *Y* (the yield margin for insured over government bonds in basis points) on *R* (the ratio of nominal government bonds to GDP) for the five years for which *Y* is determinable (2002….2006). The result from doing so is as follows[1]

$$Y = 102 - 915R \qquad (2)$$

Extrapolation of this relationship over higher values for *R* reveals that the yield margin *Y* reaches zero at *R* = 0.11. NERA then note that the average value for *R* over the period since 1976 was 0.17, which implies that the average value for *Y* over the period since 1976 was zero. Thus, if the market risk premium is estimated over the

[1] NERA (2007b) do not provide the results of their regression but the data is apparent from their Figure 3.1, and use of the data generates this regression relationship.

period from 1976, then the use of insured rather than government bonds has no impact upon the estimate of the market risk premium.

The difficulties in this line of argument are fourfold. Firstly, estimates of the market risk premium arise from a range of methodologies other than historical averaging, and some of these alternatives imply that any impact upon the current risk free rate from adopting insured bonds as the proxy for the risk free rate will be completely neutralised by the impact upon the market risk premium. For example, suppose that the market risk premium is estimated through forward-looking methods (eg: Cornell, 1999; Claus and Thomas, 2001), in which the expected return on the market portfolio is estimated ($\hat{k}_m$) and the current risk free rate R_{f0} then deducted from it. For a regulated firm with an equity beta of 1, the estimated cost of equity is then as follows.

$$\hat{k}_e = R_{f0} + (\hat{k}_m - R_{f0})$$

Thus, any effect upon the current risk free rate R_{f0} from adopting insured bonds as the risk free asset would have no effect whatsoever upon the estimated cost of equity for a regulated firm.

Secondly, the relationship between *Y* and *R* cannot be linear because *Y* must always be positive; this follows from the fact that all of the features that differentiate insured bonds from government bonds (greater default risk, inferior liquidity, restrictions upon purchase, and the lack of collateral value) induce a positive value for *Y*, even at high levels for *R*. Thus, even if it was true that the average historical value for *R* was 0.17, the average historical value for *Y* would have to be positive. Accordingly, if insured rather than government bonds were used as the risk free asset, the effect would be to lower the market risk premium as well as to raise the current risk free asset. It follows that NERA's analysis, which treats the impact upon the market risk premium as zero, would overstate the impact upon the cost of equity. For example, a function that closely fits NERA's data in their Figure 3.1 and yet ensures that *Y* is always positive is as follows.

$$Y = \frac{2.75}{R} \qquad (3)$$

Invoking this function, with a historical average value for R of 0.17, implies that the historical average value for Y is 16 basis points rather than zero.

Thirdly, conducting the analysis underlying equation (2) using data from 1976 implies (wrongly) that estimates of the market risk premium determined through historical averaging invoke data from 1976. In fact, the two dominant sources of such estimates are Officer (1989) and Dimson et al (2002); the former draws upon data from 1887 and the latter from 1900. Had NERA considered comparable historical periods rather than simply the period from 1976, the average value for R may have been lower than the figure of 0.17 used by them. If this was the case then their overstatement of the effect of shifting from government to insured bonds would be even greater than suggested above. For example, suppose that the average value for R over the relevant historical period was 0.10 rather than 0.17. Substitution of this into equation (2) then yields an estimate for the historical average value for Y of 28 basis points rather than zero.

Fourthly, because the yield margin Y depends upon features of the two classes of bonds as well as the value of R, and some of these comparative features are likely to have been more pronounced in the past, the historical average yield margin Y is likely to have been higher than suggested by the historical average level of R. For example, the historical average liquidity advantage of government bonds over insured bonds is likely to have been much greater than it currently is. Thus, NERA's regression model (2) or even the alternative model (3) will understate the historical average value for Y. Accordingly, the impact upon the estimated cost of equity from shifting from government to insured bonds will be further overstated.

In summary, even if it is true that insured bonds are a better proxy for the risk free rate than government bonds, and therefore the term R_{f0} in equation (1) must be raised, the impact upon the market risk premium ϕ must be considered. NERA's argument that the latter impact is zero is wrong, because it wrongly assumes that the market risk premium is estimated solely by historical averaging, because it wrongly assumes that the period of averaging is from 1976, because it wrongly assumes that the yield

margin for insured over government bonds is linearly related to the ratio of nominal government bonds to GDP, and because it wrongly assumes that this relationship has not changed over time. Recognition of these points implies that the impact on the estimated market risk premium from using insured bonds (as the proxy for the risk free rate) is downwards, and therefore NERA have overestimated the impact of using insured bonds upon the estimated cost of equity for a regulated firm.

4. NERA's Arguments Concerning Indexed Bonds

NERA (2007a) also consider the situation in respect of inflation-indexed bonds. These may be significant in setting the costs of equity and debt for regulated firms because nominal costs of equity and debt are converted to real costs of equity and debt by deducting forecast inflation, and some regulators use the spread between the yields on nominal and indexed bonds to estimate forecast inflation. If this is the case, then the real cost of equity is determined by the indexed rather than the nominal government bond yield and therefore will be affected by any biases in this yield as a proxy for the real risk free rate. In addition, the real cost of debt will be affected by any relative bias in indexed versus nominal government bond yields as proxies for the real and nominal risk free rates.

In view of all this, NERA has sought to determine whether the yields on indexed government bonds are more or less biased estimators of the real risk free rate than are the yields on nominal government bonds. Accordingly, NERA compares the yield spread on indexed bonds (corporate versus government) with the yield spread on nominal bonds (corporate versus government). In particular, they calculate the following spread

$$S = (Y_d^I - Y_g^I) - (Y_d - Y_g) \quad (4)$$

where Y_d denotes the yield on nominal corporate bonds, Y_g the yield on nominal government bonds, and the superscript I denotes a real yield on an inflation-indexed bond. Unstated but implicit in their analysis is that the cost of a credit default swap (C) is the same for both nominal and indexed corporate bonds. In this case, S can be written as follows

$$S = (Y_d^I - C - Y_g^I) - (Y_d - C - Y_g)$$

The term $(Y_d - C - Y_g)$ is the excess yield on an insured nominal corporate bond relative to a government bond, and is considered by NERA to represent the extent to which the yield on nominal government bonds underestimates the true nominal risk free rate. Similarly, the term $(Y_d^I - C - Y_g^I)$ is the excess yield on an insured indexed corporate bond relative to an indexed government bond, and this would presumably be interpreted by NERA as an estimate of the extent to which the yield on indexed government bonds underestimates the true real risk free rate. Consequently, NERA interprets *S* as a measure of the extent to which the downward bias on indexed government bond yields exceeds the downward bias on nominal government bond yields, i.e., a measure of the "relative bias" on indexed versus nominal government bonds. NERA (2007a, section 2.4) calculates *S* as defined in equation (4), and the results are summarised in their Table 2.3. They indicate a current value for *S* of about 20 basis points.

NERA (2007a, section 2.2) attributes this "relative bias" of 20 basis points to a reduction in the supply of indexed government bonds and to increasing demand from institutions with inflation indexed liabilities. This bias is in addition to the bias of 66 basis points on nominal government bonds. Consequently, they estimate the bias on indexed government bonds at 86 basis points. Thus, in so far as inflation is estimated from the difference between the yields on nominal and indexed government bonds, NERA (2007b, p 2) concludes that the real cost of equity should be raised by 86 basis points and the real cost of debt should be raised by 20 basis points. Implicit in the 86 basis point adjustment is the belief that insured indexed corporate bonds are a better proxy for the real risk free rate than indexed government bonds.

5. Review of NERA's Arguments Concerning Indexed Bonds

NERA's arguments concerning indexed bonds suffer from the following three difficulties. Firstly, even if it were true that the 20 basis points spread to which they refer is attributable to a reduction in the supply of indexed government bonds and/or an increased demand for these bonds from certain institutions with inflation-indexed

liabilities, this would not disqualify indexed government bonds as a good proxy for the real risk free asset within the context of the CAPM. As noted in section 3.2, the CAPM does not impose any requirements whatsoever (whether explicit or implicit) relating to the *supply* level of the risk free asset, i.e., it does not require the supply of the risk free asset to meet some minimum level, as NERA seems to believe. This follows from the fact that the supply of the risk free asset is exogenous to the CAPM (see Mossin, 1966, pp. 772-773; Hirshleifer, 1970, pp. 299-300).

In respect of demand, the changes referred to by NERA are simply part of a wider set of changes in investors' preferences for particular assets (based on their probability distributions) and the CAPM does not assume that such preferences are fixed. If an asset has a particular probability distribution for its returns, this will give rise to a demand function for that asset and therefore an equilibrium price. The demand function may change. If it does, the equilibrium price changes. The new price is different but it is not "biased". Similarly, if investors change their consumption preferences in favour of future rather than current consumption, the demand for risk free assets (and other assets) will increase, and their equilibrium yields will then decline. The new yields are not "biased" estimators of the risk free rate simply because investors' consumption preferences have changed. Changes in demand functions, and therefore in equilibrium prices for assets, are simply part of the financial landscape and are entirely consistent with the CAPM. By contrast, if NERA had argued that certain institutions were *compelled* by law to purchase indexed government bonds, then this situation would have been inconsistent with the CAPM assumption that investors face no restrictions upon their portfolio choice. Accordingly, one could argue that indexed government bonds were not a good proxy for the real risk free asset. However, NERA have not suggested that there was any compulsion here.

Secondly, and as discussed in section 3.2, the relevant criteria for choosing a risk free asset within the context of the CAPM are that the asset is risk free, liquid, that there are no restrictions upon the purchase of the asset by investors, and that investors are not attracted to or repelled from the asset for reasons other than the probability distribution over its return. Indexed government bonds violate the first requirement (albeit trivially) and may violate the second requirement on account of relatively low

liquidity. However, NERA's implied alternative (insured indexed corporate bonds) violate all of these requirements for the same reasons discussed in section 3.2 in respect of insured nominal corporate bonds. Thus, indexed government bonds are a better proxy for the real risk free asset than NERA's implied alternative.

Thirdly, if the real cost of equity was based upon the real risk free rate and NERA's contention that 86 basis points should be added to the real risk free rate was correct, then there must be implications for the market risk premium as well. As discussed in section 3.3, consideration of the (downward) impact on the market risk premium mitigates the upward impact on the risk free rate and NERA have wrongly judged this impact on the market risk premium to be zero. Thus, even if NERA's contention that 86 basis points should be added to the real risk free rate was correct, NERA would have overestimated the cost of equity by wrongly judging the market risk premium effect to be zero.

Having said all of this, a quite different line of argument in this area might have been offered. At least some Australian regulators estimate expected inflation from the difference between the yields on nominal and indexed government bonds. However, the difference in yields also reflects liquidity differences between these two types of bonds and risk differences. Taking account of these points, it may be that the difference in the yields overestimates expected inflation and NERA (2007a, section 2.3) presents some evidence to that effect. If expected inflation has been overestimated, then the real cost of capital for regulated firms will have been underestimated. Accordingly, some upward adjustment to the real cost of capital would be warranted. However, this argument is quite unrelated to the question of whether yields on nominal and indexed bonds are downwardly biased estimators for nominal and real risk free rates.

6. Conclusions

NERA has argued that nominal and indexed government bonds are poor proxies for nominal and real risk free assets, and that upward adjustments should be made to the costs of equity and possibly also the costs of debt on account of this. In particular, they favour an upward adjustment of 66 basis points for the nominal cost of equity.

Also, in so far as expected inflation is estimated from the difference in yields on nominal and indexed government bonds, they favour an 86 basis point increase in the real cost of equity and a 20 basis point increase in the real cost of debt. They also believe that reductions in the supply of, and increases in the demand for, government bonds aggravate the problems here.

These arguments are invalid, for the following principal reasons. Firstly, a reduction in the supply of an asset or an increase in the demand for it has no bearing upon its suitability as a proxy for the risk free asset within the context of the CAPM. Changes in the demand for or supply of assets, and therefore in the equilibrium prices for them, are simply part of the financial landscape and are entirely consistent with the CAPM.

Secondly, the relevant criteria for choosing a risk free asset within the context of the CAPM are that the asset is risk free, liquid, that there are no restrictions upon the purchase of the asset by investors, and that investors are not attracted to or repelled from the asset for reasons other than the probability distribution over its return. Nominal government bonds trivially violate the first requirement, and also the fourth requirement on account of their value as collateral. Indexed government bonds may also violate the second requirement on account of relatively low liquidity. However, NERA's preferred alternative (insured corporate bonds) violates all of these requirements. Thus, government bonds would seem to be a much better proxy for the risk free asset than NERA's preferred alternative.

Thirdly, even it were true that insured bonds were a better proxy for the risk free asset than government bonds, this conclusion would both raise the risk free rate within the CAPM and lower the market risk premium. NERA wrongly judges the latter effect to be zero and therefore overestimates the increment to the cost of equity for a regulated firm.

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