Paper prepared for the

Australian Competition and Consumer Commission

A Note on the Fisher Equation

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1. Introduction

The Australian Competition and Consumer Commission (the "ACCC") has requested a comment on the appropriateness of using the observed difference in yields on nominal and indexed Commonwealth Government Securities ("CGS") as an estimate of the expected inflation rate. This issue has arisen in the context of two related reports recently prepared by NERA Economic Consulting ("NERA") entitled "Bias in Indexed CGS Yields as a Proxy for the CAPM Risk Free Rate" and "Absolute Bias in (Nominal) Commonwealth Government Securities".[1] These reports have been provided to the Australian Energy Regulator ("AER") in relation to the AER's draft decision on Powerlink Queensland's revenue cap for the period 1 July 2007 to 30 June 2012.[2]

There are two key issues raised in the NERA Report:

(a) The appropriate proxy for the real risk free rate

NERA claims that observed yields on indexed Commonwealth Government Securities ("Indexed CGS") underestimate the real risk free rate for the purposes of the capital asset pricing model ("CAPM"). NERA refers to this as the relative bias in Indexed CGS yields (i.e. relative to nominal CGS yields). Equivalently, the bias can be interpreted as an overestimate of the expected inflation rate, implied from a comparison of observed nominal and indexed bond yields. It is argued that this bias arises from certain peculiarities in demand and supply conditions for Indexed CGS: in particular, an increase in demand coupled with a decrease in supply. NERA estimates the current relative bias in Indexed CGS yields at 20 basis points per annum.[3]

(b) The appropriate proxy for the nominal risk free rate

NERA claims that observed yields on CGS underestimate the nominal risk free rate for the purposes of the CAPM. NERA refers to as this as the absolute bias

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1 NERA Economic Consulting (2007a), (2007b) and collectively referred to here as the "NERA Report".

2 Australian Energy Regulator (2006).

3 NERA Economic Consulting (2007b p.1).

in nominal CGS yields. It is argued that the source of the bias is a shortage of supply of CGS relative to demand combined with the claim that government bonds possess certain unique features relative to corporate bonds, which distort their reliable use as a proxy for the risk free rate. NERA estimates the current absolute bias in nominal CGS yields at 66 basis points per annum.[4]

This brief note addresses only the first of these two issues and in particular whether there is a regulatory error rather than commenting on the approach used by NERA to quantify the suggested error.

2. Is the Observed Difference in Yields on Nominal and Indexed CGS an Appropriate Proxy for the Expected Inflation Rate ?

The relationship between real and nominal interest rates is commonly expressed in terms of the standard, single period Fisher equation[5]:

$$1+n=(1+r)(1+i) \tag{1}$$

where n is the nominal interest rate, r is the real interest rate and i is the inflation rate over the period. Implicit in equation (1) is an assumption that inflation is known over the period. In the presence of uncertainty about future inflation, i is commonly interpreted as an estimate of the expected inflation rate over the period.[6] Equation (1) is the simplest version of the Fisher relation however other versions have been developed which explicitly take into account other factors including taxes and inflation risk premia.[7]

By definition, the inflation rate over a future period is unobservable and so one must rely on an estimate. Depending on data availability, possible approaches to estimation include: estimates implied from bond markets, estimates implied from derivative

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[4] NERA Economic Consulting (2007b p.2). NERA provided a preliminary estimate of 42 – 44 basis points per annum in its first report but stated that further analysis was required which has lead to its second report and an updated estimate of 66 basis points per annum.

[5] Also referred to as the Fisher relation.

[6] Amihud and Barnea (1977 p.525).

[7] See for example, Miles (1983), Woodward (1992) and Crowder and Wohar (1999).

markets, "official" estimates from government bodies and consensus estimates from market economists.[8] Regulatory practice has historically forecast the inflation rate by the difference between the nominal bond yield and the inflation indexed bond yield, using the standard Fisher relation, equation (1).[9]

NERA seeks to support its claim that the current regulatory approach leads to an upward biased estimate of the expected inflation rate, with: (i) statements from the Reserve Bank of Australia ("RBA"); (ii) reference to the academic literature; (iii) regulatory experience from the U.K. and U.S.A.; and (iv) its own analysis.[10] For example, NERA offers the following commentary from the RBA:

> "while this spread [between nominal and indexed bond yields] is usually seen as a measure of expected inflation, its recent increase is at odds with other measures of inflation expectations and *reflected special factors*, unrelated to inflationary pressures. As noted in the earlier chapter on international markets, regulatory changes abroad have encouraged life insurers and superannuation funds to acquire long dated bonds as an asset class that better matches their liabilities. Other investors, such as hedge funds, are said to have recognised that this process is likely to continue for some time and have added to demand. These developments against a background of *a small, tightly held domestic supply* of indexed bonds, have seen their prices rise (yields fall) significantly" [emphasis added here].[11]

On matters of monetary policy, the views of the RBA are highly regarded and arguably highly persuasive. As shown above the RBA has in the recent past made it clear that, in its view, due to peculiarities in the market for Indexed CGS in particular, the traditional approach of forecasting the inflation rate by the difference between the nominal bond

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[8] See for example Scholtes (2002).

[9] Australian Energy Regulator (2006 p.101).

[10] This includes an examination of the spreads on indexed and nominal corporate bonds issued by Electranet and Envestra. On a technical point, any comparison of yield spreads should be based on implied spot rates rather than observed yields, due to complications associated with coupon paying bonds.

[11] Reserve Bank of Australia (2006 p.48-49) quoted in NERA Economic Consulting (2007a p.8). The overseas regulatory changes are described earlier by the RBA as "in some countries, most notably the United Kingdom, changes to the rules governing the way that pension funds account for their liabilities have led to a surge in demand for very long-dated bonds. The demand for inflation protected long bonds has been particularly strong, pushing real yields to an all time low of just half of one percentage point" (p.20).

yield and the inflation indexed bond yield, using the Fisher equation is currently open to question. Importantly, this view is still evident in its most recent statement on monetary policy:

> "Yields on inflation-indexed bonds are also unchanged in net terms since early February, with implied inflation expectations remaining a little above 3 per cent. Yields on inflation-indexed bonds have in recent years been lower than they otherwise would have been due to a lack of new issuance and institutional factors which have boosted demand. This has reduced the useful of these yields in providing information about movements in inflation expectations".[12]

Even though the RBA has attributed this phenomenon to "special factors, unrelated to inflationary pressures"[13], the root cause appears to be due to current market conditions – an increase in demand "against a background of a small, tightly held domestic supply"[14] – rather than an issue associated with the uniqueness or otherwise of Indexed CGS. It is not clear how long this situation will last. It is worth noting that the RBA statements concerning supply/demand imbalances appear to be more heavily directed at the Indexed CGS market rather than the (nominal) CGS market.

This places the regulator in a somewhat difficult position since inflation forecasts derived from the two government bond markets are seen to be highly objective. However, the RBA's view as to the relevance of the derived forecast is unambiguous. The question as to what is the appropriate proxy for the expected inflation rate is ultimately a policy decision for the ACCC/AER to make (subject to relevant legislative requirements). In this regard, it is suggested that the ACCC/AER seek further advice from the RBA.

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12 Reserve Bank of Australia (2007 p.43).
13 Reserve Bank of Australia (2006 p.48-49).
14 Reserve Bank of Australia (2006 p.48-49).

REFERENCES

Amihud, Y. and A. Barnea, 1977, A Note on Fisher Hypothesis and Price Level Uncertainty, Journal of Financial and Quantitative Analysis, 12, 525-530.

Australian Energy Regulator, 2006, Draft Decision: Powerlink Queensland transmission network revenue cap 2007-08 to 2011-12, Commonwealth of Australia, 8 December.

Crowder, W.J. and M.E. Wohar, 1999, Are Tax Effects Important in the Long-Run Fisher Relationship? Evidence from the Municipal Bond Market, Journal of Finance, 54, 307-317.

Miles, J.A., 1983, Taxes and the Fisher Effect: A Clarifying Analysis, Journal of Finance, 38, 67-77.

NERA Economic Consulting, 2007a, Bias in Indexed CGS Yields as a Proxy for the CAPM Risk Free Rate, March.

NERA Economic Consulting, 2007b, Absolute Bias in (Nominal) Commonwealth Government Securities, 7 June.

Reserve Bank of Australia, 2006, Statement on Monetary Policy, February 13.

Reserve Bank of Australia, 2007, Statement on Monetary Policy, May 4.

Scholtes, C., 2002, On Market-Based Measures of Inflation Expectations, Bank of England Quarterly Bulletin, Spring, 67-77.

Woodward, G.T., 1992, Evidence of the Fisher Effect from U.K. Indexed Bonds, Review of Economics and Statistics, 74, 315-320.