Response to ACG Report on Proxy Beta Estimates

4 November 2002

Background

The July 2002 Allen Consulting Group (ACG) report entitled, "**Empirical Evidence on Proxy Beta Values for Regulated Gas Transmission Activities**", put forward some estimates of beta values for regulated gas transmission pipelines. ACG contend that these results suggest Australian regulators presently use excessively high beta estimates in their building block calculations for regulated revenue requirements. For example, ACG states:

> "*Exclusive reliance on the latest Australian market evidence would imply adopting a proxy equity beta (re-levered for the regulatory-standard gearing level) of 0.7 (rounded-up) for these activities. Moreover, regard to evidence from North America or UK firms as a secondary source of information does not provide any rationale for believing that such a proxy beta would understate the beta risk of the regulated activities. Rather, the latest evidence from these markets would be more supportive of a view that the Australian estimates overstate the true betas for these activities, although concerns are expressed with the reliability of the beta estimates from these other countries."*[1]

The principal theme of this note is that the Allen Consulting Group analysis represents an extreme view of the appropriate values for beta for gas transmission pipelines. Beta is an important parameter which is difficult to observe for the types of firms to which it is applied by regulators. The empirical difficulties, many of which are noted by ACG themselves, lead to a range of estimates or proxy betas which suffers a great deal of dispersion.[2] Given this dispersion problem, the common practice of adopting an average of betas estimated from 'similar' firms as the unique preferred beta value creates potential for selection bias to strongly influence the outcome.

The purpose of this note is not to substitute some other unique preferred beta value for the extremely low value put forward by ACG. Rather it is to highlight the

[1] ACG, p.5.

[2] ACG noted, at page 50, that the market average standard error for equity beta estimates was approximately 0.32.

problems of selection bias, to explain why the ACG method has led to unusually low results, and to dispel the illusion of certainty surrounding estimates of beta.

We begin by considering selection issues raised by the choice of 'similar' firms (proxies) in the next two sections. One examines the overseas proxies used by ACG, and the other examines the selection of Australian comparators. As well as the selection of proxies, there are also selection issues with respect to the time period over which empirical data are sourced, and these are discussed in the third section below. Our conclusions follow.

Please note that where we refer to beta estimates below, we are referring to the equity beta estimates calculated by the ACG by re-levering asset betas for a 60% debt to value level of gearing.

Inappropriateness of overseas comparators

The ACG examined proxy betas for American, Canadian, and British companies, which were generally very low compared to the ACG beta estimates for Australian firms. The last column of ACG's Table 1.1 is reproduced below for the purpose of this discussion.[3]

Equity beta estimates for 60% debt to value	Tax term included in leveraging formula, Debt beta = 0.15	
	Negative betas included	Negative betas excluded
Australian companies	0.66	0.66
USA companies	0.10	0.20
Canadian companies	0.02	0.26
UK companies	0.05	0.18

The most salient point from that table is that the beta estimates are very different for each country. If the average estimates presented in that table are truly reflective of risk conditions in each jurisdiction, then the inescapable conclusion is that the underlying risks are so different between countries as not to be comparable. If they

[3] ACG, p.5.

are not truly reflective of risk conditions in each jurisdiction, then no useful inference can be drawn from this data. Either way, it is clear that these overseas figures can shed little, if any light on the appropriate betas for Australian gas transmission pipelines.

The ACG themselves express some reservations about the applicability of the overseas data:

> "*Secondly, we are concerned about the magnitude of the beta estimates derived for firms operating in other countries. In particular, the re-levered equity betas for the US firms are substantially lower than the estimates that have been derived for different time periods. It may be that the recent events on US share markets may have affected the beta estimates, which may produce a bias if those events were not considered by investors to be normal events; however, it is impossible to prove or disprove such a conjecture.*"[4]

Another troubling aspect of the ACG Table 1.1 data is the dramatic effect of the inclusion of companies which have negative betas. Excluding them doubles the beta estimate for US firms, more than triples the estimate for UK firms, and increases the estimate for Canadian firms by a factor of 13. It is not straightforward to deduce whether firms with negative betas should be included or not, and one suspects that is why ACG presented the results for both cases.[5]

Although it is somewhat unusual, a firm could conceivably have a negative beta if its pattern of returns over time is inversely correlated with market returns generally—in other words if it is a countercyclical stock. More often, however, negative betas can arise as a result of the high standard errors which are often found with beta estimates. There is also the possibility that during the measurement period the activities of the firm have been such as to significantly change the estimated risk statistics.[6]

Excluding companies with negative betas virtually reverses the rank order of betas for American, Canadian, and British proxy pools. It is fundamentally troubling that

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4 ACG, p.6.

5 The Australian Graduate School of Management, whose risk measurement service ACG uses for some of its input data, does not exclude firms with negative beta, but AGSM comments that negative beta estimates are most likely to occur at times when the firm's beta estimates are most volatile. (p. 26 of AGSM Risk Measurement Service Introduction, 11 January 2002 edition.).

6 This could happen, for example, if a firm undertook a major acquisition or divestment during the period, and the acquired or divested business was substantially more or less exposed to market fluctuations than the remainder of the firm.

there is no objective basis presented for preferring to include or exclude negative beta firms, when this choice has such a dramatic effect on the outcomes.

It might be argued that while the absolute quantum of these overseas beta estimates may vary somewhat, they are all lower than the Australian estimates. This impression arises from two aspects of the ACG experimental method: the selection of proxy companies, and the selection of time period. The ACG report considers, in Table 4.8 (p.40) beta estimates for Diversified US transmission companies, or USA diversified pipelines. Significantly, these estimates, when negative beta firms are excluded, are much higher than the betas estimated on a comparable basis for Australian proxy companies, as the table below demonstrates:[7]

Equity beta estimates with 60% debt to value with negative beta firms excluded	Tax term excluded from levering formula		Tax term included in levering formula	
	Debt beta = 0	Debt beta = 0.15	Debt beta = 0	Debt beta = 0.15
Australian companies (table 4.7)	0.69	0.66	0.68	0.66
USA companies (table 4.7)	0.25	0.19	0.26	0.20
USA diversified pipelines (table 4.8)	0.92	0.86	0.91	0.86

While ACG express some reservations concerning the use of the diversified pipeline firms as proxies, the selection of proxy companies inevitably contains a degree of subjective judgement. ACG have exercised some subjective judgement in preferring the US companies with very low betas. However, a different person could exercise that subjective judgement differently to conclude that pipeline companies were more appropriate proxies, and on that basis form a view that Australian proxy beta estimates understated the true systematic risk for gas transmission pipelines.

In summary, the overseas data presented by ACG is so equivocal that no useful inference can be drawn from it—not even the limited claim by ACG that it suggests Australian estimates are too high. ACG themselves say,

[7] All data in this table are sourced from the ACG report at page 40, combining information from tables 4.7 and 4.8.

> "*Accordingly, in the near term, while noting that how the Commission chooses to exercise its discretion is for it alone to decide, it is recommended that it adopt a conservative approach, which is suggested to imply* ***not using a proxy equity beta that is too far from the range of previous, relevant regulatory decisions****."*[8] [emphasis added]

No more explicit disclaimer of the overseas proxy data is likely to be found than this one by ACG themselves. In effect they are asking the ACCC not to rely upon it.

Inclusion of companies with unrelated risk profiles

The ACG report also disclaims the quality of its evidence on Australian proxy companies:

> "*The use of a proxy beta of 0.7 would represent a substantial reduction in the estimates of the costs of capital associated with these activities compared to the assumptions previously adopted. While such a revision would be warranted in the face of reliable, objective evidence,* ***it cannot be concluded definitively that this quality of evidence exists at this time****.*
>
> *"First, the primary source of evidence—which derives from the listed Australian entities—consists of a group of only four firms, and a full period (four years) of observations is only available for two of these."*[9] [emphasis added]

The four Australian firms used by ACG were: AGL, the Australian Pipeline Trust, Envestra, and United Energy. As noted by ACG, AGL and United Energy are multi-utilities, with strong profiles in both gas and electricity. The Australian Pipeline Trust is the only member of this group whose principal business is gas transmission pipelines. The Australian Pipeline Trust has the highest equity beta of the group, at above 1, according to the ACG estimates.[10]

Envestra has the lowest equity beta of the group, at between 0.40 and 0.47 depending upon the choice of debt beta and levering formula. ACG criticised NECG's exclusion of Envestra from our sample in an earlier report for GasNet,[11] but the Queensland Competition Authority also excluded Envestra from its proxy beta sample on account of the same factors which were mentioned in our report. This exclusion was

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8 ACG, p.6.
9 ACG, p.6.
10 ACG, Appendix B, p.2.
11 "GPU Gas Net Asset Equity and Debt Beta", NECG, 23 November 2001.

significant, and perhaps surprising, because Envestra was itself the subject of that QCA investigation. The following is an extract from the relevant QCA Report:[12]

Industry	Asset beta range (based on adjusted equity betas)
Gas distribution (listed companies)	0.46 – 0.47[1]
Electricity generation (listed companies)	0.88 – 1.22
Electricity distribution (listed companies)	0.46
Gas distribution (regulatory decisions)	0.40 – 0.60
Electricity distribution (regulatory decisions)	0.35 – 0.50

1. The actual range for Australian gas distributors is 0.09 to 0.47. However, for Envestra (asset beta of 0.09) the equity beta was estimated using only 46 observations, and the company had a leverage ratio of 0.8328. This makes Envestra's leverage ratio and therefore its asset beta an outlier relative to other distributors, which have a leverage ratio in the range of 0.1736 to 0.2988. It was therefore excluded.

Over time, the factors that caused the QCA to regard Envestra as an outlier may pass as new information emerges – although in our view Envestra's highly unusual capital structure still presents a significant risk of biasing the beta estimate. Considerable caution is therefore required before including it in any industry average.

In stark terms, the one pure gas transmission pipeline company has the highest equity beta (when re-levered from its asset beta assuming 60% debt to value), as estimated by ACG themselves. The ACG average Australian proxy beta is significantly lower (by 30% or more) than this actual pipeline company beta because that average includes two firms predominantly engaged in multi-utility distribution and retailing, and another firm whose characteristics are so anomalous that the QCA declined to use it in a sample for estimating its own beta. A clear implication is that the ACG average beta for Australian gas pipelines is more reflective of the systematic risks faced by a multiutility distribution and retail businesses than it is of a transmission pipeline's.

In the present circumstances, the Access Arrangement for the Moomba-Sydney Pipeline, it would be paradoxical indeed if the ACG estimate of multiutility distribution and retail beta were given greater weight than the measured equity beta for the MSP's owner—the Australian Pipeline Trust.

12 Queensland Competition Authority (2001) Final Decision Proposed Access Arrangements of Proposed Access Arrangements for Gas Distribution Networks: Allgas Energy Limited and Envestra Limited.

Temporal selection issues

The ACG report notes at several places that the selection of the time period over which empirical data are sampled will affect the outcome. For example:

> "*In reality, where beta estimates vary over time as the 'sampling window' is moved forward in time, there is no way of testing which of the estimates is the[sic] 'correct'. Hence, while a commitment to use the latest evidence may imply that the proxy beta used to assess reference tariffs may vary over time, the rule nevertheless should lead to a proxy beta that is unbiased."*[13]

It may be comforting to pipeline owners to know that the beta estimates are unbiased, but these owners are acutely conscious of the long-term consequences of setting a regulatory beta value today which will not be revisited for five years. If there is any reason to believe that today's beta estimate may be substantially lower than the long-term average, then claims that it is unbiased would need to be scrutinised extremely closely.

Unfortunately, the ACG report provides many grounds to suspect that its beta estimates may be substantially lower than the long-term average. ACG make the following statement:

> "*The re-levered equity betas for the US firms, in particular, are substantially lower than the estimates that have been obtained from past time 'sampling windows'. It could be hypothesised that the recent events on US share markets—such as the large surge in the values of high-technology stocks and then their subsequent fall—may have affected the beta estimates, and which may have biased the estimate of the forward-looking beta risk of these firms if those events were not considered by investors to be normal events. However, it is impossible to prove or disprove such a conjecture."*[14]

The following footnote from the same page in the ACG report provides evidence that in past sampling windows, US equity betas of 0.8 were obtained (in contrast to ACG's current estimates for the US of 0.1, or 0.2 if negative beta observations are excluded):

> "*In a submission (commissioned by BHP) to the Commission and the then Office of the Regulator-General in 1998, Dr Jeff Makholm of NERA noted that the average beta of the gas companies he included in his sample at that time was 0.66 for an*

13 ACG, p. 41.
14 ACG, p. 42.

> *average gearing level of 34 per cent debt-to-assets, which implied an equity beta of 0.81 for the 'regulatory-standard' gearing level of 60 per cent: Makholm, J., 1998, The Cost of Capital for Gas Transmission and Distribution in Victoria, p.18. This re-levered equity beta is almost identical to that reported for all US gas distributors for an earlier period: Morin, R., Regulatory Finance: Utilities' Cost of Capital, Public Utilities Reports, Virginia, p. 352.*"[15]

Clearly temporal selection is very influential in the beta estimate. The ACG report contains evidence suggesting that its own beta estimates may be substantially lower than a long-term average value. If that is so, then the the ACG estimates should not be relied upon for regulatory rate-setting over a five year Access Arrangement review period. As shown above, ACG themselves caution the ACCC against relying upon their results. The need for caution with respect to volatile beta estimates is great. One cannot hedge against beta volatility in the way that it can be done with debt and interest rates.

Conclusion

Empirical estimation of beta is difficult for regulated firms given the comparatively short time that many recently privatised utilities have been listed on the Australian Stock Exchange. As a result, such empirical estimates suffer from selection bias risk from two sources: the selection of imperfectly comparable firms for the proxy company analysis, and the selection of unrepresentative time periods for data sampling. The ACG report contains numerous admissions that its own empirical work is likely to suffer from both of these selection problems. Examples cited by ACG themselves show that the selection of different, equally plausible proxy companies, or of different time periods would result in beta estimates which are significantly higher than ACG's estimates. In light of these admitted facts, one can only conclude that the ACG estimates represent an extreme low end of a range of possible beta estimates which is remarkable for its variance.

[15] ACG, p. 42, footnote 66.