“Cost of capital parameters for Sydney Desalination Plant: By SFG Consulting”
An initial review for IPART

by
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1. I have been asked to provide a review of the draft report “Cost of capital
parameters for Sydney Desalination Plant” dated 22 July 2011 prepared by SFG
Consulting for IPART. Some of the issues raised in this review were discussed in a
telephone conference with IPART and SFG Consulting on 2 August, others are
additional to that discussion.

2. The SFG Consulting Report addresses a number of issues, and given the time
constraints applicable to this review the following are addressed sequentially in
following sections:
   a. Estimation of beta (systematic risk) for comparable companies:
      relevance of separate estimation in up an down markets, and merits of
      “fading” OLS estimates towards unity
   b. Internal consistency of WACC parameters: cost of debt and cost of
      equity relativity constraints; use of resident v non-resident investors as
      benchmark group; inter-relationship with leverage and other
      assumptions
   c. Non-systematic risks and their treatment
   d. Implications of stable cash flows of Sydney Desalination Plant (SDP)
      for its beta

Beta Estimates

3. SFG estimate beta for a group of 16 “comparable” water utilities from the US
(11 companies) and UK (5 companies) using Ordinary Least Squares, use a “bias”
adjustment (ie fading towards unity) and consider betas estimated separately from
periods in which market returns were above or below zero. One feature of their
approach is the use of a relatively long estimation period of monthly data from
January 1973 to June 2011 (with shorter periods used for many companies where data
was not available).

4. The first point to note is that use of the longer period does not generate
markedly different estimates than are obtained from (more commonly used) shorter
period estimates. Table 1 below presents Thomson-Reuters beta estimates taken from
http://money.msn.com/ (on 7 August 2011) which use 60 months of data. While the
sample average of beta is somewhat higher for the shorter estimation period, the
difference between those mean values of 0.49 and 0.44 is not statistically significant
at the 5 per cent level. One consequence of the insignificant difference between the

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“long run” and “short run” estimates is to call into question the merits of the “bias adjustment” proposed by SFG, which also would seem less relevant when estimates are being derived from a long sample where the errors in variable problem would seem less likely to be of significance.

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<thead>
<tr>
<th>FIRM</th>
<th>Thomson Reuters Beta</th>
<th>SFG Beta</th>
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<tr>
<td>AWR</td>
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<td>0.28</td>
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<tr>
<td>AWK</td>
<td>0.39</td>
<td>0.41</td>
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<tr>
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<td>0.36</td>
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<tr>
<td>ARTNA</td>
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<tr>
<td>YORW</td>
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<td>0.33</td>
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</table>

5. SFG make two adjustments to their OLS estimated betas, one for “bias” and one for leverage. Their method for “bias” adjustment involves a weighted average of the OLS beta estimate and unity with weights related to estimated standard error of the OLS estimate and the assumed prior distribution of betas (with mean of unity and standard error of 0.5). It is worth noting, however, that this approach based on Vasicek (1973) is based on an assumption that nothing is known \textit{a priori} about the stock (ie it is randomly sampled from the population of stocks). In fact Vasicek (1973, p 1237) notes that if there is prior information available about the characteristics of the population sub-sample from which the stock is chosen, that should be taken into account. He provides an example that “if a utility stock is considered, and it is known from previous measurements that betas of utilities are centered around .8 with a dispersion of .3, the estimate b is adjusted toward .8 by the formula (15) with b = .8, s'b = .3”. \textit{While the bias-correction adjustment used by SFG does not markedly affect the estimated betas, the rationale for such an adjustment, particularly using a long data sample of specifically chosen water utility stocks is not strong.}

6. SFG also estimate beta separately for periods in which the market excess returns are positive and when they are negative, suggesting that there is an asymmetric exposure to market risk about which investors would be concerned. It is not clear to me that this approach is warranted. First, at an empirical level, SFG do not provide information on whether the beta coefficients in up-period are statistically significant from those in down-periods. Second, at a theoretical level, it is not clear what interpretation can be placed on such a specification. At any point in time (in the absence of other predictive information), there is an equal probability that excess market returns over the next month will be positive or negative. Thus investors could
be expected to use the average beta (formed from some average of the “up-market” and “down-market” betas – see box below) as an estimate of forward looking systematic risk. It is not clear that this would lead them to demand some premium for investing in a stock with such asymmetric market risk. To investigate that, I think it would be necessary to undertake further analysis such as examining whether estimated intercepts (abnormal returns) in a simple CAPM model were higher for stocks where there appeared to be asymmetric beta coefficients with higher betas in down-market periods. But in the absence of a well specified asset pricing model explaining how (and why) asymmetric betas might arise and their implications (and without evidence provided on whether the estimated “up” and “down” betas are significantly different), it is not clear to me what the implications of this analysis are. I am not convinced that it justifies the apparent (although not explicitly stated) assertion at the end of Section 2.5.4 that a choice of beta from within the range of plausible estimates should be biased towards the upper end of that range.

Asymmetric beta estimation

The approach adopted by SFG essentially involves (with one difference) estimating a market model over two separate samples determined ex post by whether the explanatory variable was positive or negative. (That difference is that a common intercept is assumed for both samples). Estimating for the two different samples leads to two beta estimates given by:

\[ \beta_{\text{down}} = \frac{\sum x_{\text{down}} \cdot y}{\sum x_{\text{down}}^2} \quad \text{and} \quad \beta_{\text{up}} = \frac{\sum x_{\text{up}} \cdot y}{\sum x_{\text{up}}^2}. \]

Since \( \sum x_{\text{down}}^2 + \sum x_{\text{up}}^2 = \sum x_{\text{all}}^2 \), etc., it can be shown that

\[ \beta_{\text{down}} \frac{\sum x_{\text{down}}^2}{\sum x_{\text{all}}^2} + \beta_{\text{up}} \frac{\sum x_{\text{up}}^2}{\sum x_{\text{all}}^2} = \sum x_{\text{all}} \cdot y \]

7. SFG also estimate beta by using an index of returns on water utilities constructed from the individual companies they have data for. The resulting estimate of beta is approximately the same as for the average of the individual estimates, as would be expected given the “additivity” property of betas (ie that the beta of a portfolio will be a weighted average of the individual betas). The index approach does, however, lead to a lower standard error of estimate as would be expected.

8. SFG also discuss adjustments for leverage and comment regarding alternative formulae which can be used for levering and delevering (p8) that “the choice of equation typically makes little difference to the result”. That has been my experience also. (There is a typo also on p8, third para of section 2.2.3, where leverage is “computed as market capitalization [divided by] (market capitalization + book debt)” – which is actually 1 – leverage).

9. A further issue which is also relevant is how systematic risk may be dependent upon the form of regulation applied and thus how beta estimates from comparable firms
operating under a different form of regulation may need adjustment. Thus, for example, under a regulatory regime involving specification of an allowable rate of return (in accounting terms), it is likely that there is going to be less (in principle, zero) correlation between accounting returns and equity market returns, than other regulatory regimes where allowable cash flows can vary with market conditions. That may translate into a lower equity beta, depending upon how required rates of returns (and thus the market valuation of the regulated firm) co-vary with other relevant variables (such as expected future cash flows of the market portfolio). The implication is that betas estimated from “comparable” companies operating under a different regulatory regime reflect the characteristics of that regime.

Internal Consistency of WACC Parameters

10. SFG argue (section 3) that there is a limit implied by economic theory on the relationship between the cost of debt and the cost of equity – specifically that the greater risk faced by equity holders implies that the cost of equity must be greater than the cost of debt. The problem with this argument is one of comparing like with like. Since I have made this point elsewhere² it is simplest to reproduce those arguments:

Because the cost of (required return on) equity re is derived from application of an asset pricing model such as the CAPM and the cost of debt rd is derived from available market comparables data, the possibility arises that rd > re. Indeed, this result is observed... the argument is irrelevant, being based on different interpretations of the terms re and rd. It is true that if both are interpreted as expected returns, then the inequality re > rd must hold. This was shown by, for example, Merton (1974) and Figure 9 reproduced from that article, in which αe is the expected return on equity, αr is the expected return on debt, and d is the market debt/equity ratio, illustrates. As the capital structure approach 100 per cent debt, the expected return on debt increases from the risk free rate (r) and approaches the expected return on the firm (α).

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² Davis (2011b). See also Davis (2011a).
However, Merton also makes it clear that $\alpha_y$ is not the same as the yield to maturity which is the cost of debt figure used by market participants and the AER..... It is not an expected return, and there is no reason in principle why the yield to maturity on a corporate debt could not exceed the expected return on that firm’s equity which in turn is above the expected return on that debt security. ....While the factors causing an increase in the cost of debt could also cause an increase in the cost of equity, the relationship is not a simple one”. (Davis, 2011)

11. This issue has also been addressed in a report to the NZ Commerce Commission (Franks, Lally and Myers, 2008). “Professors Franks and Myers agree with footnote 32 of the Draft Guidelines, which says that, strictly speaking, the cost of debt should be defined as the expected rather than promised yield on debt, but in practice the expected yield is not easy to estimate. So, in most situations (unless the debt premium is very high, due to a high risk of default), promised yields can be used as proxy for expected yields” (p31).

12. It is perhaps worth noting that SFG assume a debt beta of 0.2 in their leverage adjustments for the cost of equity capital. That would imply, using the CAPM, an expected return on debt substantially less than that on equity (which they estimate to have a substantially higher beta ) and substantially below the debt premium estimated from yield to maturity figures.
13. The subsequent discussions of consistency by SFG (relating to imputation credits and nationality of equity holder, and to leverage) are premised on the assumption that the expected return to debt equals the yield to maturity, and thus are subject to the same criticism as above. However, the issue of whether assumed leverage and assumed WACC generate a set of cash flows and financial ratios which are consistent with the underlying assumptions (such as credit rating and implied credit spread) is clearly an important consistency check.

Non-systematic risks and their treatment

14. SFG note that various risks identified by SDP are not obviously systematic risks (i.e. those that cannot be diversified away by investors who will therefore demand compensation by way of a higher expected rate of return). SFG correctly note that the expected cash flows considered should be the mean of possible future cash flows, such that non-systematic risks are incorporated into those estimates. It is generally preferable to do so rather than attempting to adjust the required rate of return to incorporate such risks.

15. It is also the case that idiosyncratic risks are relevant to the optimal choice of leverage in order to reduce risks of financial distress, and because leverage will impact upon the credit spread (i.e. yield to maturity) required by debt markets.

Cash Flow Certainty and Systematic Risk

16. SFG note that the contractual arrangements entered into by SDP may imply that there is little uncertainty about future cash flows. However, as they also note, this does not imply that over a finite investment horizon the asset has no systematic risk. As shown in Campbell and Mei (1993), systematic risk arises from both variations in cash flows and from variations in required returns. This reflects the fact that the return on an asset over any period is determined by the cash flows received and the end-of-period market value of the asset. Should, for example, there be an increase in required returns, the end-of-period asset value will decline, reducing the total return for the period. If that change in the required return is correlated with market-wide changes in required returns (or market-wide changes in expected future cash flows), the asset will exhibit some level of systematic risk. Thus, for example, Davis (2005) shows that risk-free Australian government bonds have non-zero (albeit time-varying) betas.
REFERENCES


SFG Consulting (2011) Cost of capital parameters for Sydney Desalination Plant (draft), 22 July 2011