Asymmetric risk

The importance of recognition and compensation

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In conducting the analysis in the report Synergies has used information available at the date of publication, noting that the intention of this work is to provide material relevant to the development of policy rather than definitive guidance as to the appropriate level of pricing to be specified for particular circumstance.

Contents

1 Introduction

The purpose of this paper is to consider asymmetric risks that were not explicitly recognised nor considered in the assessment of an appropriate equity beta for APA Group's Goldfields Gas Pipeline (GGP).

As stated in the beta chapter, in setting the rate of return, regard must be given to the relevant provisions of the *National Third Party Access Code for Natural Gas Pipeline Systems* (the Code), which are as follows:

> 8.30 The Rate of Return used in determining a Reference Tariff should provide a return which is commensurate with prevailing conditions in the market for funds and the risk involved in delivering the Reference Service (as reflected in the terms and conditions on which the Reference Service is offered and any other risk associated with delivering the Reference Service).
>
> 8.31 By way of example, the Rate of Return may be set on the basis of a weighted average of the return applicable to each source of funds (equity, debt and any other relevant source of funds). Such returns may be determined on the basis of a well accepted financial model, such as the Capital Asset Pricing Model. In general, the weighted average of the return on funds should be calculated by reference to a financing structure that reflects standard industry structures for a going concern and best practice. However, other approaches may be adopted where the Relevant Regulator is satisfied that to do so would be consistent with the objectives contained in section 8.1.

The key implication of these provisions is that the rate of return needs to reflect the risks of the relevant business where risk is quantified using generally accepted methodologies (including the Capital Asset Pricing Model).

A major issue with the rate of return in a regulatory context is the appropriate treatment of risk and, in particular, ensuring asymmetric risks associated with the presence of regulation, and regulated assets more generally, are not ignored. Given this issue, Synergies has been engaged to:

- describe systematic risk and asymmetric risk generally;
- consider how regulation may add to this risk; and
- estimate the allowance necessary to compensate asymmetric risk.

This report is structured as follows:

- section 2 provides an overview of risk;
- section 3 explains how regulatory intervention can fail to address the commercial and regulatory risk faced by a business;
- section 4 considers the limitations of the capital asset pricing model for addressing the commercial and regulatory risk faced by a business;
- section 5 outlines our approach to estimating the value of asymmetric risk; and
- section 6 concludes this report with Synergies estimating that the consequence of asymmetric risk is $0.49 million per annum.

2 Risk

Investors in capital markets need to be compensated for the risk of their investments. Without adequate compensation there would be no investment. The rate of compensation must therefore be set at a level that reflects and adequately compensates for the risk of an investment. The rate of this compensation relative to the value of funding is commonly known as the Weighted Average Cost of Capital (WACC).

The WACC measures an opportunity cost. The WACC of an investment is a rate that reflects the risk of the investment to the providers of capital for the investment, given a particular capital structure. The WACC is used in performance evaluation, asset/project allocations and business valuations. The WACC is typically an estimated value, as assessment of risk may be at least partially subjective.

This report considers the WACC in its application to pricing and reward for risk.

One type of risk, being systematic risk, is derived from portfolio theory and capital market theory. Under a specific set of assumptions, all rational profit-maximising investors want to hold a completely diversified market portfolio of risky assets, and they can borrow and lend to arrive at a risk level that is consistent with their risk preferences. Under these conditions, the relevant risk measure for an individual asset is this asset's co-movement with the market portfolio. This means that assets are priced relative to other assets.

This co-movement (which is measured by an assets covariance with the market portfolio) is referred to as the asset's non-diversifiable or systematic risk. In essence this is the portion of an assets total variance attributable to the variability of the total market portfolio.

Systematic risk is the variability in outcome caused by macro-economic or economy-wide events such as changes in interest rates, growth in the economy or changes in exchange rates – in other words, risks that can affect all businesses in the economy. The measure of an asset's systematic risk is referred to as its beta. Under the CAPM, it is only the systematic risk that is captured in the "cost of equity" component of the WACC. The reason for this is how beta is estimated. Estimating systematic risk or in particular beta, requires risk to be symmetric.

However, in addition to systematic risk, individual businesses also experience variance in returns that are unrelated to the market portfolio. This risk is called diversifiable or non-systematic risk. Non-systematic risk is reflective of idiosyncratic issues that are specific to the business or industry in question.

Non-systematic risk is important to businesses. If a business is faced with a risk that it must bear or that is commercially sensible to bear (like the risk of asset stranding), and that risk is not related to macro-economic or economy wide events, then the business incorporates the expected impact of the exposure to the risk into its cash flows.

However, because an investor can eliminate this exposure by holding a large diversified portfolio it does not affect the rate of return that is required to compensate investors. It simply affects the value an investor ascribes to the business.

In summary, risks are normally classified as either systematic or non-systematic. Beta and, through the Beta, the WACC, captures the systematic risk only. Non-systematic risk is reflected in the cash flows. An example of non-systematic risk is the risk of losing key staff. Businesses can insure against this risk and this cost is reflected in the cash flows of the business. In a normal commercial competitive environment, a business must generate earnings that compensate for bearing non-systematic risks.

3 Regulation

Where businesses are subject to price regulation, such as gas transmission businesses, the WACC that is used to determine prices must be reviewed and approved by the relevant regulator (being in the case of the Goldfields Gas Pipeline, the Economic Regulation Authority (ERA)). Regulatory reviews of WACC are often contentious because determination of WACC parameters is inherently imprecise and involves subjective judgment.

A question arises as to whether regulation increases or reduces risk. Regulated entities such as gas transmission businesses face a range of risks that are asymmetric in the sense that the distribution of expected returns are skewed downward or truncated at the upper end. Skewed or truncated returns arise because of the inherent nature of the assets or, importantly, as a consequence of the regulation itself. The returns that the owners of regulated infrastructure are able to earn are generally not allowed to exceed the regulated rate of return while the owners remain exposed to possible under-performance. In this way regulation limits the upside of risk to the owners while leaving the owners exposed to the downside of risk.

Given that generally regulated asset owners actively attempt to lessen the impact of regulation by moving towards light handed regulatory regimes, this suggests that the costs to them of regulation are greater than the benefits.

Some examples of regulatory induced risk applicable to gas transmission businesses are:

- regulator can specify the quality of the service and the level of reliability. This can impact on asset operations, asset capacity, asset life and operating expenditure;
- regulator may not approve all operating expenditure items. This can result in the service provider being unable to pass through costs. This may occur where actual costs which are efficient exceed perceived efficient costs allowed by the regulator;
- regulator may not approve all capital expenditure items, seeing particular costs as being 'gold plating'. This may restrict the ability of the service provider to incorporate these costs into the regulated asset base and so restrict the ability to recover these costs. This may occur even where the actual capital costs are efficient;

- regulator may not approve a cost allocation or pricing structures and so restrict the ability to recover costs via an appropriate allocatively efficient price. This may have consequences for the demand for services being sought by users;
- regulator may not approve a demand forecast. The consequent over forecasting of demand by the regulator will reduce the regulated price and create a revenue shortfall risk. ;
- the regulator may not approve an appropriate WACC, with the result being that that the service provider is unable to recover the actual cost of capital. ;
- the regulator may not approve appropriate asset lives, which may have the effect of increasing asset stranding risk and reducing revenue in early years;
- the regulatory requirements for ring fencing, and similar regulatory governance requirements, impose additional costs and restrictions on service providers which may not be able to be recovered;
- there may exist the inability to pass on new regulatory or government imposed costs due to existing contractual arrangements with customers. This includes the costs arising from broader government action, such as a carbon pollution reduction scheme;
- the regulator and government may alter broad gas market processes and regulations by, for example, the introduction of bulletin boards, trading markets, the amendment of gas specifications etc. These changes may not align with existing contractual arrangements with customers. These exogenous changes in business environment impact on risk.
- prices or revenues being capped by the regulator such that the service provider cannot respond to market changes. Therefore upside revenue opportunities are truncated while downside revenue risk continues to be borne by the service provider.

The above listing is not an exhaustive list of the asymmetric risks caused by regulation. They are examples of some of the typical risks that a regulated utility may be forced to bear due to the nature of the business being regulated. The utility should be compensated for these risks.

In a competitive market, a business has a number of alternatives to manage risk. A business can treat or mitigate the risk, transfer the risk to another party, terminate the risk by not undertaking the project or take on the risk and price it accordingly. In a regulated environment, the alternatives are more limited, the regulated entity foregoes the commercial flexibility in dealing with the risk as maximum price caps and

requirements to provide service are required by regulation. The regulated entity justifiably requires compensation for bearing the risks that it cannot avoid or otherwise mitigate.

4 Applying the Capital Asset Pricing Model (CAPM)

4.1 Estimating systematic risk

The previous section explained that businesses are faced with a number of risks which can typically be categorised as being either systematic or non-systematic in nature. There is a relationship between systematic risk and expected return as represented by the Capital Asset Pricing Model (CAPM). The CAPM is a forward-looking expectational model in that it estimates expected returns. To apply the CAPM, some measure of the equity beta is required and the market model provides this estimate.

The market model is the *ex post* version of the CAPM. In the market model, the equity beta is typically derived by regressing the historical returns of the firm against the returns of a broader measure of the asset market, typically the domestic share market index. To have a valid and robust estimate, returns are required to be normally distributed (ie symmetrical}. If returns are not normally distributed (for example, they are asymmetric) then the estimated beta will not be reflective of the 'true' beta.

If the beta is calculated by regressing returns of a firm, or number of firms, exposed to truncated returns (due to asymmetric risks) then the estimated beta based on this calculation will not be reflective of the true systematic risk of the business and therefore the cost of equity based on this beta will not be reflective of the systematic risk.

It is often the case that the calculation of an equity beta is derived from a number of proxy businesses which may have normal returns (ie symmetric returns). The estimated beta is then used to calculate the cost of equity for a business with truncated returns. In this case, the calculated cost of equity will not correctly measure the systematic risk of the business.

In a regulatory setting, a truncation of returns can occur for many reasons as discussed above. Applying a conventionally determined WACC in this environment where the distribution of possible cash flow outcomes is skewed, without some additional form of adjustment or compensation, does not adequately compensate for systematic risk.

4.2 Compensation for Risk

For a regulated business owner to be indifferent to making an investment it will require compensation for both non-systematic risk and systematic risk. In a conventional framework, non-systematic risk is normally compensated through cash flows while systematic risk is reflected in the WACC. However, asymmetric risk can be either systematic or non-systematic in origin.

Systematic Asymmetric Risk: As noted above, the rate of return should compensate infrastructure operators for risk. The rate of return estimated by WACC reflects the systematic risk faced by a listed entity operating in a competitive market. Applying the estimated rate of return using these firms as proxies, to a regulated entity faced with asymmetric systematic risk, underestimates the value of the risk for the regulated entity. To adequately compensate the regulated entity for asymmetric systematic risk it is necessary to include an allowance based on the extent the asymmetric risk. This allowance is best allowed for in the cash flows.

Non-systematic Asymmetric Risk: In addition, asymmetric risk may be non-systematic. Consequently, for an infrastructure operator to be indifferent to making an investment it will also require compensation for non-systematic risk that cannot be avoided. In a conventional framework, non-systematic risk is normally compensated through cash flows rather than the WACC. Again a cash flow adjustment as an allowance for asymmetric risk should be made.

Table 1 summarises the proposition.

Table 1 Asymmetric risk of regulation

Risk	Conventional treatment	Compensation sought	Appropriate Compensation method
Non-systematic and asymmetric	Cash Flow	Non regulated business – compensated	
		Regulated business – imperfectly compensated if compensated at all	**Cash flow allowance**
Systematic risk	WACC	Normally captured	
		Asymmetric risk – imperfectly compensated if compensated at all	**Cash flow allowance**

4.3 Should asymmetric risk be compensated

In unregulated environments, businesses incorporate the consequences of asymmetric risks in cash flows, and in some cases the rate of return, required for an investment. If

unavoidable asymmetric risks were not adequately compensated then investments would not be undertaken.

Regulation itself introduces asymmetric risks where returns for bearing risk are skewed or truncated. The regulatory environment either doesn't allow for the risks to be justifiably compensated (as in the case of non-systematic asymmetric risks) or inadvertently does not capture the risks (as in the case of systematic asymmetric risks) that would normally be compensated.

The regulatory environment should ensure that an infrastructure operator is adequately compensated for any risk that it cannot effectively avoid.

As discussed above, in an unregulated environment, a business has a number of options to manage its exposure to risk. First, it can seek to mitigate the risk. Risk can generally be reduced by either reducing the probability of occurrence or the impact of the risk on the business (rarely both).

If the risk cannot be substantially reduced, the interaction of supply and demand will mean that (subject to issues of capacity to pay) a supplier will generally secure a return commensurate with the risk involved in providing the service via higher prices (provided the risk that it is bearing is not due its own inefficiency).

In the regulatory context, the issue of asymmetric risk, and the need for appropriate compensation, has been a relatively long-standing issue for regulated entities and policymakers, particularly internationally. Over a decade ago it was recognised that:[1]

> Failure [by regulators] to account explicitly for regulatory and other asymmetric risk will usher in a new era of an undercapitalised public utility sector. Regulated firms will have strong incentives to defer investment and utilise small scale technology that is below minimum efficient scale.

and further:[2]

> … asymmetric treatment of uncertainty — by which losses by the firm are treated differently by the regulator than extraordinary profits — leads to distortions in the firm's actions that operate against optimality … asymmetry can actually induce the firm to make decisions in a way that ultimately works against the goals of the regulator and the welfare of customers.

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[1] Kolbe A., W. Tye & S. Myers (1993), Regulatory Risk: Economic Principles and Applications to Natural Gas Pipelines and Other Industries (Topics in Regulatory Economics and Policy Series), Kluwer, p.60.

[2] Train K (1991), Optimal Regulation: The Theory of Natural Monopoly, MIT Press, p. 96-7.

The issue has been recognised at a policy level and to a limited extent by regulators. The Commonwealth has legislated to establish a regime for third party access to services provided by infrastructure owners. When an infrastructure owner is subject to such a regime, the Competition Principles Agreement stipulates that:

> (b) Regulated access prices should be set so as to:
>
> (i) generate expected revenue for a regulated service or services that is at least sufficient to meet the efficient costs of providing access to the regulated service or services and include a return on investment commensurate with the regulatory and commercial risks involved;[3]

These provisions are mirrored in the Revenue and Pricing Principles contained in the National Electricity Law:[4]

> A price or charge for the provision of a direct control network service should allow for a return commensurate with the regulatory and commercial risks involved in providing the direct control network service to which that price or charge relates.

The revenue and pricing principles in the National Electricity Law therefore make specific reference to the need to ensure that the return on investment is sufficient to compensate infrastructure owners for the commercial and regulatory risks involved in the provision of regulated services.

In addition, the new National Gas Law has introduced a range of measures for natural gas pipelines to ameliorate regulatory risk, including access holidays for greenfields investments and light-handed regulation.

4.4 Regulatory treatment

In Australia, a consensus is yet to emerge on the regulatory treatment of asymmetric risk, with various regulators taking alternative views. While some regulators have expressed sympathy for the principle, compensation has not always been provided. One of the reasons for this is because a robust and defensible means of quantifying the risk has not necessarily been provided.

The ACCC provided an allowance in the cash flows for limited exposures to asymmetric risk for both GasNet and SPI Powernet. An example where the prospect of

[3] Competition Principles Agreement – 11 April 1995 (As amended to 13 April 2007). Section 6, 5 (b) (i)

[4] Section 7A(5) of the National Electricity Law

regulatory truncation was expressly recognised by a regulator in respect of a greenfields investment was by ESCOSA for the Alice Springs to Darwin Rail Line.

> The adjustment or allowance aimed at remedying regulatory truncation – whether in the form of an uplift factor on top of the WACC or an imputed self-insurance premium – should be calculated by reference to the area under the pre-regulation probability distribution of expected returns to the left of the WACC. In this way, the post-regulation mean expected rate of return will equal the WACC.

Similarly, the QCA in its review of the Dalrymple Bay Coal Terminal (DBCT) in 2005, provided an uplift to the WACC in recognition of the significant investment risk that was seen to underpin the terminal's expansion. This uplift was not based on an explicit compensation however; instead, the QCA accepted the higher equity beta that was being proposed by DBCT Management.

There is a compelling case for the compensation of asymmetric risk where it can be shown to be material, with this compensation commensurate with the residual risk that is efficiently borne after any risk mitigation strategies have been taken into account.

As noted above, a key issue is being able to quantify the risk and determine how it should be compensated.

Asymmetric or unique risk was also considered in the GasNet 1998 decision. In that decision, compensation for the risk was considered appropriate. It was noted that the CAPM does not compensate for such risk and an adjustment is required to either the rate of return or the cash flows. Due to the difficulty in quantifying the risk, an upward adjustment to the beta was considered appropriate.

> EPD and others have claimed there is a significant asymmetry in the diversifiable risks faced by the service provider, and this should be reflected in a higher return available, either through a notional addition to cashflows or a higher beta. This is an empirical matter.
>
> … Under normal CAPM assumptions the equity beta is meant to reflect only market related or non-diversifiable risks
>
> … Nevertheless, the Commission does acknowledge that all of these risks are difficult to quantify. Accordingly it has adopted the suggestion of financial experts at the WACC forum, that they are taken account of by choosing beta estimates towards the top end of the plausible range.[5]

[5] GasNet 1998 Final Decision, ACCC 6 October 1998, pp 59- 60

The difficultly of course is being able to quantify the asymmetric risk. Synergies believes that it is possible to quantify the effect of the risk. As the effect of the risk can be estimated, Synergies recommends that compensation for the identified and quantified asymmetric risk should be via a cash flow adjustment.

The following describes the approach that Synergies used to estimate and quantify asymmetric risks for GGP.

5 Valuing Asymmetric Risks

Asymmetric risks are not reflected in the WACC when using the Capital Asset Pricing Model (CAPM). The asymmetric risks introduced as a consequence of regulation may be systematic or non systematic in nature. Compensation should be provided for systematic asymmetric risks and the asymmetric risks that the business needs to bear. In either case Synergies believes that the adjustment for asymmetric risk is best captured in the cash flows.

The remainder of this section explains how Synergies estimated the consequences of asymmetric risk using a transparent and robust methodology.

5.1 Compensating systematic asymmetric risk

The CAPM is as an econometric model that can only be validly applied when assumptions are not violated. One requirement of the model is that the error terms are random and normally distributed around the characteristic line. In the case of asymmetric risk, returns are not normally distributed as they are truncated. Therefore, the beta estimate does not 'truly' reflect the asymmetric risk.

Consequently, CAPM will not capture or adequately compensate asymmetric systematic risk (arising, for example, due to the truncation of returns that occurs through regulation).

The existence of asymmetric systematic risk highlights the risk associated with exclusive reliance on beta data for the estimation of systematic risk. One approach that addresses this concern is to adopt an explicit mark-up on the CAPM derived cost of capital.

Practically this uplift approach requires a subjective assessment regarding the effect of asymmetric risk upon beta. Synergies does not support this approach but rather recommends that an adjustment be made to the cash flow so that the compensation of the asymmetric risk will be explicit and transparent. This approach is discussed in the following section.

5.2 Compensating non-systematic asymmetric risk

As asymmetric non-systematic risk is not reflected or captured in the rate of return it is necessary to quantify the asymmetric risk and estimate the cash flow effect. There are

several approaches that can be adopted to compensating for asymmetric non-systematic risk. These include:

- using real option principles where the asymmetric risk is effectively a call option. Under this approach, the value of the call option needs to be determined;
- ad hoc adjustments or approaches that look to market evidence of the incorporation of asymmetric risk – for example, an indication of the valuation of asymmetric risk can be taken from the cost of financing for a greenfields investment on a stand alone basis (although this approach will normally understate this risk simply due to the collateral nature of such financing arrangements); and
- using a probabilistic approach. This approach is multi-stepped and it requires the identification of the possible risks, consideration of the likelihood of occurrence of the risk and estimation of the possible cost to the business.

In our view, the probabilistic cash flow approach represents the most rigorous method to apply. This is the approach that has been used by Synergies in assessing Goldfields Gas Pipeline asymmetric risk.

5.3 Probabilistic approach to quantify asymmetric risk

The approach that Synergies adopted to quantify the asymmetric risk for GGP is detailed as follows.

Identification of possible risks arising from regulation

The first step involved determining a list of risks that may occur that would not normally be faced by the business if it were to operate in a non regulated environment. To do this a risk workshop was conducted where key GGP personnel including the General Manager, Western Australia, the regulatory manager, commercial manager and others were involved. The workshop was designed to be as broad and open as possible, and to capture as many risks as possible. The initial workshop was an important information gathering exercise undertaken on the basis that more information was considered preferable to less.

After an initial background briefing session, risks were identified. A deterministic approach was used that grouped risks into five categories. The categories of risk were Technical, Economic, Commercial, Organisational and Political/Regulatory asymmetric risks. The workshop participants identified, considered and discussed up to five asymmetric risks from within each category of risk. In total twenty three risks

were initially identified. The intention was to undertake further filtering to reduce the number of relevant risks.

Reiterating, the risks identified and considered were asymmetric risks that would not normally be faced by a business operating in a competitive environment and would not be reflected in the beta.

Correlation

In order to ensure the impact of asymmetric risk was not overstated an assessment of the correlation between identified risks was undertaken. Ignoring correlations would have resulted in each risk being valued independently. This would in turn have overstated the total value of the asymmetric risks as the incidence of a risk may mean that others will not or might not occur.

An estimate of positive or negative correlations between risks and the strength of the correlation was undertaken. The relationship between each of the identified risks was considered and positive, negative or no relationship was assigned. Additionally, small, medium or high was allocated to the direction of the relationship to indicate the strength of the relationship.

Likelihood of occurrence

Once the risks have been identified and correlations considered, the next step was to consider the probability of occurrence. Assigning probabilities is difficult so it was decided to use a simple rating approach that assigns agreed likely probabilities for each risk. The following simple approach was used.

Table 2 Probabilities

Rank	Probability of occurrence
1	Once every 50 years
2	Once every 30 years
3	Once every 20 years
4	Once every 10 years
5	Once every 5 years
6	Yearly

Investigation

After the initial workshop, further investigation was carried out regarding each of the identified risks. Each risk was elaborated and reconsidered within a commercial

context. For example if the access arrangement allowed consideration of the risk or it was possible to either include the effects of the risk within the terms of the contract or to explicitly contract out of the risk, the risk was disregarded and considered irrelevant for the purpose of quantifying asymmetric risks.

This process reduced the number of identified asymmetric risks from twenty three to three. Of the three remaining risks, the likelihood of occurrence was then carefully reassessed. Two of the three risks were considered to have such low likelihood of occurrence that the effect of the risk would be minimal.

The one remaining risk was of asset stranding. This would occur where one of the pipeline users failed. As the majority of pipeline users are directly or indirectly (via electricity generation arrangements) involved in nickel mining and processing and related activities, this risk may arise, particularly as a consequence of the volatility in nickel prices.

If demand and production for nickel is high and therefore the ability to pay for production inputs also is high, in a competitive commercial arrangement, higher prices could be charged. In the case of a regulated asset such as the Goldfields Gas Pipeline, there is a ceiling above which prices cannot be charged. A regulated business is unable to capture the upside. On the downside, when businesses who are customers of the pipeline fail there is a loss in revenue. Thus the pipeline is exposed to the downside but not the upside. Take or pay contracts are of little consequence where a customer is in liquidation. All businesses, both regulated and non regulated are faced with this consequence.

If demand could be perfectly forecast, the resulting forecast will be the average of the upside and downside (that is, the size of the area above the median line will equal the size of the area below the median line). A regulated business cannot enjoy the upside benefit so assuming upside and downside are symmetric, quantifying the downside approximates what is forgone as an upside. We now are able to approximate the value of revenue that a commercial business as opposed to a regulated business would earn. The difference between these two revenue streams is the economic benefit lost or cost incurred that is asymmetric and is a consequence of regulation.

Quantifying risks

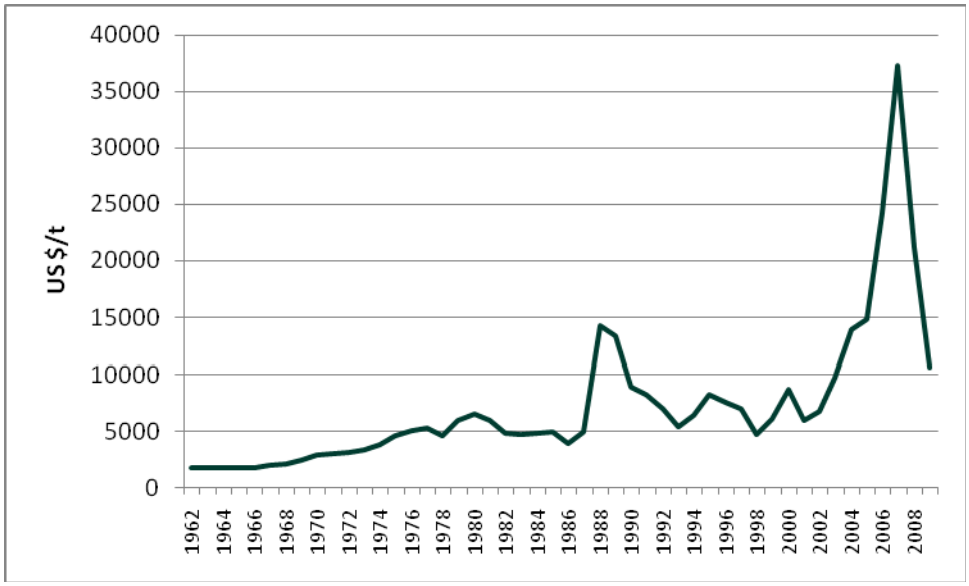
As a final stage, the costs of possible outcomes were estimated by considering the effect upon revenue if a customer failed. There are two types of customers for GGP. One type is a joint venture (JV) partner and there are three of these. They normally account for a larger portion of revenue than the other six (non-JV) customers. Customers were

stratified into JV partners and others, and each customer's individual contribution to revenue was considered.

The JV revenue impact was estimated if one of the JV partners failed. The effect was estimated as the change in revenue if one partner failed and the others continued business 'as usual'. So as to not overstate the effect by choosing the partner that has the greatest effect upon revenue, partner revenue was averaged and 'business as usual' was also averaged. The non-JV customer's revenue impact was also estimated if one of the other customers failed. The same approach used for JV partners was applied to the non-JV customers. The average revenue lost if an average customer failed was estimated. There was no bias towards large customers

A requirement of the analysis was to assign a probability to the likelihood of failure. To assign this probability, the volatility in nickel prices was considered as shown in the following chart.

Figure 1 Historic nickel prices



Changes in the nickel prices in real and nominal terms were examined over a period commencing in 1961. Extreme adverse changes were taken as indicators of customer failures. Generally extreme adverse and extreme favourable changes are one in twenty year events. To be conservative, Synergies assumed that a customer would fail not once in twenty years but rather once in every fifty years.

Should a customer fail, the period for which revenue would be lost was considered. It was assumed that smaller customers could be replaced within a period of between half a year and two years with the most likely period being one year. The time estimated to

be taken to replace large customers was estimated at between one and two years with the most likely period being one and one quarter years.

To quantify the consequence of asymmetric risk, a stochastic simulation was used. Lost revenue was estimated five thousand times with assumptions varying. The varying assumptions were revenue (as this was not yet set), likelihood of customer failure and period of lost income. Given the likely ranges, the distribution of possible outcomes was generally skewed to provide a conservative estimate of the consequence of the risk.

The consequence of asymmetric risk was estimated to be from $0.31 million to $0.84 million per annum. Again, to be conservative, a (p) 70% estimate was adopted resulting in an estimated consequence of $0.49 million. This may be interpreted as the fact that we can be 70% confident that the consequence of asymmetric risk is at least $0.49 million per annum. This rigorous analysis concludes that a highly probable estimate of the value of asymmetric risk is $0.49 million. This amount is a cost incurred (lost economic revenue) as a consequence of regulation.

The estimate of $0.49 million was based upon a number of conservative assumptions. The key assumptions were:

- while extreme changes in nickel prices were normally one in twenty year events, customer failure was estimated to be a one in fifty year event;
- the period of time for GGP to find a customer to replace the lost revenue stream was skewed towards quick revenue recovery; and
- of the possible lost revenue estimates and given the assumptions of the analysis, $0.49 million per annum is at the lower end of the range of possible outcomes. The effect of asymmetric risk would most probably be greater than $0.49 million per annum.

6 Conclusion

Regulation introduces risks that may be systematic or non-systematic. These risks are typically asymmetric or skewed where the upside benefits are truncated and downside cost reductions are not possible or additional non compensated costs are incurred.

In a normal competitive environment these risks would either not occur or would be able to be compensated (for asymmetric risks that are as a consequence of the nature of the operations) or mitigated. In a competitive environment necessarily incurred risks are compensated. Regulated businesses must also be compensated for the efficient cost of bearing necessarily incurred risks where the presence of regulation introduces the risk or takes away the ability to mitigate or transfer the risk.

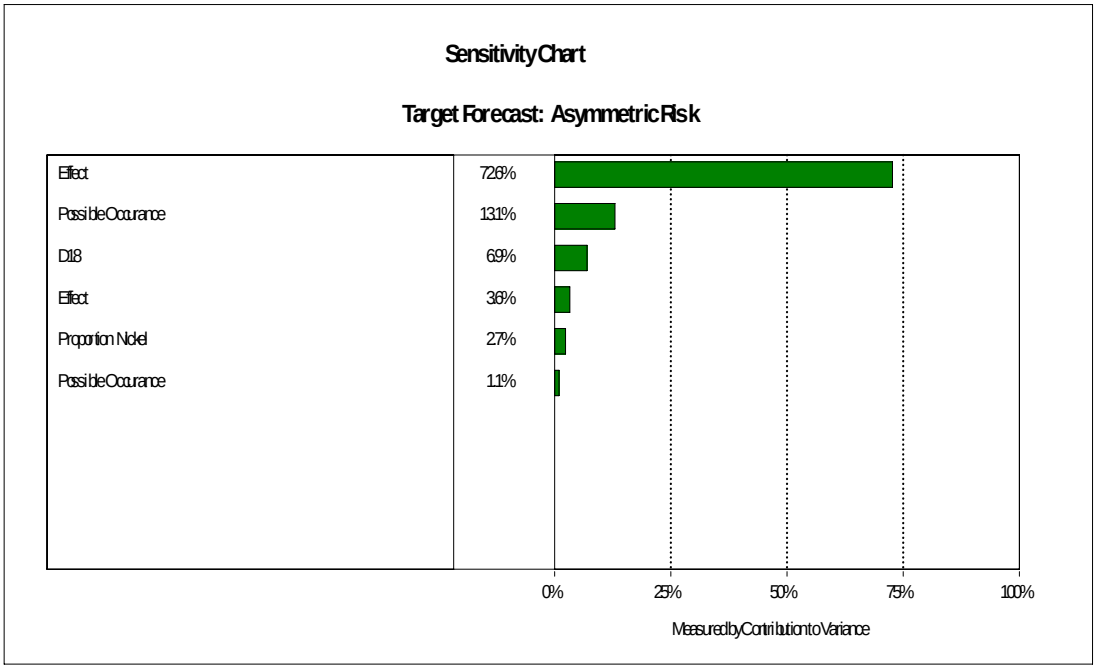
The difficulty is quantifying the risk. Like estimating WACC parameters, quantifying the risk is not exact or precise. Nevertheless the consequence of the risk should be estimated just as WACC parameters should and are estimated.

One approach that addresses the existence of asymmetric systematic risk is to recognise the limitations of exclusively relying on beta data for the estimation of systematic risk through allowing an explicit mark-up on the CAPM derived cost of capital or as a cash flow adjustment (the latter being the preferred approach).

A rigorous and transparent process that provides a framework for assessing and quantifying asymmetric risk is the probabilistic approach adopted by Synergies. The outcome of this approach is a reasonable and most likely estimate of the consequences for necessarily bearing risk and it can also quantify the cost of systematic asymmetric risks. The conservative estimate resulting from this approach is $0.49 million per annum.

GGP should be allowed an allowance of $0.49 million per annum in its cash flows to compensate it for asymmetric risks.

A Simulation Output



Forecast: Asymmetric Risk

Summary:

Certainty Level is 70.00%

Certainty Range is from 0.49 to +Infinity $ Millions

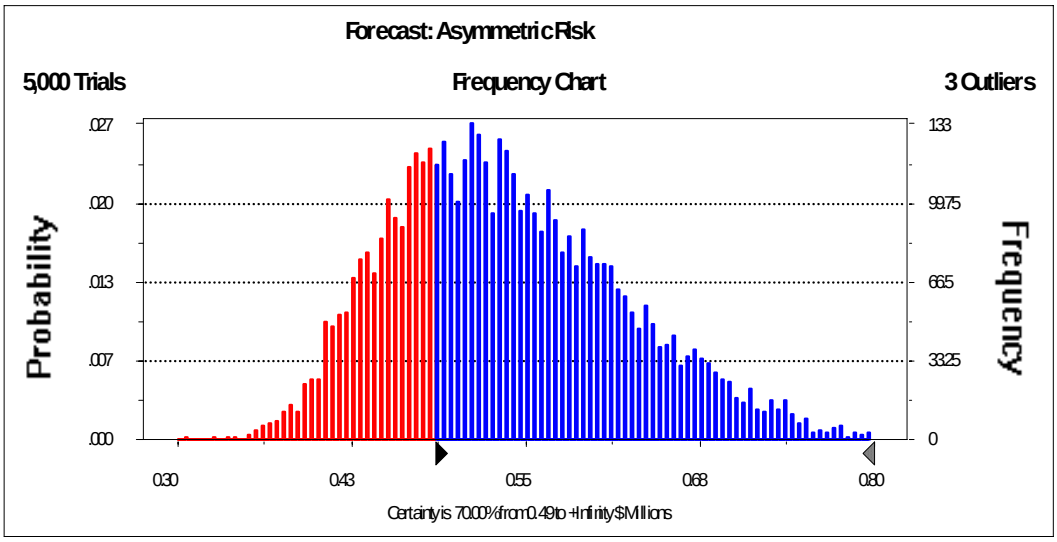
Display Range is from 0.30 to 0.80 $ Millions

Entire Range is from 0.31 to 0.84 $ Millions

After 5,000 Trials, the Std. Error of the Mean is 0.00

Statistics:	Value
Trials	5000
Mean	0.54
Median	0.53
Mode	---
Standard Deviation	0.08
Variance	0.01
Skewness	0.45
Kurtosis	2.81
Coeff. of Variability	0.15
Range Minimum	0.31

Range Maximum	0.84
Range Width	0.54
Mean Std. Error	0.00



Percentiles:

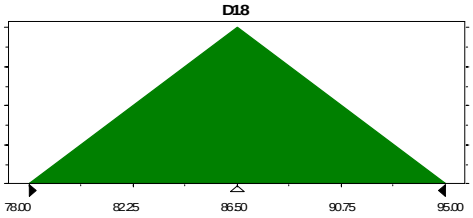
Percentile	$ Millions
0%	0.31
10%	0.44
20%	0.46
30%	**0.49**
40%	0.51
50%	0.53
60%	0.55
70%	0.58
80%	0.61
90%	0.65
100%	0.84

Assumptions

Assumption: Revenue

Triangular distribution with parameters:

Minimum	78.00
Likeliest	86.50
Maximum	95.00



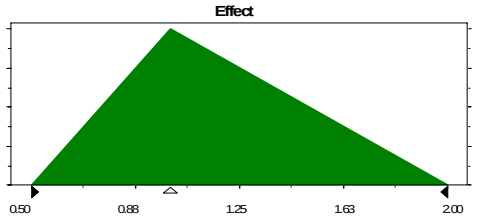
Selected range is from 78.00 to 95.00

Mean value in simulation was 86.54

Assumption: Effect Normal

Triangular distribution with parameters:

Minimum	0.50
Likeliest	1.00
Maximum	2.00



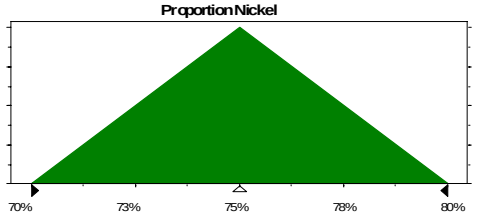
Selected range is from 0.50 to 2.00

Mean value in simulation was 1.17

Assumption: Proportion Nickel

Triangular distribution with parameters:

Minimum	70%
Likeliest	75%
Maximum	80%



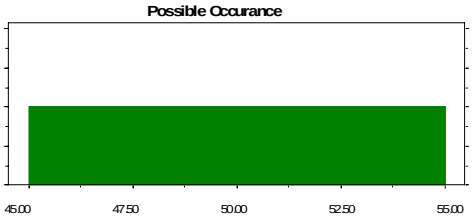
Selected range is from 70% to 80%

Mean value in simulation was 75%

Assumption: Possible Occurrence

Uniform distribution with parameters:

Minimum	45.00
Maximum	55.00

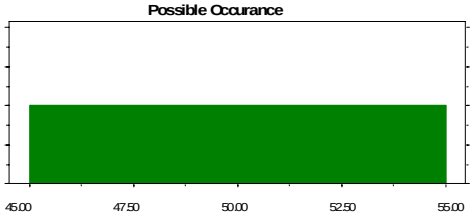


Mean value in simulation was 49.98

Assumption: Possible Occurrence

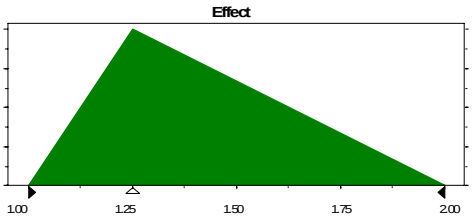
Uniform distribution with parameters:

Minimum	45.00
Maximum	55.00



Mean value in simulation was 49.98

Assumption: Effect JV



Triangular distribution with parameters:

Minimum	1.00
Likeliest	1.25
Maximum	2.00

Selected range is from 1.00 to 2.00

Mean value in simulation was 1.42