Western Australian School of Mines

Acquisitions May Add Value to Resource Companies

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Declaration

This thesis contains no material which has previously been submitted in whole or in parts in respect of any other academic award and the represents the research of the author unless duly acknowledged.

Stephen Bruce Bartrop
20 April 2010

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Provision of Data

The author would like to thank Stock Resource for provision of data used in some of the analysis in this thesis. Stock Resource is a research group that has provided market research since 2003 and has access and rights to use and publish data from a number of subscription services as well collating its own market data including commodity prices. This provision is gratefully acknowledged and has enabled some analysis which would have otherwise not been possible.

An empirical review of participants and market dynamics is useful in applying pragmatic realism to advancing financial theory.

Abstract

Resource acquisitions have added value to resource companies over the past two decades. This stems from the results of this research which has analysed 30 transactions and further reviewed 22 transactions with a total value A$240 billion. However, this figure is dominated by the 1997 BHP Billiton bid for Rio Tinto and if this attempted takeover is excluded from the list, the total value of the transactions analysed is A$60 billion.

The consolidation has occurred in three waves since the early 1990s. These periods are:

- First, a period starting in 1995 and ending in 2000; it included the end of the 1992-1996 bull run, the Asian Crisis and a period known as the 1998-2000 bull run and ending during the start of the Tech Boom drift,
- Secondly, a period between 2002 and 2004 which combines the waning stages of the Tech Boom drift and the commencement of the 2002-2008 Resources Boom, and,
- Thirdly, in a more recent period from 2006 to near the end of the 2002-2008 resources boom.

Each of these periods has different characteristics but overall there is a broad trend of foreign bidders acquiring Australian companies during weaker markets except during the 2002-2008 Resources Boom.

Cumulative abnormal returns (CAR) for both bidders and targets have been estimated using an adapted market model for event analysis. It draws on the strong correlation of absolute resource share with commodity prices.

Friendly transactions offer target shareholders a lower final offer price premia to the 30-day average target share price prior to the announcement (dual listing – 17.8 per cent, mergers – 12.9 per cent) and compares to traditional takeovers which average 48.7 per cent. In traditional takeovers the initial offer to 30-day average premia was 37.2 per cent but increases to the final offer to 30-day average premia of 48.7 per

cent mostly reflecting the impact of competitive bidding. Average increases in the final offer prices in non-competitive bidding were 16.6 per cent.

While both scrip and cash bids offered similar premia to target shareholders, foreign scrip on average offer a 20 per cent higher premia. Elsewhere, there were no material differences between the premia offered in hostile compared to non-hostile takeovers.

Bidders offering a 35 per cent premium (whether cash or scrip) to target shareholders are expected to create CAR for the target shareholders at around 24 per cent on the bid announcement. If the bid involves foreign scrip, the premium needs to be raised by 30 per cent but then the CAR for target shareholders will be slightly lower than non-foreign scrip bids at 22.9 per cent. If, however, the bidder can structure a merger the premium can reduce to zero in a 'merger of equals'.

Overall, the negative bidder CAR during the event window is more than offset by positive CAR during the post-event window, leading to a net positive CAR for acquirers of an average of 7.1 per cent. The positive net CAR for acquirers using scrip bids is 11.3 per cent; it falls to 3.5 per cent for bidders using cash offers.

In the alternative investment of exploration there are attractive probability weighted exploration returns but these are dampened by the high levels of expenditure required to achieve satisfactory levels of certainty. This will continue to undermine the investment appeal of junior explorers while *greenfield* exploration will become solely the domain of the majors.

Section	CONTENTS	Page
	Declarative Statement	ii
	Acknowledgements	iii
	Abstract	**v**
	Table of Contents	vii

Section	CONTENTS (cont.)	Page

1.0 Introduction

This thesis is an investigation into the creation of shareholder wealth in resource companies through acquisitions. Merger and acquisition activity has been present in the Australian resource sector for many decades but it became more prevalent during the 1990's and particularly during the 2000-2010 decade. This coincides with changing trends in global resource markets and, as discussed in this thesis, represents an interplay of diminishing exploration discovery rates, globalization of equity markets and changing expectations of investors. The outcome has been a vastly diminished Australian resource sector in terms of the number of listed companies on the Australian Stock Exchange and the average quality of projects within those companies.

Recent merger and acquisition activity has coincided with the strongest resource and commodity rally experienced by the markets which extended from the June quarter 2003 through to the June quarter 2008 (on a global basis, there is evidence that it commenced in 2002). While the onset of the Global Financial Crisis in the second half of 2008 caused significant world-wide wealth destruction, there are many market analysts who believe that this correction only represents a temporary setback in what is perceived to be a long-term bull run driven by demand for commodities from newly developing economies, particularly China.

There have been a number of factors which have sporadically driven an increase in merger and acquisition activity over the last two decades. However, an overriding theme has been company management's desire to deliver corporate growth. Over this period the equity markets have invariably rated the resource sector in comparison to other market sectors and in periods of resource downturns, it is the larger companies that attract disproportionately more investment and hence, a higher market rating.

Acquisitions through either merger and takeover activity or outright resource project purchase have provided a quicker route to corporate growth than traditional exploration. While exploration offers the greatest capacity to create shareholder value through a single event, that is, a significant mineral discovery, the discovery rate in exploration has diminished over time and investors do not have the patience or acceptance that a company will eventually be successful in its exploration endeavors.

Across the broader market, many researchers have recognised that most acquisitions do not create shareholder value (Eccles et al, 1999, Sirower, 1997, Chapman et al 1998). This generally stems from the subsequent failure to deliver previously estimated synergies from the transaction due to overly optimistic expectations by company management, which is typically reflected in an acquisition price premium that is never recouped.

The author agrees with this proposition in general terms but believes that resource companies operate under special circumstances which, if managed correctly, can have a higher probability of creating shareholder value. Resource companies offer investors earnings, cash flow and resource/reserve value leverage to volatile commodity prices, where movements or expectations of imminent movements in the underlying commodity price can lead to enhanced movements in their share prices.

Of course the timing of commodity prices movements can be a two-edged sword. Xstrata Mining plc's $1.72 per share priced merger with MIM Holdings Limited in June 2003 at the commencement of the resource and commodity boom ranks as one of the most successful mergers in creating value for the predatory company. In comparison Zinifex Limited's $775 million takeover offer for Allegiance Mining Limited in December 2007 at close to the peak of the resources boom ranks as one of the worst timed and priced acquisitions and was a contributing factor to the eventual near collapse of Oz Minerals Limited under a large debt burden during the height of the global financial crisis in November 2008.

In resource company merger and acquisition activity, transaction success as measured in share price appreciation of the predator or merged entity may not necessarily reflect the actual returns from the transaction in a strict economic sense. Investors may view the transaction as delivering additional commodity price leverage or alternatively, contribute to greater earnings diversification which may not materially impact earnings or cash flow forecasts in the short-term but enhance the company’s status as a desirable investment. These factors are generally specific to the quality and location of the company’s asset base, commodity exposure, market capitalization and the presence of strategic shareholders.

A proposition of this thesis is that accurate tracking of market sentiment and hence the timing of merger and takeover activity can result in the creation of shareholder value almost irrespective of the economic return from the acquisition based on the conditions prevailing at the time of the acquisition.

However, there are many factors which may derail acquisitions and, in most cases, these emerge in hostile takeovers where the predator does not have access to information to enable reasonable due diligence on the target. These circumstances have been highlighted in a number of acquisitions, for example, in Pasminco Limited’s hostile bid for Savage Resources Limited in 1998 where, after a successful takeover, it was discovered that the out-of-the-money hedge book of Savage Resources was far worse than expected (T. Shard pers comm. 1999). This, in combination with:

- Pasminco’s high gearing and associated interest burden, both having increased with the debt funding of the takeover
- weaker than expected commodity prices, particularly that of zinc, and
- a severe fall in the A$/US$ exchange rate crystallizing losses in Paminco’s own hedge book

ultimately led to Pasminco moving into administration in 2001. It was later recapitalized and re-floated as Zinifex Limited in 2004.

Hedging issues have been a major cost to the resources sector, particularly during the later part of the 1990’s. Many companies hedged the A$/US$ exchange rate for their US$ denominated revenues on misguided expectations that the A$/US$ exchange rate would continue to appreciate and erode future earnings and cash flows. Contrary to expectations at that time, the Australian dollar depreciated markedly and lead to significant unrealized losses on the balance sheets of resource companies,which were realized over subsequent years. Most economists would contend that the A$/US$ exchange rate is highly negatively correlated with commodity prices (see Chapter 3 for detailed discussion) through Australia’s terms of trade. Therefore the A$/US$

exchange rate can provide a natural buffer by depreciating during periods of falling commodity prices. While this leads to an argument that a company should either hedge both commodity prices and the exchange rate at the same time or not hedge either, many companies took a one way bet by just hedging the currency.

Inappropriate currency hedging and adverse movements in the exchange rate during the 1990's were two contributing factors undermining the strength of Australian resource companies but another was also the translation of the A$ share price in foreign currencies where the A$/US$ currency risk left many Australian resource companies undervalued relative to their global peers during the later part of the 1990's and earlier in this decade.

There are a myriad of studies in the literature which relate to failed acquisition strategies pursued by North American industrial corporations and while some of these are discussed in Chapter 2, they typically involve emotive senior management who are keen to 'win the battle' and end up paying a significantly higher purchase price for assets than warranted. While this has been the case to some extent in the resource sector, merger and acquisition activity of Australian companies has tended to create shareholder value for the predatory company.

'Buy low, sell high' is the axiom for astute investing and the cyclicality of commodity and resource markets and movements in the A$/US$ exchange rate have provided opportunities in the Australian resources sector which has lead to unparalleled mergers and acquisition activity over the last two decades. This has been stimulated by the corporate growth imperative overlain with the realization of diminishing returns from exploration.

1.1 Project Aims

Over the last two decades merger and acquisition activity has waxed and waned in response to factors which vary from the timing in commodity and economic cycles to the A$/US$ exchange rate, as well as global equity market expectations and the alternative avenues to pursue for corporate growth.

The aims of this project are to analyze merger and acquisition activity to determine trends and identify which strategies have created shareholder value. The project also seeks to interpret causes behind the share price movements of resource companies to provide a basis for the assessment of the value creation. It also seeks to re-classify exploration projects on an average probability weighted return basis to provide an investment comparison to merger and acquisition activity.

Finally, it seeks to interpret future trends in merger and acquisition activity and the impact this may have on the Australian and global resource sectors.

1.2 Defining Merger and Acquisitions

Merger and acquisition activity or M&A is the general term used in the finance industry to refer to activity resulting in corporate consolidation. This consolidation involves the purchase of all the shares of one company by another company or its shareholders such that the first company is then delisted from the Australian Securities Exchange (ASX) and becomes a subsidiary of the other company.

Company acquisitions are generally executed through takeovers which may be either hostile or friendly and the nature of which may change during the course of the takeover. Most takeovers are ‘off market’, which involves the predatory company directly purchasing shares in the target company through written offers to its shareholders. On market takeovers, by contrast, involve the predator company purchasing shares through the stock market at a specified price. Takeovers can be conducted through both on and off market offers and there is a strictly defined process involving offer and response documents outlined by the Corporations Act, the Foreign Acquisitions and Takeovers Act and the Listing Rules of the Australian Securities Exchange (Levy and Pathak, 2008)

Mergers tend to refer to activity involving the friendly merger of two companies with co-operative Boards, which may or may not involve a share price premium. Companies involved in mergers tend to be of similar size in comparison to takeovers which typically involve a larger company taking over a significantly smaller one. Mergers involve schemes of arrangement whereby one shareholder group agrees to accept the shares of another in exchange for their current shareholding (ASIC 2008).

A detailed discussion of the regulatory framework for both takeovers and mergers and the application and strategies for each are outlined in Chapter 2.

1.3 Resource Sector Coverage

The M&A activity studied in this thesis has been conducted by companies listed in the ASX resource sector, with the market conveniently categorised into resource and industrial sectors for many years. The ASX All-Resources Index (or the ASX Accumulation All-Resources Index) was the benchmark for the resource sector until the restructuring of the ASX indices in 2000 (ASX 1999). The current most appropriate benchmark is the S&P/ASX 300 Resources Index although under the main market benchmark, the S&P/ASX 200 Index, resource companies are segregated into the Metals and Mining sector, a subsector within the S&P/ASX 200 or 300 Materials Index and the oil and gas sector within the S&P/ASX 200 or 300 Energy Index (see Section 1.10.1).

Resource companies are classified as companies devoted to the exploration and discovery of mineral resources and/or their further beneficiation and processing. The more familiar commodities range from base metals (copper, zinc, lead, nickel), precious metals (mostly gold and silver), and bulk commodities including iron ore and coal. This thesis excludes analysis of steel companies although there are similar attributes of steel pricing to those of the above commodities and the linkage to world growth expectations. The steel sector has only recently become distinct in the ASX following the spin-off of OneSteel Limited and BlueScope Steel Limited from BHP Limited in 2000 and 2002 respectively.

The thesis also examines part of the energy sector although it excludes traditional oil and gas industry M&A activity given the different industry dynamics, particularly the fact that this industry involves extensive syndication to mitigate the high risk involved in petroleum exploration. Segments of the energy sector studied by this thesis are uranium and coal.

The globalization of resource companies has lead to many acquisitions conducted by overseas companies and hence, these companies require analysis relative to their own markets or to global resource indices to identify whether the transactions have returned shareholder value.

1.4 Research Scope

The following section discusses the source of research materials for this project. It also outlines some limitations prevalent in the analysis given the diversity of influences which lead to market volatility and company diversity across the resource sector such as asset quality, management experience, commodity exposure, etc.

1.4.1 Research Material

One of the key goals of this thesis is to collate data from a number of non-academic sources to provide a basis for analysing resource transactions. Apart from journal publications and texts, these include:

1. Company specific releases which may be required under ASX listing rules including continuous disclosure, as well as quarterly, half yearly and annual reporting. It also includes financial reporting and ad hoc presentations to keep the investment community informed of the companies activities, site visit presentations and questions as well as discussions with senior management over specific issues.
2. Stock Broker research providing commentary and analysis on specific company or sector events or trends.
3. Media information including newspaper or internet services reporting on company events
4. Market data services provided by Stock Resource including Iguana, Factiva, ASX and Aspect Huntley.
5. Specialist journal, bulletin or magazine publications, which vary from commodity bulletins (e.g. Metals Monitor, Platts Metals Week) to broad based magazines such as Resource Stocks magazine or Mining Journal.

While there is a contrast in the rigour of academic research relative to other sources of data, non-academic data are essential in providing a timely record of company analyst or investor impressions and expectations at the time of the announcement of key events such as a takeover. It also provides a record of share and commodity price movements at the time of a specific event which may not be evident in time series data such as closing day share prices. Unfortunately, this record including share price data is often deleted from newswire and market data services when it is greater than 10-years old.

Reilly (1985) notes that the material in academic journals differs in terms of timeliness and general orientation from investment magazines with the latter concerned with the current investment environment and highlighting investment opportunities. This is an accurate reflection of articles in resource publications, e.g. Resource Stocks, Paydirt, Mining Magazine, etc. However, most of these publications also provide a forum where senior company management can espouse their companies' strategies which are designed to create shareholder value. Indeed many of these reviews involve direct input by company personnel and hence, provide a base case to which one can later compare the execution and effectiveness of relevant strategies.

1.4.2 Research Analysis Limitations

Stock markets are notoriously capricious and influenced by a wide array of factors which are problematic in the analysis of trends. Furthermore these create difficulties in substantiating causal relationships between share price movements and the corresponding movements in other parameters although they may appear obvious at the time. As outlined in Chapter 2 this is exacerbated in resources due to the influence of changing commodity prices in addition to normal market and resource company specific factors and this leads to less substantiated and more generalised research.

The author also draws the reader's attention to two key issues:

- In academic research there can be minimal analysis on the potential linkage between events outside the market with traditional studies analysing excess stock returns over market returns (see Chapter 2). Resource company shares with high beta indices are often driven by less market-related phenomena (commodity prices movements, company specific activities) and therefore comparisons to broader market returns may not be valid.

- Most previous research has been conducted on larger markets, especially the New York Stock Exchange (NYSE) and/or with generally larger companies with high share price liquidity. Statistical analysis on large datasets is often used to provide analytical support for research contentions. This type of analysis is difficult in smaller markets like the Australian resource sector which lacks the breadth and depth of major US market sectors.

In summary, the application of past research techniques to analysing resource acquisitions in the Australian market has had limitations ranging from an appreciation of the drivers of resource company share prices through to dataset size and appropriate event methodology as discussed in Chapter 2. As a consequence the breadth of this research has been wider than expected but addresses these issues and has led to a modified event analysis methodology which provides a reasonable basis for M&A analysis.

1.5 Definitions

This section briefly defines and discusses a number of terms which are used throughout the thesis.

1.5.1 Shareholder Value

Measuring changing shareholder value is a key aspect of this thesis as it determines whether management has been successful in creating shareholder value through acquisition and merger strategies.

In this thesis, the creation of shareholder value is measured through a change in the cumulative abnormal returns in the share price of the acquiring company relative to the broader resource market in general. The share price is theoretically an independent variable which incorporates the expected value associated with the acquisition, whether beneficial or detrimental at a specific time. In addition a comparison is also carried out with the acquiring company and its share price sensitivities to key factors (e.g. ASX Indices, commodity prices) prior and post to the M&A activity. This thesis argues that an increased sensitivity to a key variable can deliver shareholder value in some circumstances as investors may be increasingly attracted to the stock as an investment. At the very least, an acquirer with a subsequent higher index weighting will attract additional investment from index funds.

A 30-day average share price level prior to the initial announcement of an M&A transaction is used for comparison to offer values.

Other measures such as changes in earnings per share (eps), cash flow per share (cfps), dividends per share (dps), and NPV valuations are not applicable in many acquisitions, for example, it may take years for a newly acquired project to be developed and produce a positive cash flow. There is also the fact that the creation of shareholder value may be derived from a change in the market's assessment of the asset base of a company while not creating a positive eps or cfps contribution, for example, a size premium if the company has increased in size through the acquisition and is now at a size level where it is attracting increased investment.

1.6 Share Price Movements

Over the years there has been a substantial level of research into the movement of share prices (Chen and Zhao, 2007, Campbell and Ammer, 1993, Fama and French, 1995, Keim and Stambaugh, 1986, Vuolteenaho, 2002). On a broad market scale, researchers tend to model share price movement under normal trading conditions as a random walk exhibiting returns that follow a lognormal distribution (see Chapter 2). Nevertheless most authors would agree that new significant information or events may create significant changes in share prices and under the efficient market hypothesis, the consequence of a new significant event is impounded rapidly or instantaneously in the share price creating a price shock (Fama, 1970).

This research supports the adage that movements in the share prices of (resource) companies are stimulated by perceived changes in the valuation of the company on a per share basis. This thesis refers to events which lead to these perceived changes in company valuations as share price 'drivers'. This is an important distinction as a share price driver may or may not lead to an underlying change in the fundamental valuation of the assets of the company.

The process is likely to evolve along the following steps:

1. A share price driver emerges with an implied company valuation change
2. Share price movement (positive or negative)
3. Ongoing assessment as to the credibility and sustainability of the new valuation
4. Potential further share price movement (positive or negative)

The separation of ‘implied valuation change’ from a share price ‘driver’ is a key concept, which is not always appreciated by market participants. The initial and later ongoing assessment of company valuations can be stimulated by different share price drivers. An example in the context of a resource company would be when a valuation change may stem first from an unexpected increase in revenue due to stronger economic growth (stronger economic data = first share price driver) which is then followed by weaker than expected commodity price rise (weaker than forecast eps growth = second share price driver) and is followed by a takeover offer for one of the company’s peers in the same sector (relative valuations from peer takeover offer = third share price driver).

Each of these drivers has implied increases or decreases in the company’s valuation and will lead to varying share price movements based on these valuation changes, each adjusted for certainty and sustainability. In essence, share price movements reflect a series of probability weighted valuation changes stemming from each share price driver as it emerges (see Chapter 4).

The frequency of the emerging share price drivers also changes over time and depends on market conditions and other circumstances. An example is that in volatile market conditions, a falling share price may be supported by a prospective dividend yield but in a rising market, the prospect of earnings growth may be the key share price driver.

1.6.1 Movements in the Share Price of Resources Companies

The main share price driver of resource companies are changes in commodity prices and to a lesser extent, changes in exchange rates. Commodity prices directly influence the earnings and cash flows of resource companies as well as the value of reserves, resources and exploration projects. However, commodity prices are influenced by the supply/demand fundamentals in their own specific markets, which may be unrelated to the operating performance of a particular resource company. An example is the increasing importance of speculative investment in commodity markets over recent years.

The operating assets often have relatively fixed operating cost structures, and hence, increases in commodity prices can lead to significant changes in future earnings and operating cash flows. This can provide significant earnings and cash flow leverage to relatively small changes in the commodity price and 'magnify' the share price movement relative to the movement in the underlying commodity price.

In addition, resource companies typically have mineral resources and reserves which become more valuable through the additional earnings and cash flows generated at higher commodity prices when they are finally exploited. In the extreme case, North American analysts typically value gold companies on a multiple of their gold resources and reserves and which often contrasts with valuations derived from price/earnings and price/cash flow multiples. This gives rise to the 'gold premium' in market valuations of gold companies. Elsewhere, a junior explorer focusing on specific target commodities may experience an increasing share price with increasing commodity prices on the prospect of greater value in the discovery or further delineation of mineralisation.

In broader economic cycles, increasing demand for commodities normally stems from increasing world economic growth, often reflected in increasing industrial production. As mentioned, in the recent resource rally, a major component of this growth and increasing commodity demand stemmed from the significant increase in the rate of industrialisation and urbanisation of China and other emerging economies. As with the recent rapid increase in Chinese commodity demand, historically it has been unexpected increases in commodities demand that have led to the significant commodity price and resource sector rallies over time, e.g. as during the 1960's.

In summary, resource companies have attributes which provide:

- Leverage to world growth cycles through commodity price movements
- Relatively fixed cost bases which enhance this leverage
- Resource, reserve and exploration prospects which also increase in value with increasing commodity prices
- Exploration value in the potential to discover an economic mineral deposit.

The latter point is particularly relevant to junior explorers and generally diminishes with the increasing size and asset base of the company. As outlined in Bartrop & Guj (2009), it is the materiality of the exploration project target size relative to the company size that is important in generating shareholder value.

1.6.2 Changing Resource Company Value

The value of a company can be an absolute or relative measure but the latter predominates in the stock market and in particular, with resource companies, given constantly changing input parameters. In contrast, an absolute valuation could be derived from a cash bid for the company at a fixed price.

In the case of resource companies, the author considers that change in value can be crystallised by either:

- An expectation of a material change in future earnings and cash flow levels leading to a change in the value of the asset base of the company; or
- A change in the value ascribed by the market to the value of this asset base

The two differ with the first relating to specific company activities while the second reflects general market valuation changes. Of course company specific activities can also lead to the second valuation change, the most evident over the last decade has been corporate management seeking to grow their companies to capture a size premium where larger companies trade at higher price/earnings and price/cash flow multiples (see Chapter 5). This has generally involved mergers and acquisition activity.

Share price drivers leading to the first outcome could include sustained changes in commodity prices or exchange rates, a new exploration discovery of a mineral deposit or an extension of an existing resource base, and an expansion in the production of an existing asset, or the acquisition or divestment of an asset.

In contrast share price drivers impacting on the second outcome relate to market trends and could include specific premia allocated to certain sectors reflecting specific commodity price expectations (e.g. the 2006 uranium bull run), the company size premia discussed earlier as well as direct corporate activity such as the threat of a potential takeover for the company.

1.6.3 Measuring Investment Value Changes

The traditional measures of a company's value and hence the scope for a change in one of these measures to emerge as a share price driver includes:

- Prospective earnings (one or two year horizon) as a function of the share price (short-term price earnings ratio)
- Sustainable earnings levels as a function of the share price (medium and long-term price earnings ratio)
- Prospective cash flows excluding capital items (one or two year horizon) as a function of the share price (a short-term price to cash flow ratio)
- Sustainable cash flows excluding capital items as a function of the share price (medium and long-term price to cash flow ratio)
- Prospective dividend yield as a function of the share price
- Sustainable dividend yield as a function of the share price
- NPV valuations
- Option valuations

These factors apply with varying degrees of importance to resource companies, for instance the relevance of dividends and dividend yields is lower as resource companies often pay small or no dividends as the returns from investing in resource shares are expected through capital gain. NPV valuations are often utilised in valuing the assets held by resource companies, reflecting the varying and limited lives of mining operations, although this is becoming less common, particularly in the mid-tier sector and is often generally absent in the junior sector (Bartrop, 2009). A third factor is that exploration companies may lack any appreciable earnings and cash flow with share price drivers representing the reporting of new drill results on a particular exploration property.

As mentioned earlier, changes in the above parameters are likely to constitute share price drivers although following the global financial crisis, there is often a pre-emption of changes in the commodity prices (and subsequent eps and cfps changes) from the release of macroeconomic data indicating the likelihood and possible pace of a recovery in world economic growth.

1.6.4 Changing Importance of Investment Measures

As evident in the previous section, there are a number of valuation methodologies which can be applied to short-term (one to two year) parameters or medium to long-term parameters (eg. two years or longer). Hence, it is likely that valuations derived under the different time frame scenarios will differ.

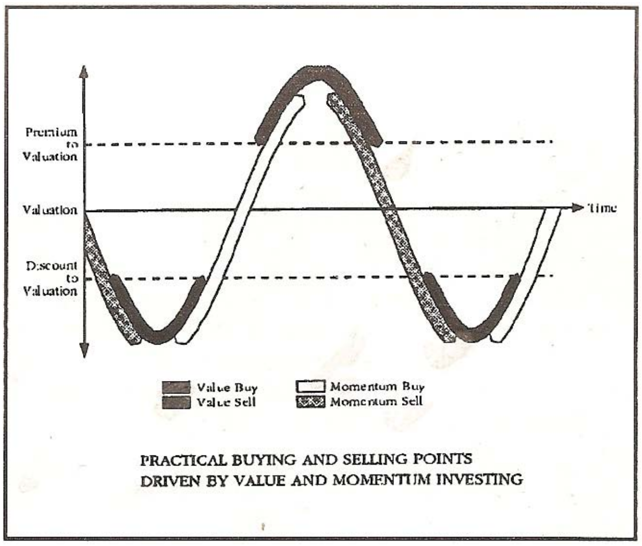
The author considers that there is little doubt that the market alternates at various times between valuations derived on the short-term parameters and those derived from medium and long-term parameters which are influenced by general market conditions (see Figure 1). These are reflected into two common investment styles; momentum and value investing, although in practice many investors incorporate elements of both styles.

Harrowell (1994) summarises the distinction between momentum and value investing as:

- Value Investing – seeking stocks which are cheap relative to a fundamental valuation of their underlying assets and discarding expensive stocks.
- Momentum Investing – seeking stocks about to appreciate in price and discarding those about to fall in price.

The practical buying and selling timing points relative to an assessed ‘fundamental’ valuation are outlined in Figure 1.

Figure 1. Theoretical buy/sell timing points for value and momentum investing. The value investor must produce a valuation for the company and then decide at what level of discount or premium to that valuation they would each buy or sell. The momentum investor is attempting to pick the turning points.



From Harrowell (1994)

During rising markets short-term valuation parameters dominate because the marginal investor is likely to be investing predominantly on a momentum investment style. This is evident as the emerging data, whether economic growth and/or increases in commodity prices, on the whole are generally only likely to impact on short-term valuations. An example is that a rising copper price now is unlikely to alter long-term copper price forecasts upon which medium and long-term valuations are based. These long-term copper forecasts are only likely to change if there is a sustained period of higher copper prices and there is an expected supply/demand balance over the long-term that would provide commodity analysts with the confidence to change long-term forecasts.

In contrast, at the depths of a bear market where low spot commodity prices reduce short-term earnings and cash flows to levels where the corresponding share price ratios are lifted to exorbitant levels, it is likely that medium to long-term valuations such as NPV valuations or sustainable earnings and cash flow ratios, etc. are providing support to the share price (Figure 2).

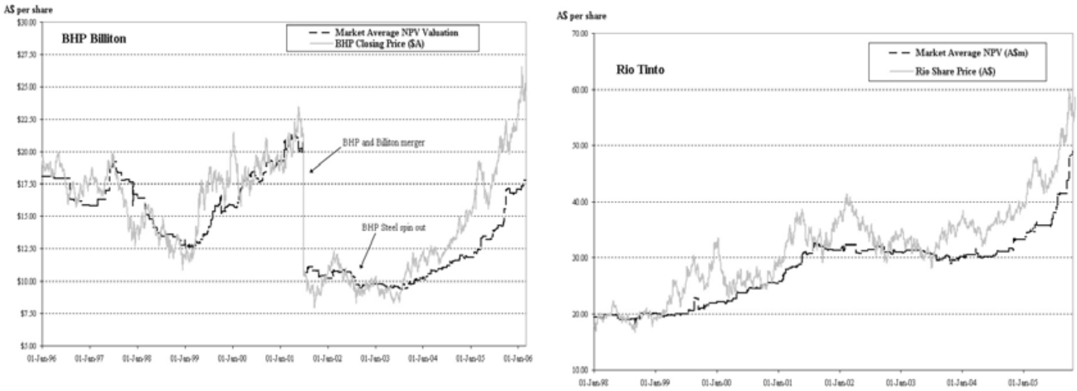
Figure 2. Dominant market valuation parameters during different market conditions.

Bull Market	Bear Market
Short-term valuation parameters (dominant) Momentum Investing	Short-term valuation parameters
Medium and Long-term valuation parameters	Medium and Long-term valuation parameters (dominant) Value Investing

Using examples of BHP Billiton and Rio Tinto, Bartrop and Guj (2006) suggested that companies with established and forecast cash flows tend to trade in a cyclical manner around the cumulative Net Present Value (NPV) valuation of their assets in line with changing short-term valuation parameters. This is evident in Figure 3, which charts the BHP Billiton and Rio Tinto share prices around broker-average NPV valuations.

NPV valuations are a common ‘fundamental’ way of valuing the resources sector and while individual brokers’ NPV valuations may vary in line with specific operating and revenue assumptions, the researchers considered that, as a consensus, they provided the market with more stable valuations upon which to compare the volatile share prices of mining stocks.

Figure 3. BHP Billiton and Rio Tinto share prices and average broker NPV valuations.



From Bartrop and Guj (2006).

The BHP Billiton and Rio Tinto share prices broadly follow the average NPV valuations but can trade at any one time at a discount or more often at a premium to the average NPV. From Figure 3 it is, however, evident that during buoyant market conditions, share prices can trade at significant premia relative to the underlying NPV valuations. Bartrop and Guj (2006) regarded this as a result of momentum investing as its drivers are short-term changing events almost entirely unrelated to a fundamental NPV valuation.

This was particularly relevant in the recent bull run to June quarter 2008 where NPV valuations appeared to be playing ‘catch-up’. In bull markets, momentum investing can lead to ‘bubble’ situations as exemplified by uranium company share prices recently factoring in average enterprise values more than US$20/lb U_3O_8 for Australian uranium explorers with no producing mines, despite the fact that their uranium resources were in many cases unlikely to ever be brought into production (Bartrop 2007).

1.7 Acquisition Targets

The acquisition targets studied in this research are listed companies on the ASX (generally members of the S&P/ASX 300 Resources Index) as the presence of a share price theoretically provides an independent and market-driven value which reflects future expectations on the company’s performance (Reilly,1985; Copeland et al, 1996; Peirson et al, 1990).

In comparison, unlisted entities are not subject to continuous disclosure and other reporting requirements entailed by the listing rules on the ASX.

1.7.1 Target Reserves and Resources

Most resource companies seek to develop and mine mineral resources and it is generally the size and grade of these resources (and reserves subset) which ultimately dictates the scale of the operation through the economic optimisation of throughput rates and the level of capital expenditure that can be supported by the reserve base.

In some cases it is the resource/reserve size combined with other factors such as remoteness and product value that can lead to the development of further downstream processing including smelters and refineries. In most cases, with a significant resource/reserve base, incremental optimisation over time can involve multiple production level expansions as well potential development of downstream processing.

Integrated operations supported by large and generally richer orebodies have been more common in the past (Mt Isa, Olympic Dam, Telfer, Broken Hill), but are still occurring in some projects in more recent times, e.g. Equinox Minerals' Limited Lumwana project in Zambia which includes the development of a smelter to enhance project economics (Equinox 2009). Elsewhere, access to large resources such as the Aurukun bauxite deposit came with a statutory commitment to build an alumina refinery as part of the winning tender following the Queensland Government's confiscation from Pechiney (Australia) Limited (Fitzgerald 2009).

An important aspect is that it is the resources/reserve base which drives the value of mineral assets, not the level of historical capital expenditure which can be deemed scrap value if there is no supporting production base. Furthermore, the largely depreciated capital assets and infrastructure of many long-lived and possibly integrated operations, while still functional, would be prohibitively expensive to replace at current costs. This can provide low-cost acquisition opportunities (relative to replacement value) provided there is a production base capable of utilising this infrastructure and/or exploration potential (Sims and Bartrop, 1993).

Hence, the due diligence of an acquisition of targeted resources and reserves is extremely important in merger and acquisition activity. The resource and reserve quality includes confidence levels (JORC classification, see below), reconciliation with any past production, future mining constraints, historical and forecast metallurgical performance and exploration potential to expand existing resources. The ability of an acquirer to create shareholder value often lies with strategies to develop further or expand acquired resources, particularly where the resources have been stranded and the acquirer can facilitate access to a processing plant.

1.7.2 Exploration Tenement Acquisitions

The acquisition targets studied exclude basic grass-roots exploration joint ventures, farm-ins or tenement purchases. The reason is that in these cases, the success and the subsequent creation of shareholder wealth is generally derived from exploration activities leading to the discovery of a mineral resource – a high-risk strategy in itself (Bartrop and Guj, 2009). The factors controlling exploration success reflect first, the very existence of an undiscovered resource in a project area, and secondly, the use of appropriate exploration techniques, and lastly, the perseverance and funding required to discover it.

Companies interested in acquiring exploration assets (non-petroleum) tend to identify prospective target areas through in-house research and then seek access to the ground which can involve;

- If the area is available, completing and submitting an application to the relevant State minerals authority.
- If the area is under an existing tenement, which is likely to remain in place for some time, approaching the owner and seeking a joint venture farm-in deal or an outright acquisition

Approaching existing tenement holders is normally the more expensive option and has a degree of uncertainty in that an economic deal may not be struck or there may be an unwillingness by the owner to divest equity in the tenement. If a deal is consummated it is usually in the form of a joint venture with a farm-in structure which involves fixed expenditure commitments to achieve specific equity levels. Straight-out purchases are less common but may involve acquisition prices paid in scrip and/or cash and a production royalty may be kept by the owner over future production.

The underlying selection of prospective areas and hence embarking on exploration acquisitions such as joint ventures can be relatively subjective. Companies may have target generation teams or individuals which apply new or in-house geological models or geophysical or geochemical data analysis to identify trends which elevate the prospectivity of certain areas. The reasons may also arise from a belief that past exploration efforts may have missed identifying and testing prospective targets or there may be change in commodity focus and/or geological model. It is also important to note that larger resource companies have financial clout which provides greater opportunities for entry into their targeted projects given the attraction of this capital to often under-funded, junior explorers.

These issues underline the difficulties in the analysis of exploration project acquisitions in two ways:

- The discovery rates on acquired (or joint ventured) exploration properties versus non-acquired exploration properties are difficult to determine given the statistically small number of exploration discoveries relative to the global exploration effort, and;
- The acquisition prices paid (farm-in structures or outright purchases) can be based on industry benchmarks or the financial clout of each partner and are less related to the generally unquantified exploration potential of the tenement and potentially the value of any future discovery.

The risk in exploration has previously been assessed by Mackenzie and Woodall (1987). They note that the risk commonly involves the application of limited corporate funds to exploration programs which fail to yield any success. They categorized exploration risk into three areas:

1. Discovery risk - the risk of actually discovering an economic mineral deposit is assessed by Mackenzie and Woodall (1987) as typically having a 1 to 2 per cent chance of success.
2. Geological risk. This relates to the uncertainty of the return of a discovered resource due to geological variability amongst deposits. An example is the discovery of a mineral resource which is subeconomic because it does not meet minimum size or grade parameters.
3. Market risk. This is ‘revenue’ risk where a discovery is rendered uneconomic due to weaker commodity prices.

The author notes that the risks identified by Mackenzie and Woodall (1987) represents only three of a number of identifiable risks, for example, sovereign or country risk, exchange rate risk on revenues, technical risk on mining and beneficiation, environmental risk, etc. Broader categories such as ‘technical risk’ and ‘commercial risk’ may be more appropriate for the last two categories whereas ‘discovery risk’ could include the risk of not discovering an orebody with economic size and grade characteristics.

Nevertheless, Mackenzie and Woodall’s (1987) work does reiterate the high risk associated with exploration and the fact that this is unlikely to have a relationship with any acquisition activity to secure the tenements in the first place. This thesis analyses exploration discovery probabilities in Chapter 6 to quantify exploration as an alternative or complementary growth option to merger and acquisition activity.

1.8 Trends in Evaluation and Reserve and Resource Reporting

The following sections review the development of the Joint Ore Reserves Committee (JORC) code for the reporting of resources and reserves and the Valmin code for valuing resource assets. The various codes have ‘constrained’ the reporting of the discovery of new mineralisation, the estimation of reserves and resources, and independent expert valuations, particularly in relation to the ‘sign off’ of the reporting by a deemed and named competent person.

1.8.1 Reporting of Exploration Results

The reporting of the discovery of mineralisation to the Stock Market has been fraught with issues over many years that stem from the ability of company management to fabricate, exaggerate or place out of context encouraging drill results with a consequence of an unwarranted share price appreciation.

The Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the ‘JORC Code’ or ‘the Code’) was established in 1989 to provide minimum standards, recommendations and guidelines for public reporting in Australasia of exploration results, mineral resources and ore reserves. Revised and updated editions of the Code were issued in 1992, 1996 and 1999. The 2004 edition supersedes all previous editions (ASX 2004).

The 2004 edition includes changes to the reporting of exploration results and includes the reporting of exploration targets (Stoker 2005). While the reporting of exploration results now requires the involvement of a competent person, the ability to report exploration targets has now addressed a major deficiency in the JORC code prior to 2004.

In particular, historical reserves and resources were not allowed to be reported in announcements to the ASX under the original guidelines despite the fact that many were conducted by competent geologists and would meet JORC compliance had the code been around at that time. This created a variation in information levels across the market as company releases to the ASX would not contain a specific non-JORC compliant resource while it may have been included in presentations to the investment community if it was deemed a material aspect of the company's projects. Historically these presentations were not released to the market and created an unlevel 'investment playing field' but continuous disclosure requirements now mean that these presentations must be disclosed to the market (Bartrop, 2009).

Clause 18 in the 2004 JORC Code also now provides the capacity to report exploration targets (ASX 2006). In summary, the terms 'resource' and 'reserve' must not be used in this context and any statement referring to potential quantity and grade of the target must be expressed as ranges and must include:

- a detailed explanation of the basis for the statement, and
- a proximate statement that the potential quantity and grade is conceptual in nature, that there has been insufficient exploration to define a mineral resource and that it is uncertain if further exploration will result in the determination of a mineral resource.

However, despite over twenty years of development of the JORC code, in early 2009, the ASX reported that after reviewing 5,200 announcements by mining entities, 6 per cent were found to contain a total of 333 instances of non-compliant reporting by 246 entities. There are around 800 mining entities listed on the ASX (ASX 2009).

The consideration in resource company M&A activity is the reliability of exploration data as well as the context in which is it is presented to the market which may impact the share price of the company. Share price bubbles are discussed in Chapter 2, but it is worth reviewing the Poseidon Nickel NL share price run as it is often cited as a significant reason for the creation of the JORC code (Stoker 2005).

Poseidon Nickel NL announced on 1 October 1969 that drilling had intersected 40 feet grading 3.56 per cent nickel and 0.55 per cent copper along with other lower-grade intersections at Windarra, Western Australian (Sykes, 1978). The share price increased dramatically from below $2.00 prior to the announcement to peak at $280 per share in the following February (see Figure 4).

Figure 4. Poseidon Nickel NL Share Price

From Simon (2003)

Based on the data presented by Sykes (1978) and Simon (2003), the cause of the rise in share price represented a number of factors including the increasing importance of nickel and stainless steel production at that time, the low market capitalisation of the company at the time of the announcement (it was around $2 million in the period before the announcement), the presence of short selling with positions that had to be covered, director and management/consultants purchasing shares and potentially unquantified information leaking from the field. Stoker (2005) highlights the ambiguity in the consultant geologist's statement associated with the release of the assays as a key impetus for the introduction of the JORC code as follows:

"*The Consulting geologists, Burrill and Associates Pty Ltd quote that the mineralised zone has an indicated length of 1000 ft and a minium width of 65 ft*".

However, a statement in this manner defining observable mineralisation trends is not unlike many statements reported now and it is probable that Burrill and Associates Pty Ltd would be deemed competent persons under the current JORC code had it been present at the time. What Poseidon Nickel NL and many other companies with similar but not so grand, speculative share price runs demonstrate is the attraction to investors of junior explorers with the first hints of a potentially huge discovery.

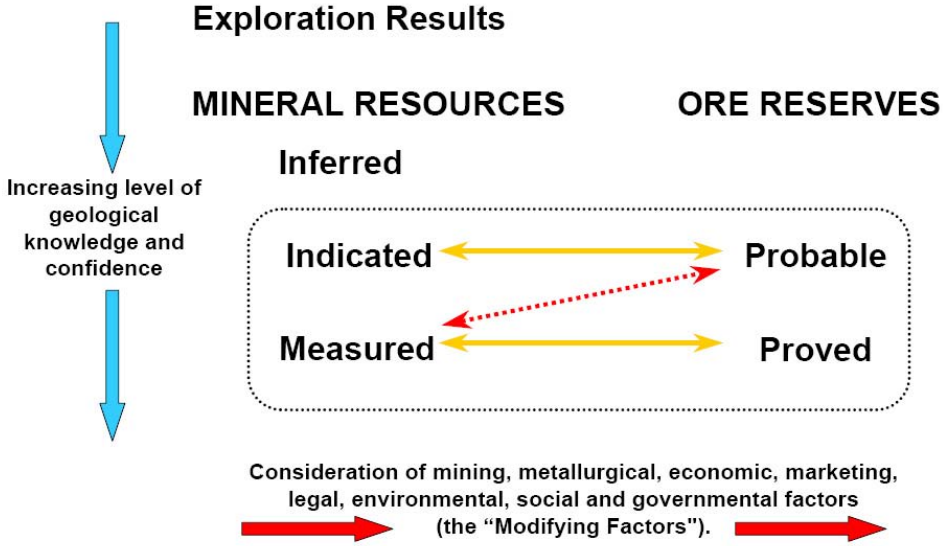
This contrasts with intent to deceive as demonstrated by Canadian junior, Bre-X Minerals Ltd with its discovery of the Busang Gold deposit in Indonesia. Busang was purchased in 1993 and significant gold intersections were announced in October 1995. The estimate of the project and hence, the company's value increased over time; in 1995 it was 30Moz, in 1996 it was 60Moz, and finally in 1997 it was reported at 70Moz. The Bre-X share price increased to C$280 per share by 1997 (split adjusted) and at its peak the company had a market capitalisation of US$4.4 billion (Wikipedia, 2009). In 1997 as part of a development program involving Freeport McMoRan Inc., Freeport conducted check core assays and subsequently announced the discovery of insignificant amounts of gold. Later work by independent consultants confirmed the presence of 'salting' including the addition of shaved jewellery.

The Bre-X fraud is an extreme case highlighting the level of due diligence required in remote but high-value projects. However, the willingness of investors to speculate will always remain a concern in early exploration success irrespective of JORC code reporting standards, and this represents a challenge in negotiating fairly priced M&A activity for companies involved in early stage discoveries.

1.8.2 Reporting of Reserves and Resources

The Joint Ore Reserves Committee (JORC) code for the reporting of ore resources and reserves has changed little since it was first proposed in 1994 (Stoker 2005). The code is relatively simple and separates three categories of resources which reflect increasing levels of geological confidence (inferred, indicated and measured) with resources in the latter two categories able to be converted to reserves with consideration of 'modifying factors' which are mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors (see Figure 5).

Figure 5. Diagrammatic representation of the JORC Code for the reporting of mineral resources and ore reserves.



From Stoker (2005).

The strict category definitions are defined in Table 1 for both resources (Table 1a) and reserves (Table 1b).

Table 1a. The JORC Code classification of resources.

Inferred Resource

An 'Inferred Mineral Resource' is that part of a Mineral Resource for which tonnage, grade and mineral content can be estimated with a low level of confidence. It is inferred from geological evidence and assumed but not verified geological and/or grade continuity.

It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes which may be limited or of uncertain quality and reliability.

Indicated Resource

An 'Indicated Mineral Resource' is that part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a reasonable level of confidence.
It is based on exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are too widely or inappropriately spaced to confirm geological and/or grade continuity but are spaced closely enough for continuity to be assumed.

Measured Resource

A 'Measured Mineral Resource' is that part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a high level of confidence.
It is based on detailed and reliable exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are spaced closely enough to confirm geological and grade continuity.

From ASX (2006).

Table 1b. The JORC Code classification of reserves.

Proved Reserve

A 'Proved Ore Reserve' is the <u>economically mineable part of a Measured Mineral Resource</u>. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments and studies have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that <u>extraction could reasonably be justified</u>.

Probable Reserve

A 'Probable Ore Reserve' is the <u>economically mineable part</u> of an Indicated, and in some circumstances, a Measured Mineral Resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments and studies have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors These assessments demonstrate at the time of reporting that <u>extraction could reasonably be justified</u>.

From ASX (2006).

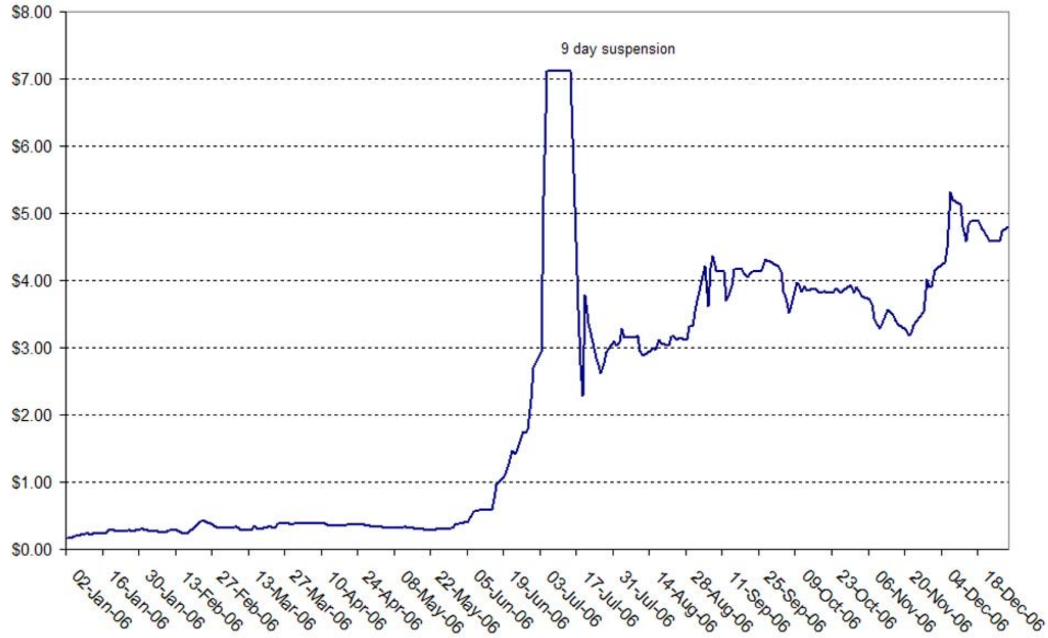
While the code is clear in terms of the level of confidence (low, reasonable or high) of a resource estimated by a competent geologist, this level of confidence can be subjective between different deemed competent geologists. In addition, while the ASX adopts the JORC code for reporting by resource companies, penalties for breaches appear minimal and in the worst case, a retraction of the resource statement may be all that is required. This often stems from the 'subjective' element as to what constitutes the different levels of confidence and in practice, is an untested part of the code.

This was highlighted in the case of Australian Mining Investments Ltd. (ASX code AUM), (now CuDeco Limited, ASX Code: CDU) when on the 29th June 2006, it reported an inferred resource of 59 million tonnes at 2.04 per cent copper equivalent for its Las Minerale orebody which is part of the Rocklands Group Copper Project near Cloncurry in north western Queensland (Australian Mining Investments, 2006).

The announcement stimulated a share price rally from below $2 to peak briefly around $10 before subsequently falling back to a closing price of $7.11 when a trading halt was requested on the 5th July (ASX 2006). The company was suspended for nine days until it reported an updated resource on the 13th July 2009 (CuDeco 2006). The 13th July 2009 release reclassified the previous 59 million tonne inferred resource to a 25 million tonne inferred resource and with 34 million tonnes as target mineralisation based on the fact that the company's competent person had extrapolated the mineralisation from drill hole data and this did not meet the inferred resource confidence criteria. The share price first fell to $2.28 then immediately recovered to over $3.00 (Figure 6).

In this case, while the initial resource statement was retracted and then restated, investors who had bought shares at the peak share prices lost money as well as those investors who sold when the share price overshot on the downside.

Figure 6. Cudeco Closing Share Price during 2006.



Data sourced from Stock Resource.

Accidental or purposeful overstating of resources by companies has been frequent in the past (e.g. ASX 2009), and particularly in takeovers where it may take several months or even years for the incoming management team to appreciate the overstatement and then seek to write off resources so that the annual resource statement trends towards realistic levels. There are a number of examples highlighted in the financial markets but Normandy Mining Ltd's writeoff of a significant proportion of the gold resources of Great Central Mines Ltd's Bronzewing mine in theyears following the 1999 takeover by Yandal Gold Pty Ltd. is a prime example.

Hence, while the JORC resource and reserve reporting code is resilient with few changes since its establishment in 1994, its application can be variable and there continues to remain enough 'flexibility' within the code in the estimation of resources and reserves that indicates careful due diligence is paramount in M&A activity.

1.8.3 Valmin Code

The Australian Institute of Mining and Metallurgy and Mineral Industry Consultants Association comprising a number of bodies (AIG, MICA, AusIMM, Minerals Council of Australia, ASX, ASIC, SIA) created the Valmin Code. This Code provides a set of fundamental principles and supporting recommendations regarding good professional practice to assist those involved in the preparation of Independent Expert Reports that are public and required for the assessment and/or valuation of mineral and petroleum assets and securities so that the resulting reports will be reliable, thorough, understandable and include all the material information required by investors and their advisers when making investment decisions (Valmin 2005).

The Valmin Code was first issued on 17 February 1995 and the second on 22 November 1997 with the current edition issued in 2005.

The relevance of the Valmin code is to ensure accuracy, materiality and reliability of Independent Expert's reports in mergers and acquisition activity in supporting or otherwise, Board recommendations. As noted by Blumer (2000), it is the independence that is critical, particularly in light of the fact that the outcome may differ from the expectations of company management which is paying for the report and generally providing data for the valuation.

In this research, Independent Expert's reports provide important, publicly available valuation parameters which can be directly compared to share price movements. As discussed in Chapter 3, share price movements inconsistent with these valuation parameters indicate that at the time the market was focused on alternative valuation criteria differing from those used by an Independent Expert.

The Valmin Code is non-prescriptive on valuation methodology, but instead simply states that the expert must utilise valuation methods suitable for the mineral or petroleum assets or securities under consideration (Valmin 2005). Selection of an appropriate valuation method will depend on such factors as the:

(a) nature of the valuation;
(b) development status of the mineral or petroleum assets and
(c) extent and reliability of available information

It also notes that decisions as to the valuation methodology or methodologies to be used are solely the responsibility of the expert and must not be influenced by the commissioning entity, reasserting the independence of the process.

If a company has current or future cash generating assets, the Valmin code recommends discounted cashflow/net present value methodologies *inter alia*. However, increased subjectivity emerges in the valuation of exploration properties and there are some novel approaches deemed applicable which are briefly outlined in the following sections.

1.8.3.1 Multiple of Exploration Expenditure

The multiple of exploration expenditure method is a process whereby a subjective factor (also called the prospectivity enhancement multiplier) is applied to previous relevant exploration expenditure to help derive a value for the tenement. In addition, a proportion of prudently budgeted proposed exploration program expenditure can be added to the historical expenditure.

1.8.3.2 Joint Venture Terms

The terms of a proposed joint venture agreement may be used to provide a market value based on the amount an incoming participant is prepared to spend to earn an interest in the property.

1.8.3.3 Empirical Methods

Market value determinations may be made according to the Independent Expert's knowledge of the particular property. This can include a discount applied to values arrived at by considering known and/or conceptual target models for the project area. The market value may also be rated in terms of a dollar value per unit area or dollar value per commodity unit. This latter method is termed a "Yardstick" or a "Real Estate" approach. Both methods rely on infrequent sales of similar assets and are inherently subjective, reliant on so-called technical considerations and/or the informed opinion of the valuer.

1.8.3.4 Similar Transactions

When commercial transactions concerning properties in similar circumstances have recently occurred, the market value precedent may be applied in part or in full to the property under consideration.

The techniques described above highlight potential value uncertainty in Independent Expert's reports, particularly where there is a significant value assigned to an exploration portfolio relative to non-exploration assets. This value 'subjectivity' highlights the difficulty in the analysis of grass-roots project transactions. Whilst there are many papers on reviewing valuation techniques for these types of projects (eg. Malone 1994, Grant, 1994, Appleyard, 1994, Goulevitch & Eupene 1994, Onley 1994), there is understandably no research analysing these valuations or purchase prices of exploration projects which are later compared to the ultimate value of these properties after an intensive exploration program.

1.9 Idealised Resource Companies

The 'idealized' business cycle for a mining company is to explore and locate a mineral deposit, conduct pre-feasibility and feasibility studies to establish the economic viability of the exploitation of the deposit and then to proceed with its development. As each ore deposit is of finite life, the resource company is likely to conduct an active exploration program to maintain a 'supply' of future deposits capable of exploitation to sustain the company's viability and existence.

Variations on this 'idealized' cycle may involve junior explorers selling exploration discoveries prior to development – a common practice in the Canadian industry. Alternatively, companies may specialise in downstream processing (smelting, refining and fabrication, in some cases) and may specialise in one or a selected number of commodities.

As discussed Chapter 3, the opportunities for larger resource companies to grow in the resources sector can become limited given the size of the total world market for some commodities, particularly metals like gold and base metals. This is exemplified by the four largest global resource companies excluding oil companies (BHP Billiton, Rio Tinto, Anglo American and Xstrata) which have necessarily diversified across a number of commodities to attain earnings and cash flow levels capable of supporting their large market capitalisations and growth objectives.

1.9.1 Traditional Resource Company Growth

Resource companies traditionally have strategies encompassing project development to maintain or grow future earnings. Companies either discover or acquire mineral resources which may not be fully developed or offer expansion opportunities. Management then seeks to add shareholder value through the application of capital to projects that produce a positive NPV discounted at the company's WACC or a generally higher, company specific hurdle rate.

Apart from NPV accretive projects, Bartrop and White (1995) identified other key elements in acquisition targets in a survey across fifteen mining companies, as follows:

- Minimum mine life – greater than five years, depending on size of company
- Minimum gross revenue – generally applies to larger companies
- Minimum size – variations to some degree on above two;
- Cost position significant – projects which fall in the lowest quartile is the common ambition;

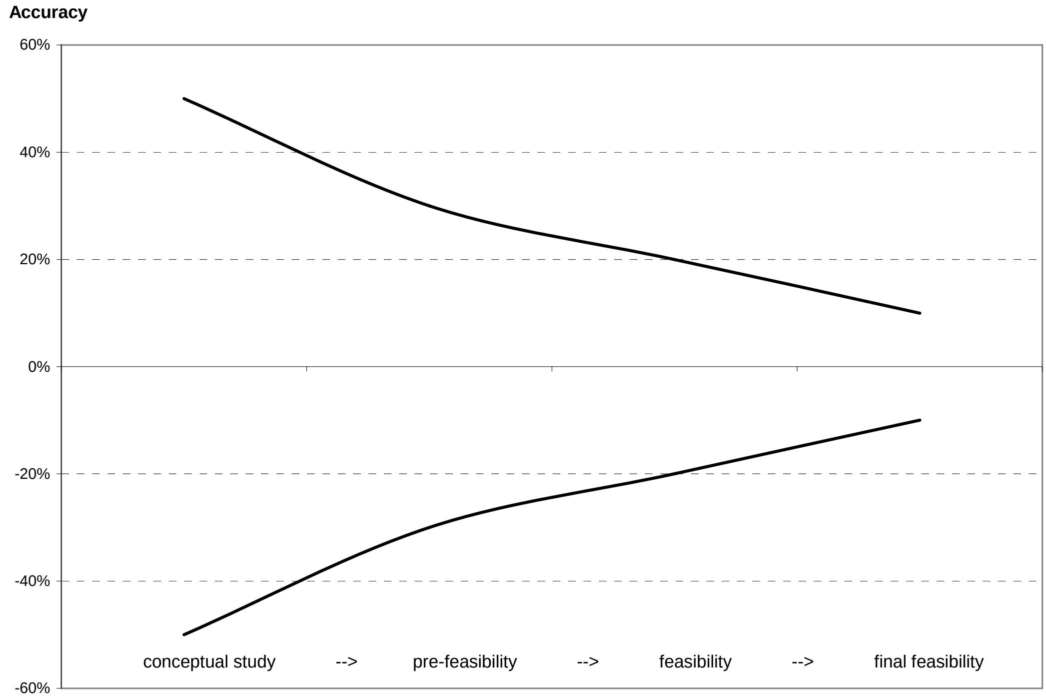
- Commodity – chosen on the basis of strategic fit or the project may be selected for commodities that are counter to market cycles;
- Good access and close to markets (although less important with high value products such as gold);
- Mining methods to be employed and where the company expertise lies – underground or open cut or a combination of both

While the survey is now dated, it is likely to remain relevant as not surprisingly, the most important specification appears to be a minimum size, which translates into a minimum production rate over a minimum mine life. All companies acknowledge the risk of bringing short mine-life projects into production to find that unexpected technical factors undermine the project economics which cannot be recouped with profitable production in future years. Larger companies also apply minimum annual revenues to ensure the project will be material in their existing project portfolio. A strategic fit along with size and cost curve position appear to be the most important elements in determining project acquisition targets.

1.9.2 Project Development De-risking

The valuation of identified resources becomes increasingly objective, first with increasing geological confidence in the resource through further delineation and infill drilling, and second, through continual refinement of the costs associated with mining, milling and marketing as the project advances towards a feasibility study. The latter can be illustrated by the ‘trumpet curve’ notion (see Figure 7). The valuation of operating mines, or mines on care-and-maintenance, have scope for the greatest reliability, given that there is an historical basis for the mining method, metallurgical performance and value of a saleable product.

Figure 7. Trumpet curve – expected accuracy for a given project stage.



Based on Noakes and Lanz, (1993).

This increasing confidence in the valuations derived from more advanced projects is likely to lead to lower levels of discount in the acquisition prices relative to the theoretical ‘true’ value of the project determined under the assumption of certainty, i.e. as if all operating risks could be known and quantified. In contrast, less well known projects will attract a greater discount given the risk inherent in the valuation process from less reliable parameters. This discount can take the form of higher discount rates in NPV valuations, the use of more conservative or a range of parameters in the valuation process and/or using sensitivity analysis or Monte Carlo simulations to test the financial robustness of and the distribution of potential returns from a project.

While a risk-adjusted valuation range is typical of a company’s approach to assessing potential acquisitions, it can also lead to major discrepancies between a company’s value of a project versus the value assigned to the project by the stock market. In particular, many stock market participants do not change discount factors to reflect the changing risk profile of the various stages of project development and hence, any discount simply reflects the time-value of money to first project cash flows.

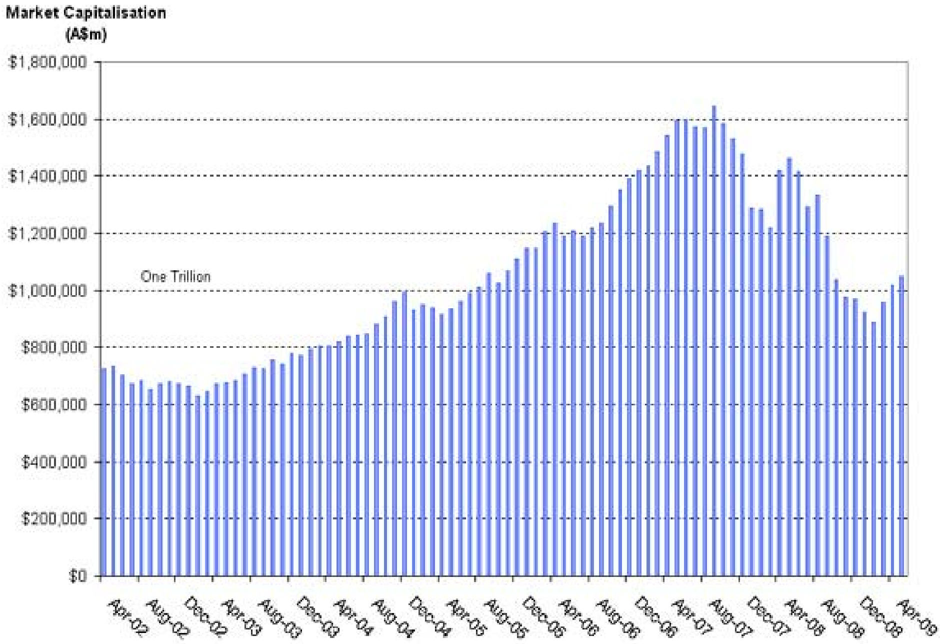
1.10 The Australian Stock Market

The Australian Stock Market is operated by the ASX (Australian Securities Exchange Limited). It was formed in 1987 by legislation of the Australian Parliament which enabled the amalgamation of six independent stock exchanges that formerly operated in the various state capital cities. Each exchange had a history of share trading dating back to the 19th century (ASX website: http://www.asx.com.au).

Approximately 41 per cent of the adult Australian population own shares, either directly (via shares or other listed investments) or indirectly (via unlisted managed funds), according to the latest Australian Share Ownership Study (ASX 2009a). The total ownership level has declined from 46 per cent when the study was last conducted in 2006, reflecting investor responses to recent market volatility.

Figure 8 plots the market capitalisation of domiciled companies listed on the ASX (ASX 2009a) on a monthly basis since April 2002. The chart shows the market peaking at around $1.6 trillion at the height of the recent resources bull-run in early to mid 2007 and to the time when the first signs of the US subprime mortgage collapse started emerging. The market capitalisation of the market declined with the subprime collapse and after a brief recovery in early 2008, declined sharply to below $0.9 trillion with Global Financial Crisis. The recent recovery in the second quarter of 2009 has resulted in the market capitalisation moving back above $1 trillion, a similar level to the market back in 2005.

Figure 8. Market Capitalisation of the Australian Stock Market on a monthly basis since April 2002.



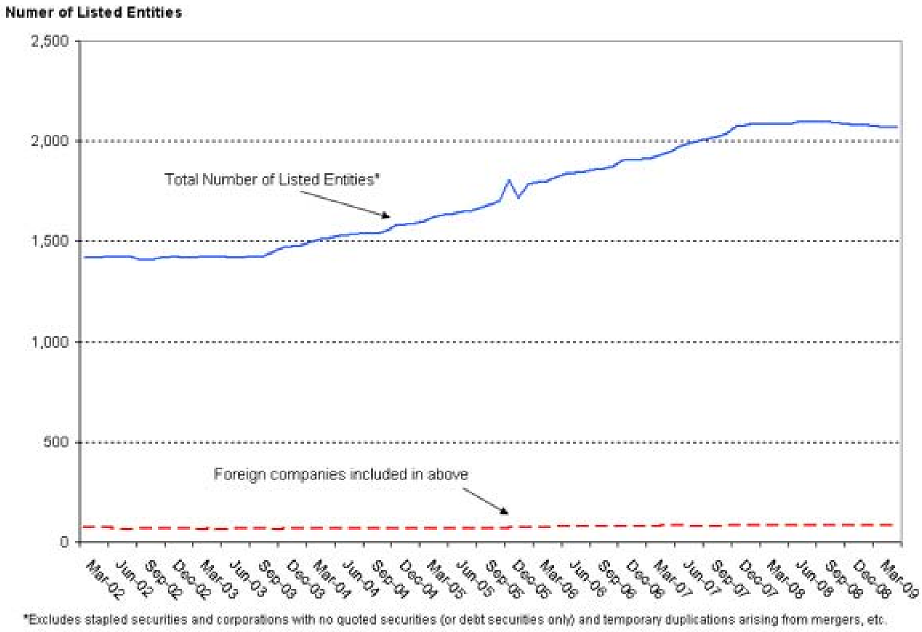
Based on data from ASX (2009a).

Figure 9 plots the total number of listed entities on the ASX excluding some minor exceptions (stapled securities, listed managed investments, etc.) since March 2002 and also on a monthly basis. Figure 9 also plots the number of foreign companies which are also included in the total number of listed entities (ASX 2009b).

The number of listed entities increased over the recent boom with listings increasing from below 1500 in March 2004 to peak at 2099 in July 2008 although the rate of growth decreased markedly after December 2007. This also corresponds to a time which is not long after the first signs of the US subprime mortgage collapse appeared (late August 2007). The stability in the number of listed foreign companies (65 to 85) indicates a minimal contribution of foreign companies during the resources boom and subsequent downturn.

As mentioned earlier and derived from a separate ASX report (ASX, 2009), approximately 800 of the total number of listed entities are mining entities.

Figure 9. Total number of listed entities on the ASX on a monthly basis since March 2002. Numbers of listed foreign companies are also plotted separately but are also included in the total numbers.



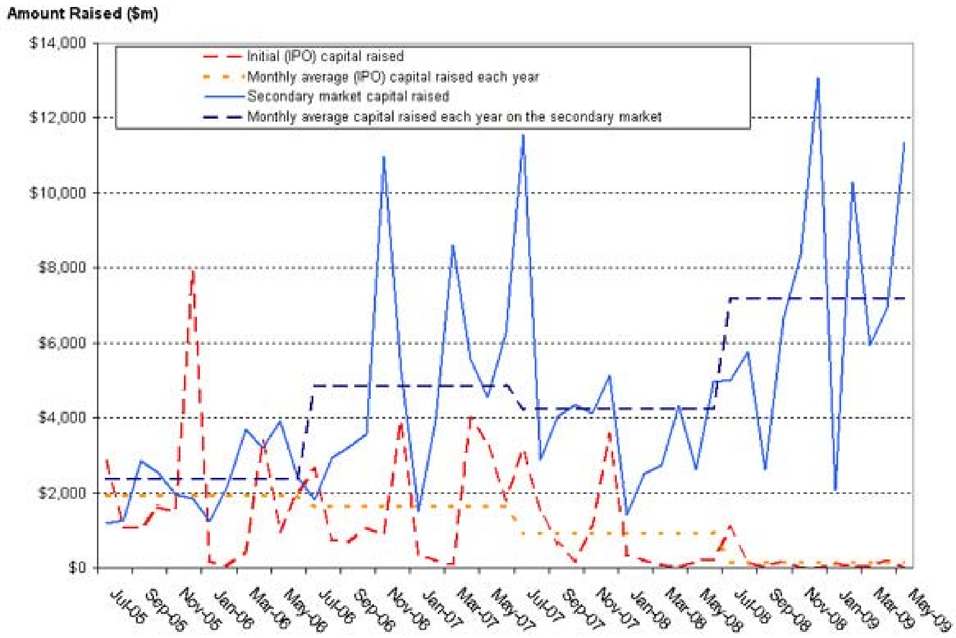
Based on data from ASX (2009b).

Figure 10 plots the capital raised on the ASX since July 2005. It is separated into capital raised from initial public offerings (IPOs) and capital raised on the secondary market (rights issues, placements, share purchase plans, etc.). In both cases there are monthly averages for each financial year to highlight broader trends.

The two types of capital raisings highlight interesting trends which reflect factors occurring across all markets during this period. Using monthly average data for each year, in FY2006 there was a rush of IPOs, particularly in the mining sector and an average of almost $2 billion was raised monthly in FY2006. This declined modestly to $1.64 billion during FY2007 but then fell sharply to $933 million in FY2008 and then collapsed to $157 million in FY2009. This trend is not surprising given the difficulties of floating new companies in the wake of the US subprime mortgage collapse, itself ultimately leading to the Global Financial Crisis.

In contrast secondary market raisings increased from FY2006 (monthly average of $2.36 billion) to FY2007 at average of $4.85 billion per month and then fell back briefly in FY2008 to average $4.22 billion per month before then surging in FY2009 to average $7.18 billion per month. As discussed in Chapter 3, a consequence of the Global Financial Crisis was the collapse of the debt markets, which forced many companies to the equity markets to raise capital to pay down debt given the uncertainty associated with refinancing near-term expiring corporate debt.

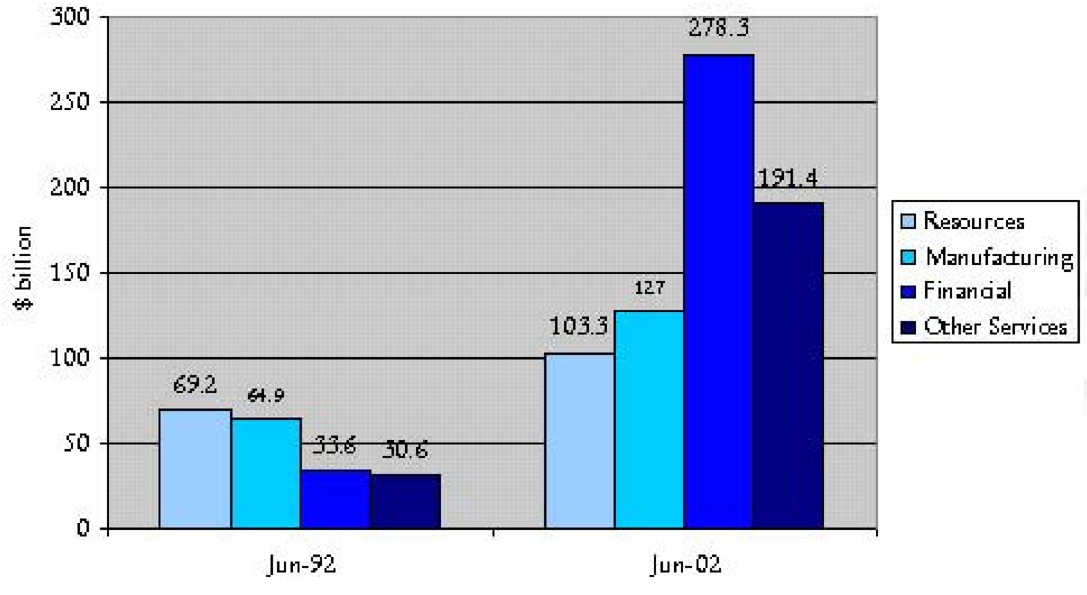
Figure 10. Capital raised on the ASX through IPOs and Secondary Market Raisings.



Based on data from ASX (2009b).

In reviewing the 1990's there were emerging trends in the growth of the various ASX industry sectors. This is demonstrated by the following chart which segregates the market into four arbitrary sectors (Resources, Manufacturing, Financial and Other Services) and compares the growth in each sector over a ten year period (see Figure 11). Table 2 below also summarises the percentage changes in these four sectors.

Figure 11. Change in market capitalisation by sector from June 1992 to June 2002.



From the ASX (2003).

Over this decade period, the domestic market capitalization increased by 253 per cent from $198 billion at the end of June 1992, to $700 billion as at end of June 2002 (ASX 2003) while it also corresponded to a period of strong share market returns (13.5 per cent per annum gross return for the 10 years to December 2000 according to the ASX (ASX 2001).

Table 2. Growth in the four sectors over the decade to June 2002.

ASX components	**30-Jun-92**	**30-Jun-02**	**Change**	
	A$b	**A$b**	**A$b**	**%**
Resources	69.2	103.3	34.1	49
Manufacturing	64.9	127	62.1	96
Financial	33.6	278.3	244.7	728
Other services	30.6	191.4	160.8	525
Total market	198.3	700	501.7	253

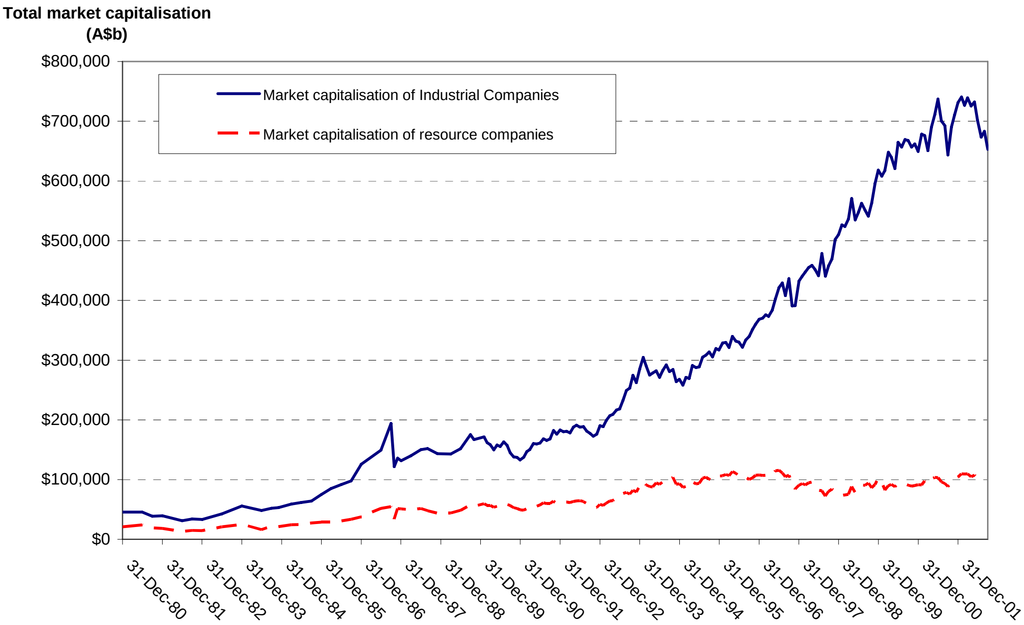
From the ASX (2003).

While the resources sector grew by 49 per cent over this period, it has been overshadowed by the growth in the Financial and Other Services area. In particular, there was the strong privatization push from the Federal Government which included the sale of the Commonwealth Bank, part of Telstra, the sale of Victorian power utilities as well as demutualization of AMP and NRMA. The ‘Other Services’ classification also includes communications and media stocks which have also grown significantly.

The decreasing size of the resources sector relative to the rest of market prior to the recent resource rally is also demonstrated in the charting of the market capitalization of the All-Industrials index and the All-Resources index since 1980 (Figure 12).

The All-Ordinaries is an index made up of the weighted share prices of approximately 500 of the largest Australian companies. It was established by ASX at 500 points in January 1980, and was the predominant measure of market performance until 2000. The companies are weighted according to market capitalisation (ASX 2003) but conveniently split into industrial and resource companies. The All-Resources index represents the metals and mining and energy components of this index while the All-Industrials index was all other stocks. The data has been derived from direct ASX data feed and has been manipulated by visual basic programs written by the author for this purpose.

Figure 12. The market capitalisation of the industrial and resource components of the ASX from 1980 to 2001.

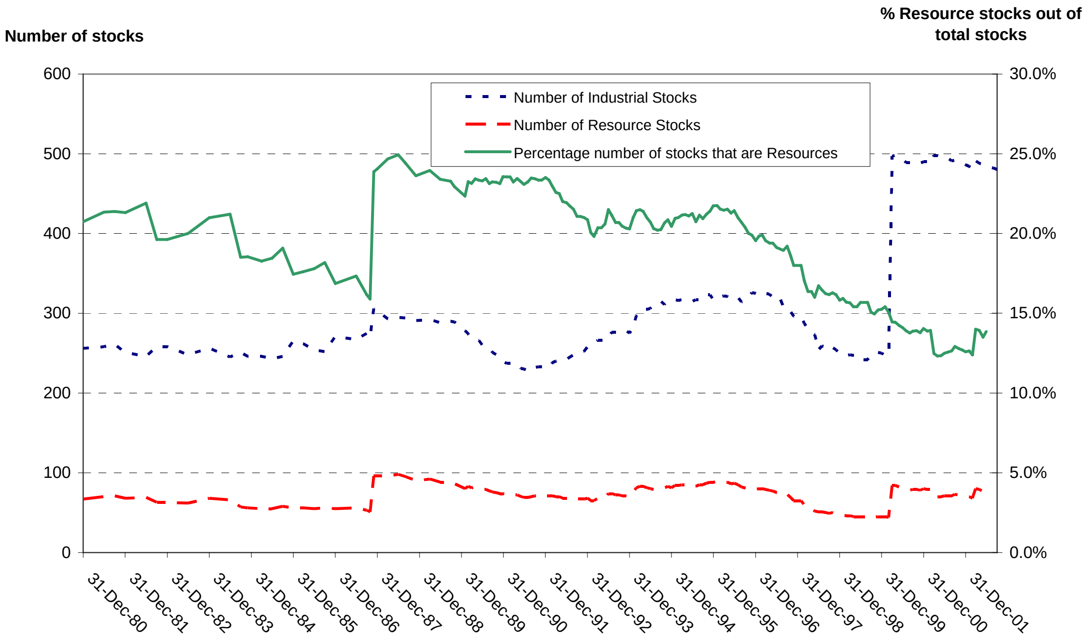


Raw data sourced from Stock Resource.

In Figure 12 it is evident that at the end of 1980, the All-Resources component of the All-Ordinaries Index represented 45.9 per cent of the entire index. At the end of 1990 it was 37.1 per cent but by the end of 2000 it was a mere 14.1 per cent of the All-Ordinaries index. Both indices have since been modified or replaced by the ASX with the last comparable data set as at the end of June 2002. At this date, the All-Resources Index was 14.5 per cent of the All-Ordinaries Index.

Chart 13 plots the number of companies within the All-Ordinaries split into industrial and resource companies over the same time period. It also charts the percentage of resources stocks compared to the total number of stocks within the All-Ordinaries index.

Figure 13. Number of industrial and resource stocks and resource stocks as a percentage of the All-Ordinaries Index on the ASX between 1980 and 2001.



Raw data sourced from Stock Resource.

Ignoring the significant change in composition of the indices from 1999 (see below) and another restructure in 1987, the number of resource stocks in the All-Ordinaries Index exhibits a declining trend since 1987. This reflects a combination of:

- Replacement by new larger industrial stocks in the All-Ordinaries index, e.g. Telstra, Commonwealth Bank.
- Consolidation of the index with takeovers and mergers of the larger resource companies, e.g. Norths, Ashton Mining, Comalco.
- The collapse of some resource companies e.g. Western Metals, which has resulted in a significant diminution of the market capitalization of the resource sector '

Abnormalities in the trends in Figure 13 reflect restructuring of the indices. The most recent restructure was on the 1 April 2000 when the All Ordinaries increased from approximately 250 stocks to 500 stocks although the change appears in the chart in late 1999. At that time the All Ordinaries ceased to be an institutional benchmark and was replaced by the S&P/ASX 200 & 300 indices. At that time the All-Ordinaries became a 'deep' index which was representative of almost the entire market (covering approximately 99 per cent of the market capitalization of the market) but included stocks which are effectively untradeable due low liquidity, etc. It became a 'TV' Index designed to show the movement of the whole market but not designed as an institutional benchmark. Its prior relevance was effectively replaced by the S&P/ASX 200 & 300 Indices. There was significant trading around 1 April 2000 as funds rebalanced their portfolios to match the new indices (pers comm. M. Hartmann, Macquarie Bank 2002).

1.10.1 New Indices

In March 2000, the ASX entered into a 15 year agreement with Standard & Poor's (S&P) Index Services under which S&P assumed the management of the ASX indices (All Ordinaries and the new benchmarks). The ASX states that it believed that partnering with an internationally renowned company such as S&P would bring longer-term benefits to ASX in terms of building awareness of the Australian market, attracting investment, and facilitating the development of ASX derivatives and Exchange Traded Fund businesses. (ASX 1999)

The new benchmark became the S&P/ASX 200 Index. This includes stocks from the S&P/ASX 100 Index along with an additional 100 stocks selected with an emphasis on liquidity and investability. The index is designed to have a fixed number of companies (200) in this index and if a constituent is removed, it will be replaced by another company in the S&P/ASX 300 Index. The S&P/ASX 200 Index represents approximately 89 per cent of the total market capitalisation of the Australian market. (S&P 2003).

Table 3. The S&P/ASX main indices and codes.

Index Name	ASX code
S&P/ASX 20	XTL
S&P/ASX 50	XFL
S&P/ASX 100	XTO
S&P/ASX 200	XJO
S&P/ASX 300	XKO
S&P/ASX Midcap 50	XMD
S&P/ASX Small Ords	XSO
All Ordinaries	XAO

From ASX (1999).

As mentioned earlier, this thesis is primarily focused on resource companies within the S&P/ASX 300 index given the greater universe for researching M&A activity.

1.10.2 Global Industry Classification Standard

On August 2, 1999 Standard & Poor's and MSCI jointly launched the Global Industry Classification Standard (GICS) which was claimed to ease the investment research and management process for financial professionals worldwide. Effective after the close on March 28, 2002, the Global Industry Classification Standard was restructured to consist of 10 economic sectors aggregated from 23 industry groups, 59 industries, and 122 sub-industries covering over 25,000 companies globally. This was modified in 2003 to consist of 10 economic sectors aggregated from 24 industry groups, 62 industries, and 132 sub-industries (ASX, 1999, S&P 2003).

Table 4. S&P/ASX 200 Index economic sectors, codes and weighting as at 9 June 2009.

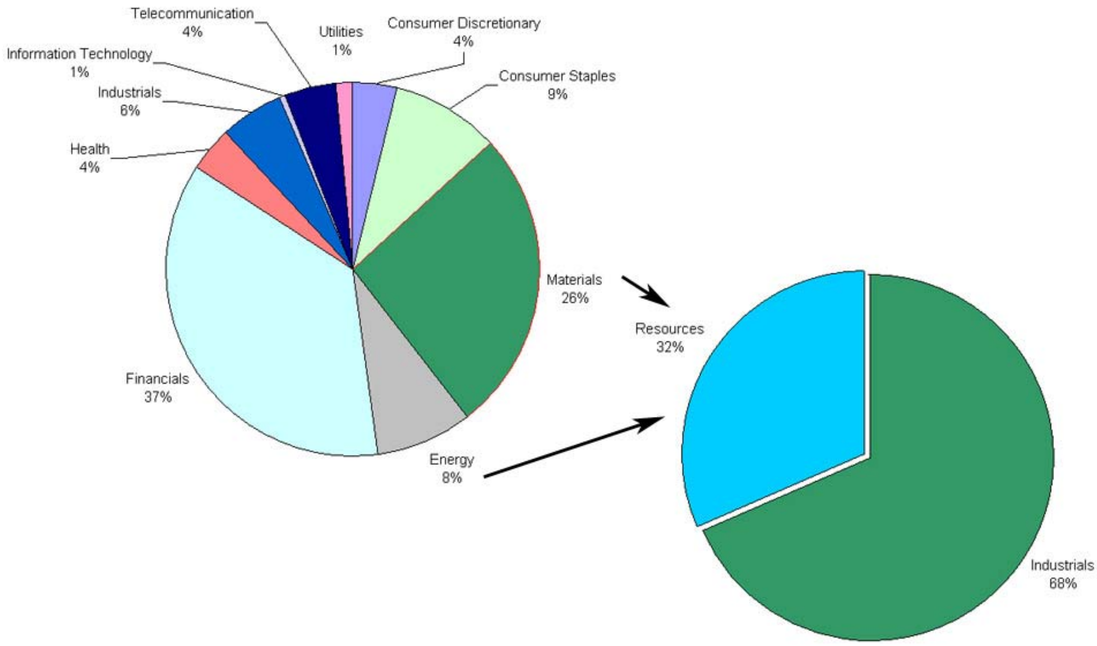
Index Description	Index Code	Weighting
Consumer Discretionary	S&P/ASX 200 CONS DISC IX	3.96%
Consumer Staples	S&P/ASX 200 CONS STAP IX	9.47%
Materials	S&P/ASX 200 MATERIALS IX	26.07%
Energy	S&P/ASX 200 ENERGYINDEX	8.26%
Financials	S&P/ASX 200 FINANCINDEX	36.47%
Health	S&P/ASX 200 HEALTHINDEX	3.77%
Industrials	S&P/ASX 200 INDUSTR INDX	5.59%
Information Technology	S&P/ASX 200 INF TECH IDX	0.53%
Telecommunication	S&P/ASX 200 TELECOM INDX	4.42%
Utilities	S&P/ASX 200 UTILITIES IX	1.47%
TOTAL		100.00%

Data sourced from Stock Resource.

Resource stocks now fall within the Materials and Energy Sectors. However the GICS Materials Sector encompasses a wide range of commodity-related manufacturing industries. Included in this sector are companies that manufacture chemicals, construction materials, glass, paper, forest products and related packaging products, and metals, minerals and mining companies including producers of steel.

This is highlighted in Figure 14 which diagrammatically portrays the relationship between S&P/ASX 200 index components and the resources and industrial divisions of the market.

Figure 14. The ASX 200 Index and the components in the resource sector as at 15 June 2009. The second chart splits the market between industrials (68 per cent) and resources (32 per cent).

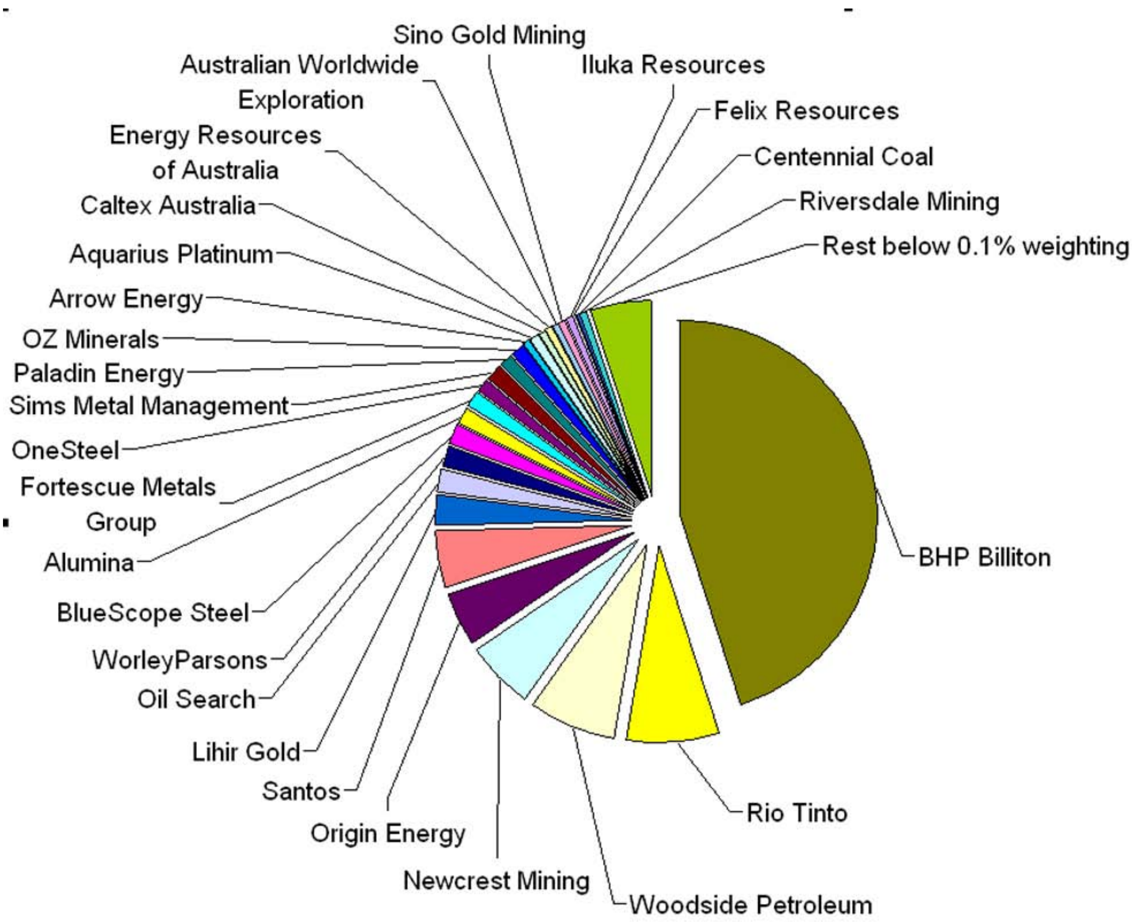


Data sourced from Stock Resource.

The new index structure 'weakens' the resources sector as very few fund managers now compete with a resource index but rather focus on outperforming the Materials sector with its diversity beyond resource companies. Nevertheless, the five-year resource rally which ended June 2008 has reasserted the importance of resources which has returned to around 32 per cent of the market, and similar to levels back in the 1980's and early 1990's.

Figure 15 outlines the major components of the S&P/ASX 300 Resources Index as at the 6 June 2009. Not surprisingly, the largest company weighting is BHP Billiton (45 per cent) and combined with Rio Tinto (8 per cent), represents more than half the index. Excluding the oil and gas companies, (Woodside, Santos, Origin), Newcrest (6 per cent) and Lihir (3 per cent) are the next largest non-petroleum or utility companies.

Figure 15. The major components of the S&P/ASX 300 Resources Index.



Data sourced from Stock Resource.

Unfortunately a breakdown of the companies within the smaller (resource) indices is now not available unless additional subscription fees are paid to access the data.

2.0 Review of Applicable Financial Markets Theory

This chapter reviews current stock market theory and its practical application to investment in mining securities. It is intended to provide an overview rather than a comprehensive review of financial economic theory given the breadth of the subject and keeping in mind that pertinent aspects will be drawn out in Chapter 3 and 4. It is also important to understand how stock market participants may interpret announcements regarding acquisitions as reflected in their subsequent investment actions and the movements, if any, of the share prices of the companies involved in the transactions. Price movements can be the initial signs that M&A activity is expected to add shareholder value.

The chapter also briefly reviews valuation techniques used within the financial industry. It will argue that the stock market changes the way it values mining companies during different phases of an economic or commodity price cycle. These changing valuation methods can lead to companies trading at a range of discounts or premia to their inherent NPV valuations. The fact that companies periodically trade at a discount to their NPV valuations provides opportunities for resource acquisitions below fundamental value and this has the capacity to generate value for the acquiring company.

Later, the chapter discusses the Australian legal framework for mergers and acquisition activity under the Corporations Act 2001 and other relevant legislation. In particular, it reviews strategies and trends in relation to schemes of arrangement versus traditional takeovers.

The last part of the chapter reviews current research on acquisitions. Most of this research is directed at industrial companies involved in mergers and acquisitions in the US, and outlines the factors that have been deemed important in their success or failure. There is some Australian research on the analysis of M&A activity although where the analysis has involved event study methodologies; this has generally been applied to non-resource companies only. This reflects the limited applicability in analysing resource company M&A activity using incumbent methods.

The breadth of the subject matter discussed in Chapter 2 reflects the background for subsequent discussions and analysis in Chapters 3, 4 and 5. Chapter 3 addresses resource market characteristics, Chapter 4 investigates resource share price movements while Chapter 5 presents a modified approach to event study methodology which has been applied to a set of transactions.

2.1 Literature Sources

Literature has been sourced from academic journals, general business and consultant papers, text books and finance and mining industry sources. However, there are two major issues that can 'colour' the research:

- The first is that industry leaders in the financial sector can be extremely forthright in expressing views, particularly those written in some text books. A typical example is the argument that cash flows are the major driver of share prices rather than earnings per share. The author along with other researchers (e.g. Copeland, 1996) believes that the evidence is inconclusive while others will argue it is almost definitive (e.g. Stewart 1991). The author considers that different factors influence share prices at different times and it is difficult to be authoritative on one specific factor even though it may be a more prevalent factor than others.
- Secondly, the effects of company announcements including profit and dividend releases, notification of impending acquisitions, increased capital expenditure programs, capital raisings, etc. are difficult to effectively analyse in isolation, particularly in studies seeking to incorporate statistically significant samples. This is because information may be linked with other factors that contribute to a price outcome but these factors may not be drawn out in the analysis. An example is that it is difficult to analyse the effect of the discount applied to the prevailing share price in unexpected equity raisings without some knowledge and analysis of the companies' reasoning behind each raising, which may be difficult to obtain. To extend this example further, we may find that equity raisings for gold companies are conducted at a premium when the gold price is rising but later, when it is falling, they are conducted at a steep discount. An average of these results does not represent

an accurate analysis of the equity raising premium or discount relationship with gold price trends.

In summary, market-related research is difficult and is likely to require a blend of quantitative as well as qualitative analysis. There is also an understated importance in simple observations of investment practices rather than theory postulation in isolation.

2.2 Financial Markets Theory

The purpose of stock market placement (investment) is to achieve a return on investment through either capital appreciation and/or income distributions. Reilly (1985) formally defines an investment as the current commitment of funds for a period of time in order to derive a future flow of funds that will compensate the placing unit for the time the funds are committed, for the expected rate of inflation, and also for the uncertainty involved in the future flow of funds. The importance of this additional compensation for risk is a critical assumption in modern portfolio theory. In fact Copeland et al. (1996) believe that at the limit if the supplier of capital does not receive a fair return to compensate for the risk he/she is taking, he/she will move his capital across nation borders in search of better returns relative to similar risk. If he is prohibited by law from moving his capital, he will consume more and invest less.

Stewart (1991) terms capital flows seeking appropriate risk-adjusted returns as *disintermediation*. He believes *disintermediation* operates within the stock market in line with other markets but where returns are measured by a company's earnings performance in relation to its capital structure. Changes in the return on capital are inferred to directly translate into the relative performance of the company's share price. Stewart (1991) summarises this tendency of value (funds) to flow from low to higher-return companies by the following equation:

Corporate return/ investors' required return = market value/capital

Or in symbols: $r/c^* = \text{market value}/\text{capital}$

This theory has important implications in that it links a company's internal performance as expressed by the return of its earnings or cash flow to its external share price performance. The required rate c* is termed the cut-off rate or cost of capital, and is the rate required by the company's equity investors or shareholders because as Stewart (1991) states, it is the return they could achieve by investing in other, comparably risky opportunities.

The market capital to book capital, or more correctly, replacement capital, ratio is know as Tobin's *q* ratio and there is a body of research devoted to the *q* theory of investment and the *q* theory of mergers (e.g, see Yoshikawa, 1980, Jovanovic and Rousseau, 2002).

Neoclassical theory of corporate investment is based on similar assumptions with management seeking to maximise the present net worth of the company as expressed through the market value of its shares. Tobin and Brainard (1977) outline how an investment project should only be undertaken if it increases the value of the shares. The securities markets appraise a project, its expected contributions to future earnings of the company and its risks. If the value of the project as appraised by investors exceeds the cost, then the company's shares will appreciate to the benefit of existing shareholders. That is, the market will value the project more than the cash used to pay for it and an increase in the share price will correspond to this value.

Therefore the rate of investment, i.e. the speed at which investors wish to increase the value of the capital stock, should be related, if anything, to *q*, the value of the capital relative to its replacement cost (Yoshikawa, 1980). Economic logic indicates that a normal equilibrium value for *q* is one for reproducible assets which are in fact being reproduced. Values of *q* above one should stimulate investment, in excess of requirements for replacement and normal growth, and values of q below one discourage investment.

Market value to capital ratios are also discussed later in Section 2.5.5. However, the *q* approach has not been particularly useful in the resource sector and stems from variable project portfolios owned by many resource companies as well as the general discrepancy between the historical book value of mining assets and their value in terms of their net present value (NPV) as operating assets, or even more so, as exploration assets. Hence the *q* ratio at one time may reflect one particularly attractive project but this may be atypical of future projects given the variability between all resource projects. There are also complications with the estimation of the *q* ratio as project lead and development timeframes may leave understated capital recorded on the balance sheet relative to market cash flow expectations upon project delivery. Hence, investors tend to prefer comparing resource company share prices with NPV valuations of their assets that are based on long-term commodity price and exchange rate assumptions.

As a consequence, NPV valuations per share have been a common analytical tool for many years and share price premia or discount could be viewed as a *q* type measure where the replacement capital is the NPV of the project. A high NPV *q* (share price divided by NPV value per share) might reflect a combination of the NPV value and risk of the project (s) which may or may not be reflected in the discount rate, and also a market assessment of management's ability to deliver shareholder value which may incorporate its track record of project delivery or operational performance and other factors, e.g. ability to secure financing, appropriate commodity hedging, etc.

The discount rate has traditionally been estimated using weighted average cost of capital (WACC) (Reilly, 1985). The equity component is generally derived from the Capital Asset Pricing Model (CAPM) which in combination with the dividend growth and earnings models, represents the generally accepted methods for estimating risk adjusted discount rates for evaluating mining projects (Taheri et a, 2009). However in financial markets there is now less rigour in NPV analysis as analysts commonly use benchmark discount rates across various sectors or may not even use NPV valuations in determining stock recommendations (Bartrop, 2009). Discrepancies between the 'theoretical' and market application of WACCs were highlighted recently with the Rio Tinto's unsustainable debt burden after acquiring Alcan in 2007. The debt to fund this acquisition reduced the company's WACC and conversely increased its NPV valuation. However, the market ignored this consequence and instead sold down the stock on the risk of company failing to meet its debt obligations and being forced into a dilutionary equity raising. Gold companies also consistently trade at a premium to NPV valuations derived using traditionally estimated WACCs and with individual valuations unrelated to the WACC derived NPV valuations. Therefore many analysts use a standard discount rate of 5 per cent applied across all gold companies and then rank the share price premia or discount to the sector average NPV valuation to help determine trading recommendations. This type of ranking removes the WACC variation across a sector as investors determine the merits or otherwise of the q NPV ratios.

The NPV discrepancies between project valuation for corporate purposes and company NPV valuations for investment decisions reflect a number of factors including discount rates (corporate hurdle, WACC, benchmark), commodity price and exchange rate assumptions as well as resource, operational and cost parameters. In the author's experience there has been an increasing preference for investors to seek standardized NPV valuations across all companies or as a sector such as gold above, so that they themselves can assess the probability of whether the value will be ultimately reflected in the share price and over what time period.

2.2.1 Capital Asset Pricing Model (CAPM)

The CAPM theory provides the basis for many applications within the financial sector and to a lesser degree, in the resource sector and is worth briefly reviewing for later discussion in this thesis. The model is based on determining a company's cost of equity capital by estimating the difference in a company's share price return with the return of the overall market using historical data. Reilly (1985) refers to it as an equilibrium asset pricing model.

The model segregates the expected or required rate of return on an equity investment into a risk-free rate such as a Government bond plus a risk premium reflecting the additional risk required by investors firstly, to invest in the stock market (above the risk free rate) and secondly for the non-diversifiable risk of a particular company specific risks. This can be summarised as:

$$R_j = R_f + B_j(R_m - R_f)$$

Therefore if:

R_j = expected return on stock *j*

R_f = risk free interest rate

R_m = expected return on a well-diversified portfolio of shares (such as the whole stock market)

B_j = 'Beta factor' or relative volatility of the return on stock *j* compared to the market average

It is evident that $B_j(R_m - R_f)$ adjusts the market risk premium above the risk free rate for the risk or volatility of returns of the specific company being assessed.

In determining a risk-adjusted rate for an investment, Hull (2008) recommends:

1. Take a sample of companies whose main line of business is the same as that of the project being contemplated.
2. Calculate the betas of the companies and average them to obtain a proxy beta for the project.
3. Set the required rate of return equal to the risk-free rate plus the proxy beta times the excess returns of the market portfolio over the risk-free rate.

While the CAPM has a long history, there several shortcomings relevant to the resource sector which are worth highlighting and hence this thesis has investigated alternative pricing mechanisms using probability weighted changes in company value. The short comings discussed here are the relevance of the risk-free rate, beta (alpha) relationships given the commodity price leverage of resource companies, and embedded option value.

2.2.1.1 Risk-free Rate

Long-term Government bond yields (say 10 year, or even longer timeframes in the US) are often used as a risk-free rate in the model. In the resource sector, they often provide the best approximation of the life span of a resource project. Reilly (1985) points out that historically 'risk-free' type rates have been volatile and as evident in the current economic environment, it reflects the contrasting forces of Governments seeking to fund their various economic stimulus packages following the Global Financial Crisis.

Under CAPM the premise is that unless an investment compensates the risk with a higher return, an investor will always chose the least risky return and hence a deemed 'risk-free' government bond. However, to segregate out the risk-free rate may not always be the case as:

- Investors may allocate a proportion of their investments to the resource sector under diversification strategies irrespective of expected returns. In the most basic case, an index fund will hold stocks in a weighting corresponding to their weightings in an index. The promise of investment returns to investors is the 'market return'.
- Other investors may not view risk-free rate as additive in their expected investment return. Rather it is likely to be viewed as an absolute minimum expected return to encourage investment so that it reflects an 'all or nothing' parameter. Also in the case of investing in resource companies, a multiple of the risk-free rate is usually a prerequisite for encouraging investment on a stock by stock basis.

The latter point is a subtle one but as outlined in Chapter 4, it means that the risk-free rate can be excluded from modelling the movement in a resource share prices as it will be inherent in a probability weighted value change causing the share price movement.

However, the first point could explain variation in the equity risk premium, which appears to have declined over time.

In the US, Kaplan and Ruback (1995) estimated a mean implied market equity risk premium of 7.78 percent from the inversion of cash flow analysis of a sample of highly leveraged transactions and state that this is comparable to historic arithmetic average market equity risk premia derived elsewhere. Bruce et al (1986) state that data from the Sydney Stock Exchange indicated an average risk premium of 6.5 percent pa to the Commonwealth bond rate was earned during the 1973-1983 period by this market. Officer (1992) stated that for over 100 years the equity risk premium has averaged approximately 8 percent in Australia although around this time there are indications that the premium had reduced.

In the author's experience over the last 10 years and while working at three investment banks, market analysts have lowered their equity risk premium from 6 per cent in the early 1990's to around 4 per cent in the late 1990's for valuing Australian companies. A 6 per cent equity risk premium was a 'market standard' for many years and based on the work of Officer (1992**),** Warren et al (2000) advised equity research analysts at one investment bank that an equity risk premium of 4 percent was now appropriate with supporting research on estimating historical excess returns as well as the premium implied from current market pricing.

The recent trends in lowering the equity risk premium has been reactionary as NPV valuation methods have failed to correlate with equity prices and analysts have struggled to justify recommendations based on fundamental valuations. Lowering the equity risk premium (as completely moving away from WACC discount rates) has been a partial solution but this thesis will argue that the issue relates to the market focusing on different valuation techniques at different times and NPV valuations become less relevant during bull markets (see Section 1.6.6).

2.2.1.2 Beta and Alpha Indices

Recalling, the β index is a measure of the sensitivity of a particular share price relative to changes in the return on the market portfolio. It is estimated by using the co-variance of the share return with the return of the market index, standardised (divided) by the variance of the market return, i.e.

$$\beta_j = \text{covariance } (j,\text{market})/\text{variance (market)}$$

Factors expected to influence the beta of a company include:

- The non-diversifiable (systematic) risk component of a company's activities, for example, higher risk resource companies versus retailers.
- Gearing. Theoretically, a higher geared company will have a greater beta due to the excess earnings over interest costs in a growing economy and potentially vice versa in a contracting economy.

- Sensitivity of the company's revenue to the economic or business cycle with a higher beta often reflecting greater earnings leverage to the movement in a cycle.

The beta relationship of a particular share to the market is a fundamental element of the CAPM as it is deemed that the beta index explains the total difference in the returns of a stock relative to the market, i.e. the individual risk premium of a share equals the market premium times β. While this ability has been called into question on many occasions (see Rubinstein 2006, Mehrling 2005, Campbell and Vuolteenaho, 2004; Vuolteenaho 2002; French 2003, Markowitz 1999, Fama and French 1992) it is the relationship between resource stocks and commodity prices that is important to this thesis. The reader will appreciate that β will constantly change given periods when Australian growth doesn't match world growth and the performance of individual commodity prices doesn't match the relative performance of the commodity complex as a whole. Hence, this thesis would argue that a constant such as β would be expected to change frequently– perhaps more frequently than traditionally assumed with CAPM.

The lack of accountability for this frequency (and CAPM in general) could be evident in alpha (α) - a coefficient measuring the portion of an investment's return arising from specific (nonmarket) risk. It is distinct from the amount of return caused by volatility, which is measured by β discussed above. For example, if a stock has a β of 1.5, it would be expected to gain a maximum of 15 percent when the index gains 10 percent. If, however, the stock actually gains 20 percent, the excess return above 15 percent represents the stock's alpha (http://www.allbusiness.com/glossaries).

2.2.1.3 Embedded Option Value

One problem with the traditional NPV approach is that many projects contain embedded options. In resource companies this may reflect opportunities to expand existing plant, the potential to discover new resources through future exploration programs and also participate in more favourable commodity prices in the future. Typical NPV corporate valuations of projects are likely to include sensitivity analysis around a base case or use Monte Carlo simulations to highlight this variability.

In M&A activity this embedded option value is evident in the valuation range often provided in Independent Expert's reports with an upside case assuming a number of positive factors or the occurrence of events not in the low case. However, the presence of operational and other parameters underpinning the low case are necessary to allow the embedded option value to be able to attain the high case.

Before continuing the discussion on embedded or real options, this thesis briefly reviews traditional option theory. As noted in Chapter 1, resource companies offer investors earnings, cash flow and resource/reserve value leverage to volatile commodity prices, where movements or expectations of imminent movements in the underlying commodity price can lead to enhanced movements in their share prices. On a first assessment, this could been attributed to option value but there are a number of factors that suggest this is not the case and this thesis argues that share price movements relate to probability weighted valuation changes (see Chapter 4) although there is no doubt resource companies have embedded options. In the following discussion, the reader should contemplate whether the market is using a sophisticated option pricing techniques to value, for example, the additional value created by a potential expansion of a plant to a resource company or alternatively, simply the probability weighted value of this occurrence. Empirical observation would indicate the latter and in the author's experience option pricing is only prevalent in option markets where traders are using option pricing models to derive expected option values.

2.2.2 Traditional Option Value Theory

Traditional options are exchange traded put and call options with the valuation of a call option being the initial focus of the Black-Scholes model (Black & Scholes, 1973). The model estimates the price of a call option as a function of five variables:

- the current spot price of the underlying share,
- the volatility of the share price (as measured by the standard deviation of the share's return distribution),
- the exercise price of the call,
- the term to expiration, and,

- the risk-free rate of interest.

This review looks at key elements of the formula rather than a detailed analysis of individual variables and for a detailed understanding of options theory the reader is referred to financial texts such as Hull (2008), Peirson (1990), Felmingham and Coleman (1995) and Reilly (1995).

The formula for the price of a call option (W) is as follows:

$$W = PN(d_1)-Ce^{-rT}N(d_2)$$

Where:

W = price of the call option
P = current share price
C = exercise price

N(d) is a cumulative standard normal density function with upper integral limit d and therefore $N(d_1)$ and $N(d_2)$ are probabilities with numbers between one and zero.

In continuous time e^{-rT} is an appropriate discount factor for the period T at a rate r. Therefore the term Ce^{-rT} is the present value of the exercise price (C).

Therefore under these groupings it is evident that the formula simply compares the present value of the exercise price with the current share price and probability weights both in accordance with the volatility of the share price.

Peirson et al (1990) summarise the assumptions incorporated in the model, which have also come under scrutiny with the global financial crisis, particularly with respect to the severely diminished liquidity occurring in rapidly falling markets. Nevertheless, the assumptions are:

- There exists a constant risk-free interest rate at which investors can borrow and lend unlimited amounts

- The share price follows a random walk in continuous time with a variance rate proportional to the square of the share price. The variance rate is a known constant.
- There are no transaction costs, taxes or other sources of friction.
- Short selling is allowed with no restrictions or penalties.
- There are no dividends, rights issues or other complicating features.
- The call is of the European type (i.e. exercise only at expiration date).

While there have been a number of modifications to the formula to cope with various factors beyond the basis assumptions, Peirson et al (1990) highlight that a key assumption that share prices follow a random walk over continuous time as not necessarily being the case in real markets. They also note that the measure of volatility implies that the distribution of possible share prices at the end of any given time period (such as at the end of the option's life) is lognormal. Nevertheless, they contend that both may represent reasonable approximations to actual behaviour.

Option valuation methodology based on the initial research of Black & Scholes, (1973) is pervasive throughout the finance industry and in many cases becomes self fulfilling given most participants in options trading utilise algorithms derived from the Black & Scholes model. However, if the returns reflected in the price of the asset are not in equilibrium with the risk-free return over a defined time period then it is difficult to assume the application of the Black-Scholes equation.

This latter point and the fact that resource shares can trade well below NPV valuations (implying a negative option value) as well as resource share price movements which often directly correlate to commodity price movements (see Chapter 3) indicate complexities in the application of traditional option methodology to resource shares. A negative embedded option reflecting the cost of a company being forced to close an existing mine could be argued to yield a negative option value but empirical observation of the market participants rarely supports this contention. However, it is the complication of applying specific parameters of a commodity price return distribution to the analysis of a resource company share price distribution that is likely to render the application impractical and unrealistic.

As noted by Hull (2008, p266), the most widely used model of stock price behaviour is a generalised Wiener process adapted for expected stock returns

$$dS = uSdt + \sigma Sdz$$

Where:

$S =$ stock price at time t

$u =$ expected rate of return on the stock

$\sigma =$ volatility of the stock price

A Wiener process is a particular type of Markov stochastic process and can be used for modelling geometric Brownian motion as well stock prices and relates future prices (or particle positions) as a function of standardized normal distribution and the square root of the time.

The application of a Wiener process is likely to have a limited application in the tracking of resource prices except for short intervals of time or during periods where there are no clear commodity price trends (share price drifts as described in Chapter 3). The correlation of resource share price movements with commodity prices is independent of time and reflects trends, generally evident from underlying macro-economic factors. Further out in time, the risk of a trend being replaced with a new trend increases but this is more likely to reflect macro-economic changes rather than a function of share price volatility and time although the volatility is expected to remain relatively constant during a trend period. As further discussed in Chapter 3, commodity prices reflect a combination of supply/demand fundamentals and speculative investment with both leveraged to world growth expectations and which are generally more discernable in the daily price movements than the application of broader growth projections which affect the prices of industrial companies. However as discussed in Chapter 4, the correlation of commodity prices and resource share prices is better reflected in absolute price levels on a daily basis than in a comparison of share price and commodity price returns, a further complicating factor and requiring study periods to be within a single trend period.

2.2.2.1 Embedded (Real) Options

Returning to the earlier discussion on embedded options, Cox et al (2000) argue that traditional option pricing theory is relevant to almost every area of finance and believe that virtually all corporate securities can be interpreted as portfolios of puts and calls on the assets of the firm. In a rather liberal interpretation, they cite an example in the valuation of contracts where the outcome to each party depends on a quantifiable uncertain future event. In an elementary form they consider a firm with a single liability of a homogeneous class of pure discount bonds. The stockholders have a "call" on the assets of the firm which they can choose to exercise at the maturity date of the debt by paying its principal to the bondholders. In turn, the bonds can be interpreted as a portfolio containing a default-free loan with the same face value as the bonds and a short position in a put on the assets of the firm.

Cox et al (2000) and other researchers including Dixit & Pindyck (1995) and in mining, Lima & Suslick (2006) and Samis (1995) have applied option methodology to capital investment where alternatives occur in specific time frames and where there is a quantified return for a fixed investment cost and usually in the form of a NPV. As noted by Dixit & Pindyck (1995), the options are the opportunities to invest capital at specific times to achieve expected outcomes in the future.

Cox et al (2000) utilize their binomial option pricing model and compare real options and financial options in Table 5.

Table 5. A comparison of financial and real options.

FEATURE	FINANCIAL OPTION	REAL OPTION
Underlying asset	Traded stock	Project. Non-traded asset. Trackable? Perfectly? *
Underlying asset price or value	Known	Estimated
Exercise price	Known and constant	Estimated and can change over time
Time to Expiration	Known and fixed	Estimated and can change over time
Volatility	Estimated (from observable time series) and can change over time	Estimated and can change over time
Interest rate	Risk-free	Risk-free?
"Leakage"	Dividends; interest coupons	Convenience yield; Income; Market share
Optimal exercise strategy	Decision to exercise exchange-traded financial options does NOT affect on the value of the underlying asset.	Decision to exercise the option often affects the future values of the underlying asset (investment).

From Cox et al, (2000).

To translate specific project parameters or characteristic to a financial option variable, Cox et al, (2000) also offer a comparison in Table 6.

Table 6. Translating project characteristics and a financial option's variables.

Project's Characteristic	Financial Option's Variable
Present value of assets to be acquired or project to be undertaken	Asset price
Costs or expenditures required to acquire the assets or undertake the project	Exercise price
Length of time decision may be deferred	Time to expiration
Volatility of underlying asset or project	Volatility
Time value of money to the company	Riskless interest rate
Cash flows and yields paid by the asset and not captured by holding the option	Cash dividends

From Cox et al, (2000).

In general, while modified option methodology can certainly be applied to capital investment decisions, complexity often overshadows practicality, particularly in the confidence in the outcome, given the number of estimated parameters and their ability to vary over time. As discussed earlier, traditional option valuations in resource companies are likely to involve translating the relevant commodity price return distribution characteristics to the option price valuation (generally ignored in the earlier research) or at least using parameters derived from a single trend period.

As indicated in Bartrop and White (1995), while future project options are appreciated at the time of project assessment, companies usually assess a defined project development route and may apply probability and sensitivity analysis to determine the robustness of the investment case. Unquantified option values (e.g. expansion potential, exploration success) may support a go-ahead for a marginal project but it is largely management's discretion as to how this is assessed and most lack the expertise and inclination to apply option methodology.

This mirrors empiricism in current markets where investors are more likely to invest on probability weighted project returns that may or may not equate to an option valuation for the same investment opportunity (see Chapter 4).

2.2.2.2 Real Options Framework in Takeovers

Hackbarth and Morellec (2008) developed a real option model to analyse stock returns in M&A activity in which the timing and terms of takeovers are endogenous and result from value-maximising decisions. It emphasizes the role played by efficiency and capital reallocation in the timing and terms of takeovers and examines the impact of growth options and disinvestment opportunities on the dynamics of mergers and acquisitions.

In broad terms, in a takeover the more inefficient firm sells its assets to a more efficient one and thereby puts its resources to their best use. At the completion of the takeover, the merged entity can either invest in new assets or divest some of the acquired assets. The researchers note that investment decisions are viewed as sharing two important characteristics. First, there is uncertainty surrounding their benefits. Second, the decisions are at least partially irreversible. Hence, the decision to enter a takeover deal, expand operations, or divest assets can be regarded as the problem of exercising real options.

Furthermore, the one essential difference between the option to enter the takeover deal and the options available to the merged entity after the takeover is that the former involves two firms. This implies that the timing and terms of the takeover are the outcome of an option exercise game in which each firm determines an exercise strategy, while taking into account the other firm’s exercise strategy. By contrast, the options to expand or divest represent standard investment decisions that can be made in isolation. Because the takeover surplus depends on the operating options available to the merged entity, the derivation of value-maximising strategies in Hackbarth and Morellec (2008) analysis proceeds in two steps. The first step determines the exercise strategies for the expansion and contraction options of the merged entity. The second step derives the equilibrium restructuring strategies, taking the optimal expansion and contraction strategies as given.

Hackbarth and Morellec's (2008) research and their predecessors provides an interesting approach to analysing the behaviour of stock returns in M&A activity although the complexity and the nature of assumptions (e.g. the takeover surplus may not reflect the operating options available to the merged entity but rather a market size premium) may render the process of limited predictive value.

2.2.3 Arbitrage Pricing Theory (APT)

Arbitrage Pricing Theory (APT) is a multi-factor model which offers greater breadth than CAPM and is further discussed in Chapter 4. Reilly (1985) states that the APT contends that the expected return of an asset can be modelled as a linear function of a number of factors which are deemed to influence share price returns. Each factor has a specific beta-coefficient. He notes that arbitrage pricing theory has three main assumptions:

1. Capital markets are perfectly competitive; including the ability of investors to short sell shares (Peirson et al, 1990)
2. Investors always prefer more wealth to less wealth with certainty (risk aversion described earlier)
3. The stochastic process generating asset returns can be represented as a K factor model.

The K factor model is of the form:

$$R_i = \alpha_i + \beta r_m + \gamma epsgrowth + \delta management + \xi oilprice + ...$$

Where

$R_i =$ the return on asset *i* during a specified time period

α_i = a constant, specific to asset *i*

$\beta r_m =$ expected returns based on the sensitivity of changes in the share price to changes in the market.

These are followed by a series of factors which are deemed to influence the share price, for example $\gamma epsgrowth$, where γ quantifies changes in the share price to changes in earnings per share (eps) growth such that if $\gamma = 0.6$ and eps growth accelerates by 10 per cent, then the share price would be expected to rise by 6 per cent. Factors included in this equation are typically focussed on broad economic variables such as industrial production, oil prices, inflation and wage growth but can include company specific factors.

The arbitrage concept applies in the sense that if the price of the asset is not in line with the model estimate at the end of a specific period, then arbitrage opportunities will bring the share price back into line with the model forecast.

Peirson et al (1990) presents the theory in its simplest case where the return on a particular security, *i*, can be described by the abbreviated equation.

$$R_i = \alpha_i + \beta_i (F - \overline{F}) + e_i$$

Where

α_i = a constant, specific to asset *i*

β_i = a measure of the 'sensitivity' of returns on asset *i* to 'factor' *F*

F = a risk 'factor' which explains returns

$\overline{F}$ = the expected value of *F*

e_i = an error term which has an expected value of zero and is specific to asset *i*

In this case using the risk 'factor' as *F*, the equation specifies that unanticipated variations in F will cause returns to change. If, as 'expected' $F = \overline{F}$ and $e_i = 0$ then $R_i = \alpha_i$. Therefore α_i is the expected return on asset *i*. Importantly, it is changes in *F* from expectations that lead to a change in expected returns. In terms of e_i, Roll and Ross (1980) describe this as a noise term, i.e., an unsystematic risk component idiosyncratic to the *i* asset. It is assumed to reflect the random influence of information that is unrelated to other assets.

In financial texts, the earlier formula is traditionally presented as follows:

$$R_i = \lambda_0 + \lambda_1\beta_{i1} + \lambda_2\beta_{i2} + ... + \lambda_k\beta_{ik}$$

Where

$R_i =$ expected return on asset *i*

λ_0 = the expected return on an asset with zero systematic risk; can be inferred as risk free rate

$\lambda_j =$ the risk premium for the *j*th factor; *j*=1,….k

β_{ij} = assets *i*'s sensitivity measure for the jth risk factor; *j*=1,….k

Roll and Ross (1980) believe APT offers a testable alternative to CAPM while Peirson et al (1990) note that the CAPM equation is really a special case of a single factor arbitrage pricing equation, the factor being the returns on the market portfolio. Nevertheless, this thesis would concur that APT offers a higher degree of sophistication which is more likely to cope with share price behaviour than CAPM and its single comparison to market portfolio returns.

Lastly, value-at-risk (VaR) is a category of risk metrics (c.f. risk measure which is the process to estimate a risk metric) that describes probabilistically the market risk of a trading portfolio (www.riskglossary.com). This incorporates assessing probability distributions for various influences on a portfolio and is akin to a modified version of arbitrage pricing theory. The use of VaR has increased dramatically and applied to a broad range of assets, for example, BHP Billiton's operating cash flow at risk (McCarthy, 2006) to investment bank currency trading positions or derivatives. This thesis views a probabilistic approach to share valuations and subsequent movements in share prices as a logical explanation based on empiricism and analysis outlined later in this thesis.

2.3 Efficient Market Hypothesis – Aspects and Phenomena

Research on the performance of bidders and targets in mergers and acquisitions are discussed later in this Chapter (see Section 2.7.4) but generally fall into two categories (Brailsford and Knights, 1998). The first category of studies deals with an examination of the effects of takeovers on share prices. The standard test involves the application of event study methodology which estimates the risk-adjusted abnormal returns on ordinary equity shares before and after the takeover event. The second category of studies focus on changes in reported accounting numbers following a takeover and profitability ratios are often analysed.

Brailsford and Knights, (1998) note that the arguments for the use of share prices stem from an underlying assumption about market efficiency and in a competitive market, prices should reflect an unbiased consensus about the value of information. The market efficiency cited is informational efficiency and forms the basis for the Efficient Market Hypothesis (EMH). The EMH states that asset prices in financial markets should reflect all available information; as a consequence, prices should always be consistent with 'fundamentals' (Beechey et al, 2000).

This section reviews the broad concepts of informational efficiency as its concepts are applicable in the analysis of share price movements and to special circumstances such as post announcement drift and price bubbles which are important to aspects of this research. Critics of EMH cite these circumstances as reflecting aspects of behavioural economics or behaviour finance with some justification although the shortcomings of the EMH are sometimes interpreted as simply misinterpretations of the model itself (Beechey et al, 2000).

2.3.1 Informational Efficiency

While Copeland et al, (1996) view market efficiency as equivalent to informational efficiency; in essence it is the assumption of an immediate response of the market to incorporate all relevant and publicly available information into a company's share price. The implications as outlined by Peirson et al, (1990) are that share prices 'fully reflect' all available information and hence, implies that 'mispricing' opportunities are not available to investors. Indeed, the Securities Institute of Australia (1998) comments that a significant task of a security analyst/portfolio manager is trying to forecast the events that might cause latent 'value' to be crystallised in a company's share price (events it describes as 'catalysts for value') but then EMH is theoretically expected to incorporate a probability weighted value for these outcomes.

Peirson et al (1990) comment that there are logistical constraints to the dissemination information in the market and not all investors will simultaneously hear the latest news which may be material to a company's share price. This can lead to the creation of excess returns as well as by trading market over-reaction and under-reaction biased price reactions to new information. Both these cases highlight that information impounding into share prices may not be immediate as hypothesised by the EMH.

Fama (1970) classified informational market efficiency into three forms which reflect available sources of information:

1. Weak form efficiency. This implies that the information contained in the past sequence of prices of a security is fully reflected in the current market price of that security;
2. Semi-strong form efficiency. This implies that all publicly available information is fully reflected in a security's current market price;
3. Strong form efficiency. This implies that all information, whether public or private, is fully reflected in a security's current market price.

Weak form is consistent with the Markov property of stock pricing discussed earlier (Hull 2008) while each successive form is cumulative with weak form efficiency implicit in semi-strong efficiency and so forth. Peirson et al (1990) state that an implication of strong form efficiency is that an investor cannot earn abnormal returns from having inside information. Hence, strong-form efficiency is unlikely to be widespread although there is ample evidence that it is lacking in the resources sector where increased trading volumes occur in the days leading to a material announcement by a company. Nevertheless most research is directed at supporting or discrediting EMH at a semi-strong efficiency level.

Semi-strong-form market efficiency requires that security prices adjust instantaneously and without bias to the public announcement of information. Therefore abnormal returns should not be received from a subsequent analysis of this information and tests of the semi-strong form of the EMH analyse whether there are any post-announcement abnormal returns associated with the public release of information (Peirson et al, 1990). These tests can be part of event studies as discussed later in Section 2.3.2.

Beechey et al, (2000) have reviewed a considerable amount of empirical research devoted to testing whether financial markets are efficient under the predictions of the EMH. Table 7 summarises some EMH predictions and the empirical evidence relating to each prediction from their selective survey.

Table 7. Predictions of the Efficient Market Hypothesis.

Prediction	Empirical Evidence
Asset prices move as random walks over time.	Approximately true. However: Small positive autocorrelation for short-horizon (daily, weekly and monthly) stock returns. Fragile evidence of mean reversion in stock prices at long horizons (3–5 years).
New information is rapidly incorporated into asset prices, and currently available information cannot be used to predict future excess returns.	New information is usually incorporated rapidly into asset prices, although there are some exceptions. On current information: In the stockmarket, shares with high returns continue to produce high returns in the short run (*momentum effects*). In the long run, shares with low price-earnings ratios, high book-to-market-value ratios, and other measures of 'value' outperform the market (*value effects*). In the foreign exchange market, the current forward rate helps to predict excess returns because it is a biased predictor of the future exchange rate.
Technical analysis should provide no useful information	Technical analysis is in widespread use in financial markets. Mixed evidence about whether it generates excess returns.
Fund managers cannot systematically outperform the market.	Approximately true. Some evidence that fund managers systematically underperform the market.
Asset prices remain at levels consistent with economic fundamentals; that is, they are not misaligned.	At times, asset prices appear to be significantly misaligned, for extended periods.

From Beechey et al, (2000)

As expected, Table 7 highlights mixed levels of support. There are also other areas where potential post-announcement abnormal returns or beta adjustments used to explain share price returns are called into question. These include post-announcement drift, price bubbles, the size effect or small-firm effect and the dividend-yield effect discussed in the next sections.

Empirical evidence from the author's experience supports the contention that it is information that is 'not yet in the market' that will instigate investment or divestment by certain portfolio managers, particularly in North America. Therefore the assumption that information is factored in the market implies that all facets of that information are ‘factored’ into the share price immediately following the announcement. In fact there are observable situations when material company announcements that would normally affect a companies share price are released after market one day (particularly on a Friday) and while the share price has not moved, investors reading the announcement on the following day do not invest as there is an assumption that the new information is indeed already factored into the share price. The question is whether this financial behaviour creates a self-fulfilling relationship in line with the EMH.

While there is certainly empirical evidence that supports EMH, there are many cases in the author’s experience where it is not supported. These fall into three categories:

- The logistical time for information to disseminate across market participants is certainly not instantaneous and depends on a variety of factors including the importance of the company within the market, the attention directed to it by market participants, additional media used for dissemination, timing of announcement, etc.
- Certain information is complex and may take hours or days to determine a valuation impact and the timeframe for this analysis is likely to be variable.
- Historically many portfolio managers in Australia will invest at least one day after an announcement given the time required for the sector analyst to present the recommendation to an investment committee seeking investment approval.

Overall, the concept of a share price rapidly moving towards a price that reflects additional value emerging from an announcement is not unrealistic. However, it is unrealistic to assume that the full value of every announcement is always ‘impounded’ instantaneously in the share price at the time of the announcement. Interestingly, Roll (1986) believes his hubris hypothesis whereby management in bidding companies pay too much in mergers and takeovers is consistent with strong-form market efficiency while in the Australian context and around that time, Walter (1984) found evidence in Australian takeovers for semi-strong efficiency.

2.3.2 Event Study Methodology

The announcement of merger and acquisition activity represents an 'event' and the subsequent reaction by the participating companies' share prices constitutes useful data in analysing the market's initial perceptions to the overall success of the proposed transaction.

Event study methodology is designed to statistically determine whether an event has caused cumulative positive or negative returns relative to normal expectations for the company's share price in question relative to market movements. Peirson et al (1990) note that there are many variants of event-study methodology but, for each 'event' it is important to establish:

- What is the information?
- When was it announced?
- Were there abnormal returns associated with its announcement?

They note that an important concept is that first, the information provides information only if it differs from market's expectations at that time. Otherwise, in an efficient market the effects of the information will already be reflected in the share price before the announcement.

Second, it is important to identify accurately the event date because the market may react in anticipation of the announcement as investors revise their expectations. The market should also react at the time of the announcement to any unanticipated information. However, the market should not continue to react after the date of the announcement because its response should be instantaneous and unbiased.

Finally, it is necessary to calculate the response of the market to the announcement, for example, as the percentage change in share price in excess of (or below) what would normally be expected to occur.

MacKinlay (1997) has reviewed event study methods and outlines the procedures involved. The null hypothesis in event studies is that the event has no impact on the distribution of returns. He also notes that the event window often includes the day of the announcement and the day following the announcement although in practice it is often expanded to multiple days. Andrade et al (2001) note that there are two commonly used event windows; the three days mentioned above or alternatively a longer window beginning several days prior to the announcement and ending at the close of the merger.

The abnormal return is the actual ex post return of the security over the event window minus the normal return of the firm over the event window. The normal return is defined as the expected return without conditioning on the event taking place. For firm *i* and event date *t* the abnormal return defined by MacKinlay (1997) is:

$$AR_{it} = R_{it} - E(R_{it} / X_t)$$

Where

$AR_{it} =$ Abnormal returns for time period *t*

$R_{it} =$ Actual returns for time period *t*

$E(R_{it} / X_t)$ = Normal returns for time period t with X_t is conditioning information for the normal return model

MacKinlay (1997) also notes that there are two common choices for modelling the normal return – the constant mean return model where X_t is a constant, and the market model where X_t is the market return. The constant mean return model, as the name implies, assumes that the mean return of a given security is constant through time. The market model assumes a stable linear relationship between the market return and the security return.

An estimation window needs to be defined in this type of model and MacKinlay (1997) states that the most common choice is using the period prior to the event window. He cites an example that in an event study using daily data, the market model parameters could be estimated over the 120 days prior to the event. Generally the event period itself is not included in the estimation period to prevent the event from influencing the normal performance model parameter estimates. Recent returns analysis in mergers and acquisition by Hackbarth and Morellec (2008) focused on a 90-day estimation period prior to a three day event window (one trading day before and after the announcement). In a recent Australian study Maheswaran and Pinder (2005) used a 70-day period either side of the announcement date using a modifed market model with the market return based on the All Ordinaries Accumulation Index.

This thesis tailors an event study methodology for resource companies in Chapter 5 as part of the analysis of resource mergers and acquisitions. Many recent takeovers involve schemes of arrangements (see Section 2.6.2.2) which can involve a gradual de-risking of the transaction and abnormal returns may not be evident due to positive incremental returns which are not individually abnormal but correspond to increasing market confidence that the target shareholders will agree to the scheme and which culminates with the final shareholder vote. This is exemplified in the Xstrata plc scheme of arrangement with MIM Holdings Limited in 2003 and which delivered low cumulative abnormal returns relative to the final offer price premium over the 30-day average share price prior to the initial announcement of a potential takeover (see Appendix 1).

As a last word in this chapter on event study methodology, MacKinlay (1997) notes that economic models (e.g. CAPM, APT) have been used to constrain statistically based normal return models. He comments that while CAPM was common in event studies of the 1970s, market discrepancies with the CAPM question the validity of the CAPM restrictions imposed on the market model and hence the results of the studies may reflect the influence of these restrictions. However, as this risk is avoided by using an unconstrained market model, the use of the CAPM based event studies has almost ceased.

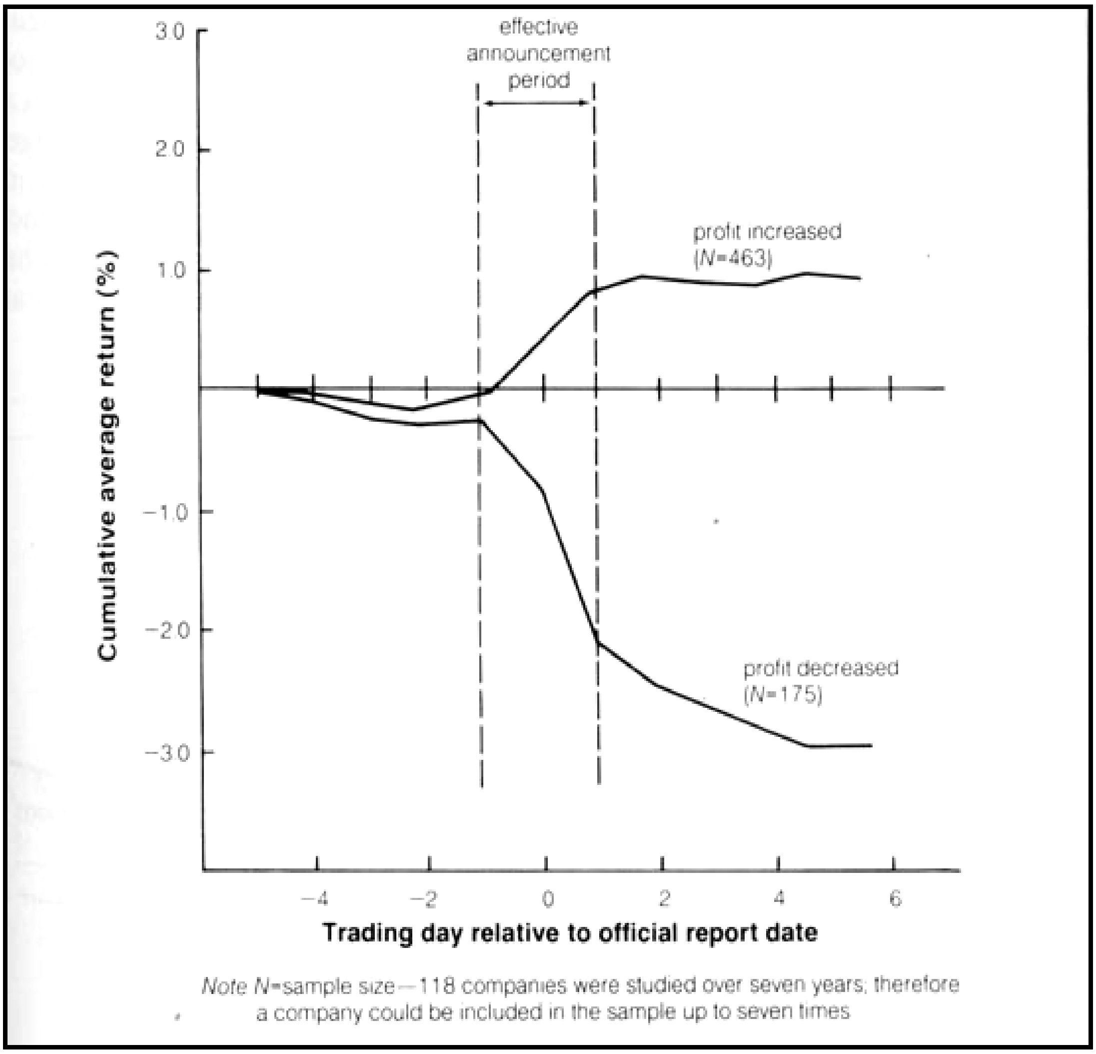
Similarly, other studies have employed multifactor normal performance models motivated by the APT. MacKinlay (1997) notes that a general finding with APT is that the most important factor behaves like a market factor and additional factors add relatively little explanatory power. Overall, he reports that the gains from using an APT adjusted model versus the market model are small and not warranted.

2.3.3 Post-announcement Drift

Semi-strong information efficiency theory postulates that at the date of an event, the share price should respond instantaneously and without bias. In an event study as described above, this behaviour would manifest itself as a sharp change in the cumulative abnormal return (CAR) immediately following the announcement. Thereafter, the CAR measure should display no pattern because there should be no further abnormal returns associated with the announcement.

However, Peirson et al (1990) note that one of the first anomalies to be documented was the tendency of the CAR measure to 'drift' in the period after the announcement. An example of 'post-announcement drift' is evident in Figure 16 which plots the CAR returns from 4 days before an announcement and 6 days after the announcement for two groups, one comprising companies which announced an increased profit and the other comprising companies which announced a decreased profit. The 'post-announcement drift' is evident in the CAR for the 'profit decreased' group as it continues to decline after the announcement.

Figure 16. Post Announcement Drift.



From Peirson et al (1990).

Figure 16 provides an example of the outcomes of event studies. In light of the previous discussion, it could be argued that the event window is too narrow. This is in line with the expected level of analysis that is likely to accompany a negative earnings release and which may stimulate further divestment given potential implications for the health of the business. The other implication is that the level of efficiency in the EMH is not as uniform as defined in the hypothesis.

Within mergers and acquisitions, post announcement drift over short periods of time has not created research problems in analysing M&A event studies. However, long-term negative drift (three to five years) can overwhelm a positive combined stock price reaction at announcement, making the net wealth effect negative (Adrade et al, 2001). Chapter 5 summarises the results of the event studies conducted in this research including estimating the cumulative abnormal returns in 252-day post-event periods. It is evident in this analysis that the returns are sometimes influenced by other factors not stemming from the M&A activity and hence, the influence of extraneous factors is likely to be greater over longer time periods.

2.3.4 Price Bubbles

There is a common hypothesis that share prices (and the prices of other assets) might display ‘bubbles’ on rare occasions. Various definitions of a ‘bubble’ have been proposed but it is generally stated that the following two features constitute a bubble Peirson et al (1990):

1. Prices show a strong tendency to rise for a period, possibly followed by a decrease which may be quite sudden.
2. As a result of the price rise, the price departs from the true, fundamental value of the asset.

Peirson et al (1990) note that while the first of these features seems to be readily observable in real stock markets, (for example, the crashes of October 1929 and October 1987), the presence of rising prices does not necessarily imply the presence of the second condition.

In reviewing asset bubbles, Hong et el (2008) note that they tend to tend to occur during periods of excitement about new technologies. As an example, the authors cite that in the U.S., speculative episodes have coincided with the following major technological breakthroughs: (1) railroads, (2) electricity, (3) automobiles, (4) radio, (5) microelectronics, (6) personal computers, (7) biotechnology, and most recently (8) the Internet. Interestingly, recent movements in resources and commodities prices are not mentioned!

Early last decade, Froot and Obsteld (1991) noted that interest in bubbles had waned in part because econometric tests had not produced persuasive evidence that rational bubbles could help explain stock prices. They proposed that some behaviour of US stock prices may be explained by the presence of a specific type of rational bubble that depends exclusively on aggregate dividends. In contrast Topol (1991) describes a ‘fads’ model in which any investor sets his bid and ask prices according to an additive learning process. On one hand, an investor adjusts his price to a value that is calculated from an incomplete information set. This is *‘limited’ rational behaviour*.

On the other hand, to capture some information believed to be held by the other investors, he also adjusts his price to the average prices of his nearest buyers and sellers. This is *mimetic contagion*. Stock price movement is then socially transmitted.

In recent times Hong et el (2008) note that the ‘Internet bubble’ stimulated new research which arrived at two conclusions; the first is that differences of opinion between investors and short sales constraints are sufficient to generate a price bubble; and second, once a bubble begins, it is difficult for “smart” money to eliminate the mispricing (i.e., there are limits of arbitrage). Their research focuses on the role of advisors and their communication process with investors in generating divergence of opinion and asset price bubbles. In particular, while smart investors recognize the heterogeneity in advisors, naive ones take whatever recommendations they receive at face value. They believe that all advisors are well-intentioned in that they care about the welfare of their advisees and want to honestly disclose their signals to investors.

A contributing factor to bubbles is potentially the inexperience of fund managers as identified by Greenwood and Nagel (2009) during the ‘Internet bubble’ or ‘Tech boom’. They found that young managers, but not old managers, exhibit trend-chasing behaviour in their technology stock investments and this was amplified by large inflows into their funds prior to the peak in technology stock prices.

As outlined in Chapter 1, momentum investing can lead to ‘bubble’ situations as exemplified by the uranium bull market where uranium company share prices factored in average enterprise values per resource pound for resources which were unlikely to be ever brought into production (Bartrop 2007). Personal discussions with many retail investors at that time suggested many investors did not anticipate that the companies would in fact bring these projects into production within a timeframe capable of delivering the expected value in the share price but rather were investing for short term gain on the momentum generated by an increasing (and probability manipulated) spot uranium price. While Topol’s (1991) ‘fads’ model could apply, the likelihood is that investors are simply drawn to speculative greed on a momentum run.

2.4 Market Dynamics

This section provides an empirical review of participants and market dynamics which is useful in applying pragmatic realism to advancing financial theory. It reviews both the participants as well as trading approaches and concludes with a review of returns analysis which was common during the Tech Boom (2000-2002).

The final section reviews acquisition concepts including the Australia legal framework and specific research on M&A activity.

2.4.1 Share Price Movements

Share price movements on the stock market represent the combined actions of thousands of participants placing buying or selling orders or simply holding on to earlier acquired positions. These actions are driven by a variety of factors which can be broadly classified under three areas. These are; changes in external expectations in the market; natural share market demand growth; and lastly, intra-market allocation decisions. Influencing factors within these broad subdivisions are summarised below:

1. <u>External Expectations</u>
   - The perceived economic outlook and its implications on the future earnings and cash flow of companies; e.g. economic growth, inflation, etc.
   - The perceived relative risk and returns from other asset classes, eg. real estate or bonds versus equities.
   - Share investment driven by investor fear of missing out in share price rallies. This can be stimulated from recent strong share market returns and the investment can sometimes involve minimal analysis.
2. <u>Natural Demand</u>
   - Superannuation fund investment growth
   - Growth in personal wealth
   - Increases in the availability of debt funding for equities
   - Increases in foreign investment, for e.g. in Australian resources during commodity booms
   - New securities issues, for example, IPO’s, placements, rights issues.
3. <u>Intra-market Allocations</u>

- Perceived sub-sector performance expectations.
- Stock-specific factors including dividend distributions or bonus share issue entitlement ex-dates.
- Perceived technical (charting) and other, including commodity price driven, identified trading opportunities.
- New securities issues, for example, IPO’s, placements, rights issues (can attract intra-market and external funds).

The market is forward looking and hence it is perceptions that are important at a specific time. The forward looking timeframe is generally observed to be in the six to nine months range but this is variable and may be considerably shorter in times of high economic and market data volatility.

2.4.2 Market Participants

As mentioned in Chapter 1, the market capitalisation of the Australian Securities Exchange (ASX) is approximately A$1 trillion as at April 2009. The investors in this market range from individual retail investors, investment funds and superannuation funds, foreign investors (individuals or funds), companies and principal traders with investment banks.

Lucy (2007) comments that Australia’s funds management industry is one of the most sophisticated in the world, and with an investment funds pool size of US$700 billion, it is the largest in Asia and fourth largest in the world. Australia’s per capita average of investment in managed funds is valued at close to A$50,000, dwarfing all other nations (including the United States by 20 per cent) and reflecting an increase of around 115 per cent over the last five years.

Industry funds are anticipated (according to projections performed by Rice Warner Actuaries as at June 2008) to grow from a share of the total superannuation market of 19.0 per cent to about 25.7 per cent by 2023 (K. Boag, pers comm.). The Self Managed Super Fund (SMSF) market is forecast to remain the largest segment at 26.2 per cent in 2023 but will grow slightly less strongly than the industry fund market. Together these two segments will represent over 50 per cent by 2023 of a total forecast market of $4.77 trillion in nominal dollars. The remainder is dominated by the traditional life company/bank owned super funds with small contributions from public sector and retail funds.

In 2003, the ATO (2003) reported that SMSFs comprised 20 per cent of the superannuation industry and, at 31 December 2003, had approximately $125 billion in assets under management. At that time there were around 300,000 self managed super funds, and the number of funds was growing at a net rate of about 2,200 per month. The average account balance of a self managed super fund is $235,000 and membership generally comprised either one member (21 per cent) or two members (65 per cent).

While recent data are unavailable on the growth of SMSFs from the ATO, the earlier projections forecast that they will represent around 25 per cent of funds under management in 2023 and have an increasing presence in the market.

Both direct retail investors and investors with SMSFs are likely to have different investment philosophies and flexibility in comparison to traditional industry and life insurance/bank owned funds and this has changed the trading activity evident in some market segments. This is particularly the case in the junior and mid-tier parts of the resource sector during the recent five year resources rally and which has involved increased higher risk investment as well as short-term trading.

2.4.3 Short-Term Trading

Over the last 10 years, the presence of the 'day trader' has influenced market trading patterns, particularly in some small to mid-sized resources companies. A 'day trader' typically uses internet based market data which can provide real time prices and an executable transaction platform. More sophisticated traders can utilise software which is designed to quickly identify emerging favourable share price trends.

Transactions are executed quickly and efficiently and can be subsequently closed out within minutes if desired but many are closed out by the end trading for a particular day to avoid the risk of adverse NYSE movements overnight. Hence the important aspect of the 'day trader' is that he can capitalise on small profits quickly if there is a belief that a stock price will move up (shorting is uncommon). An example of the influence of substantial ‘day trading’ is evident with the reporting of encouraging drill intersections by De Grey Mining Ltd on the 6th December 2003 (De Grey Mining, 2003). The encouraging drilling intersections were part of an exploration program investigating an early stage project which required further drilling to determine whether there was any potential for economic levels of mineralisation present. The total turnover on the day of the announcement and the subsequent two days totalled approximately 75 million shares. This contrasts with a total 59 million shares listed on the ASX by the company. Evidence of share price churning by traders is the fact that around 59 million shares were traded during a period when the share price increased by around 125 per cent and it is estimated that in most trades profits were sought in the 10 per cent to 50 per cent range.

In a recent sample, Bartrop (2009a) noted that strong promotion of its Carnarvon Basis offshore Artemis Project by MEO Australia (ASX Code: MEO) had led to a strong increase in the share price and turnover of MEO rising from less than 10 cents to over 50 cents on daily volumes of several million share and up to in excess of 40 million shares on a number of occasions. The market capitalization of MEO provided a ‘see through’ valuation of the Artemis project, which could be applied to its joint venture partner, Cue Energy (ASX Code: CUE). However, this valuation suggested that Cue’s other assets had a market valuation close to zero but in reality represented valuable producing interests in Oyong oil, Maari oil, the Oyong and Wortel gas projects and the company’s PNG interests. Cue Energy had not been actively promoting its Artemis project interest given its focus on its more advanced projects.

Tate (2001) outlines the impact that traders can have on share price movements which include:

- Trends are the cornerstone of trading and it is impossible to trade against the trend.
- A controllable risk is the ‘time in the market’ which should be minimised.

The ‘day trader’ has heightened volatility when there is positive news flow and the stock exhibits signs of a momentum run. In many cases there is a ‘pull back’ in the share price at the end of the day as a number of positions may be closed out. The outcome can be a greater dissociation of a share price from the fundamental value of the company and reducing other investor confidence in the robustness of this fundamental value.

2.4.4 Charting or Technical Analysis

Benninga (2008) divides security analysts (and investors) into 'fundamentalists'' and 'technicians.' Fundamentalists believe that the value of a stock is ultimately determined by underlying economic performance and financial issues are discussed in Section 2.5. Technicians, in contrast, assume stock prices are determined by patterns and believe that, by examining the pattern of past prices of a stock, they can predict future prices or trends.

Interestingly, the concept of charting appears to undermine the presence of weak form efficiency in the market (see Section 2.3.1) as noted by Benninga (2008).

The author contends that technical charting does have merits where there is potential for an underlying behavioural psychology in the share price movements. A readily observable case is when after extensive trading at a certain price level, a share price then falls. If the share price slowly increases again, it may meet a resistance at this original price level as earlier investors may decide that they can now 'get their money back'. This 'resistance level' may require significant trading turnover to remove the initial investors and replace them with new investors which expect the stock to move higher and hence will maintain their investment for a further period of time.

However, rather than refuting weak form efficiency, this example perhaps highlights the difficulties in applying 'blanket theories' across a complex market.

2.4.5 The Interaction of Trading and Investment on Share Prices

The trading pattern of a particular stock is influenced by the company's marginal investor, which may vary in changing circumstances. While in Section 2.3.1, this thesis outlined a number of factors influencing investment decisions, the composition of the investor base can influence share trading patterns. In particular the presence of institutional investors can provide underpinning support at low share prices relative to fundamental valuations but also may provide a cap in over priced scenarios. For example, a company's share register may comprise 50 per cent institutional investors, 30 per cent long-term retail investors and 20 per cent active traders. If the stock price is volatile, active traders may trade the stock within say a 20 per cent price range based on positive or negative news flow. If the price becomes too low, say at greater than a 20 per cent discount to its fundamental value, then institutional investors may start purchasing shares. Conversely, if the shares are deemed to become overpriced, perhaps through the efforts of 'day traders', then institutional funds may provide a cap to further price increases through large volume sales.

In comparison a junior resource company may have a shareholder base that only comprises traders and longer-term retail investors. In this case, the cap to any share price rally may be from the stalling of momentum runs as dictated by investment volumes and the increasing nervousness of short-term traders already holding the stock. The stalling may emerge from a diminishing number of new buyers and/or a material and easily observable departure from fundamental value. In relation to new company announcements, the number of potentially new buyers is a function of the effectiveness of the dissemination of this information as outlined below in Section 2.3.6.

On negative market news, the downside is a lack of fundamental value to investors which may lead to very low support levels for junior resource companies as investors may simply 'move on' and sell the stock almost irrespective of the price to realise cash for other investments. Hence, there is an expectation of greater volatility in the share price of smaller companies simply from the aspirations of the investor base.

2.4.6 Algorithm Trading

Kakade et al, (2004) note that in share trading it has been the relatively recent visibility of limit orders waiting for possible execution (i.e. market depth) that has opened the way to trading algorithms (algo) of all varieties that attempt to exploit the market microstructure.

Computer trading using algorithms has been pervasive through the Australian market with most major investment banks having a set of 'algo' black boxes. Typical computer trades involve VWAP (volume weighted average price) or OWT (one way trading) and may involve less liquid stocks or position building or selling where a number of orders need to be placed in the market over a period of time.

In the case of the US, The Economist (2009a) reports that the average algo transaction size on leading stock exchanges has fallen from about 2,000 shares in the mid-1990s to fewer than 400 although the overall trading volume has soared.

According to Wikipedia (1999), algorithmic trading may be used in any investment strategy, including market making, inter-market spreading, arbitrage, or pure speculation (including trend following). The investment decision and implementation may be augmented at any stage with algorithmic support or may operate completely automatically ("on auto-pilot"). It reports that a third of all EU and US stock trades in 2006 were driven by automatic programs, or algorithms, according to Boston-based consulting firm Aite Group LLC. As of 2009, high frequency trading firms account for 73 per cent of all US equity trading volume.

In 2006 at the London Stock Exchange, over 40 per cent of all orders were entered by algo traders, with 60 per cent predicted for 2007. American markets and equity markets generally have a higher proportion of algo trades than other markets, and estimates for 2008 range as high as an 80 per cent proportion in some markets.

According to Schmerken (2009) the overall proportion of U.S. equity trading executed electronically increased to 36 per cent in FY2009 from 32 per cent in FY2008 on a volume basis. The increase follows a period in which algo trading strategies performed poorly in the lead up to the Global Financial Crisis with algos lacking a pattern of historic data that could accommodate the unprecedented levels of volatility experienced in late 2008. However, Schmerken (2009) notes that many algorithms have now been redesigned to take the new data patterns into account, and this has attracted the increased volumes in 2009.

Algo trading is becoming an important aspect of mid-tier Australian resources companies, particularly where there is relatively low liquidity and executing may take several days or longer to fill substantial orders. It is generally the domain of institutional orders, and therefore investments will be those that meet institutional criteria (minimum size, liquidity, minimum earnings and cash flow levels, etc.). The author believes that as a generalization, algo trading is likely to reinforce share price trends reflecting steadily increasing or decreasing share price movements.

2.4.7 Share Price Impact from New Announcements

Over the medium-term, shares are ‘expected’ to trade around their long-term fundamental value. However, individual share price movements can be related to underlying change in perceptions of the value of the company and often occur in ‘steps’. Section 2.3.2 briefly reviewed event methodology while Section 2.3.3 described post-announcement drift. This section discusses an empirical view of material share price announcements, particularly in relation to junior and mid-tier resources companies.

In a material company announcement to the ASX, the factors affecting the subsequent share price movement include:

1. the *materiality* of the potential difference in perceived news value versus the current share price,
2. the *conviction* of market participants in the reliability of the news value,
3. the *market awareness* of the presence of the announcement,
4. the *investability* of the stock relative to its *liquidity*, and
5. the *state* of the market at that particular time.

In the first instance, the *materiality* is important in relation to relative upside in the share price and the risk involved with an investment. In this instance, a junior resources company may not attract increased investment unless say, drilling results substantially upgrade a project from its earlier status. Similarly, a small regional exploration success is unlikely to be material to a mid-tier company with operating assets.

In the author’s experience, the *conviction* of the revaluation basis and overall *market awareness* are two key factors influencing potential movements in share prices and can be quite variable across the market for similar announcements from similarly sized companies. A conviction factor often relates to prior market knowledge of the project and ability to recognise the significance of the new data while market awareness is the ability for a significant number of investors to be aware of the announcement. Both directly relate to the publicity conducted by the company and its promotional efforts as well as the profile of management. Frequent market announcements, presentations to and discussions with the investor/shareholder base as well as the financial community are extremely important as well as potential analyst and investor site visits. Market awareness and conviction also relate to the presence of a supporting broker and the breadth of the broker's client base.

A key factor affecting a company's share price performance is the size of the pool of investment funds that can be directed towards investing in a particular company relative to the liquidity of that company. The former reflects its *investability* and as discussed earlier, often reflects size and operational attributes of the company. The *liquidity* can reflect both the size of the free float of a company as well as the degree of 'tightness' of the share holdings. A high proportion of shares owned by directors, management and friends can lead to higher share prices per given announcement due to an inability to execute orders without pushing up the share price although this can 'backfire' where share price 'jumps' are too great and investors lack a comfortable level of liquidity. Company management setting future value propositions to the market that well exceed the current share price will also decrease liquidity with shareholders keen to 'hang-on' for longer term upside.

The final factor is the state of the market at the time of the announcement as a strong bull market will illicit a greater share price appreciation than a falling market for a similar positive announcement.

Hence, an equation to describe the potential share price movement by a company after a material announcement is:

$$\Delta S_i = \mathrm{P}change * f(C_n.A_n.I_i.L_i).MS$$

Where:

$\Delta S_i =$ Actual share price change of stock *i*

$\mathrm{P}change =$ Potential share price change reflecting the materiality of the news in an average market

$C_n =$ A measure of the confidence in the news

$A_n =$ A measure of the market pervasiveness of the news

$I_i =$ The quantity of investment funds capable of being directed to stock i

$L_i =$ A measure of the free float and shareholder 'tightness' or liquidity of stock i

$MS =$ A broad market factor depicting recent market sentiment, e.g. is the announcement in a rising or falling resource market?

While the parameters are difficult and subjective to estimate, it nevertheless highlights that there are potentially five factors (or more) that influence how a company announcement is received by the market and the influence it may have on the company's share price. Two of these factors relate to the company's marketing campaigns and ability to disseminate information, two relate to stock specific attributes and the final reflects how the market is performing at the time of the announcement.

Hence, the analysis of the share price reaction to news announcements, particularly in the mid tier and junior sector, is not solely dependent on the materiality of the news. This is an issue confronting the overall share price performance of some resource companies and research such as event analyses.

2.5 Discussion of Financial Valuation Methods

The influence of market participants in the setting of resource company share prices depends on a combination of the investment capability of 'buy-side' investors, the breadth of the 'sell-side' influence of the promoters and key brokers, and stock specific issues including the degree of 'compellingness' of the investment proposal and well as other issues alluded to in the previous section. However the attraction of the resource sector has varied over time and when the resource sector has moved out of favour, different valuation techniques generally emerge which present the sector in a poor light.

This section briefly discusses variations of returns analysis which underpins a significant proportion of the M&A activity following the Tech Boom (2000-2002) and which was designed to consolidate the industry to increase returns (through greater control of commodity supply) and to provide fewer but more attractive investments for global funds. The first part discusses the recent introduction of the International Financial Reporting Standards (IRFS) in Australia which change the accounting for goodwill in M&A activity.

2.5.1 International Financial Reporting Standards

The impact of the historical variation in accounting standards is evident with Choi and Lee's (1991) examination of the effects on the market for takeovers and mergers with reference to whether national differences in the treatment of purchased goodwill are associated with differences in premia offered by U.K. as opposed to U.S. acquirers of U.S. targets. They found that merger premia associated with U.K. acquisitions to be consistently higher than those for U.S. acquisitions. Moreover, higher premia offered by U.K. acquirers appear to be associated with not having to amortize goodwill to earnings and this was demonstrated to affect managerial behavior. This is in line with the U.S. research by Robinson and Shane (1990) that presented qualified results of an association between acquisition accounting method and bid premia for target firms. In particular, the researchers found bidders were willing to pay for the benefits derived from the accounting method of pooling in comparison to the purchase method which generally led to goodwill amortisation and reduced future earnings.

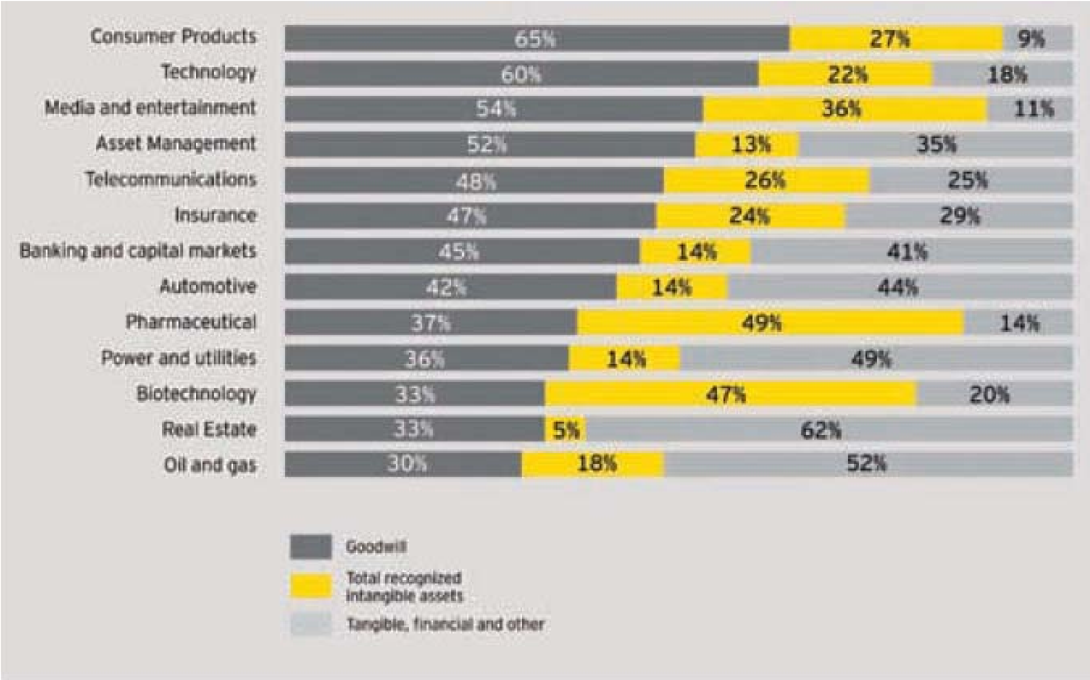
Australia adopted International Financial Reporting Standards (IFRS) in 2005 (AASB, 2004) and financial statements became comparable across many countries leading to increasing investment confidence by North American and European investors. Global companies such as BHP Billiton and Rio Tinto could now produce a single set of accounts rather than presenting a series of accounts compliant with various standards, e.g. US GAAP.

With respect to M&A activity, the adoption of IFRS led to significant changes in the accounting for goodwill. Prior to the adoption of IFRS, Australian Accounting Standards Board (AASB) standard (AASB 1013 *Accounting for Goodwill*) required goodwill on acquisitions to be recorded as an asset and amortised on a straight-line basis over a period not exceeding 20 years (c.f. early UK standards). Under IFRS (AASB 3 *Business Combinations),* goodwill with an indefinite life is not written off. However, companies must undertake annual impairment tests of the value of this goodwill. Like the annual impairment test for other assets, the recoverable amount is the higher of either the fair value less cost to sell; or value in use (i.e. the present value of future cash flows including disposal value).

Bugeja and Gallery, (2006) report that the change to Australian and international goodwill accounting follows in the footsteps of changes made by the Financial Accounting Standards Board to US standards. However, the UK Financial Reporting Standard 10 *Goodwill and Intangible Assets* continues to require amortization of purchased goodwill, with a maximum amortization period of 20 years. The useful life may be determined as greater than 20 years if it is expected that the durability of the acquired business will exceed 20 years and the value of goodwill can be regularly measured. This has a bearing on resource acquisitions by U.K. domiciled companies with Australian and other non-U.K. targets.

Ernst & Young (2009) conducted an international study of over 700 transactions completed by IFRS compliant companies in Europe, Americas and Asia. Figure 17 summarizes the allocation of the acquisition price to net tangible assets, identifiable intangible assets and goodwill in 13 different sectors. Apart from the oil and gas sector, resource companies are excluded from the survey. However the survey does provide an interesting and not surprising comparison with higher goodwill allocations in technology and consumer products while oil and gas companies had the lowest goodwill allocation percentages across the reviewed sectors.

Figure 17. The allocation proportion of goodwill, intangible and tangible assets in acquisitions across various sectors.



From Ernst & Young (2009).

In times of significantly decreasing commodity prices as recently experienced with the global financial crisis, annual impairments tests in resource companies are resulting in numerous impairment charges as evident in many resource company financial statements (e.g. BHP Billiton 2009, Rio Tinto 2009).

Prior to the adoption of the IFRS, goodwill amortisation was a significant consideration in M&A activity because of the impact of amortisation charges on earnings. To compensate for amortisation and other non-operating aspects of earnings, analysts often estimated ‘adjusted earnings’. This process is designed to standardise reported net operating profit after tax and include adjustments to (Oliver 1998):

- Abnormal gains/losses net of tax
- Foreign exchange gains/losses net of tax
- Gains/losses from asset sales net of tax
- Excess or inadequate depreciation
- Amortisation of intangibles
- Tax effect adjustments

- Adjustments for different reporting periods (eg. Adjust 31st December year end reporting years to years ending 30th June)

Interestingly, Bugeja and Gallery, (2006) actually found that after studying goodwill of different ‘ages’, firm value is positively associated with goodwill purchased in the observation year and in each of the preceding two years, but not with goodwill acquired more than two years previously. They believe their findings suggest that only recently acquired goodwill is associated with the market value of equity, which indicates that the market rationally perceives ‘older’ goodwill as not having future economic benefits.

Under the current IFRS regime the market appears to have increasing confidence in asset values reported each year and company management usually ‘flag’ material impairments prior to results reporting. Hence, the market focuses on ‘underlying earnings’ to reflect the operating performance of the company and ignore significant items unless they reflect unexpected and material asset write downs. Resource companies also typically provide earnings sensitivities to movements in commodity prices and exchange rates. This highlights a company’s earnings leverage to particular commodities and exchange rates as well as providing analysts and investors with a method of estimating short-term earnings based on these commodity price and exchange rate trends or expectations. This contrasts with the alternative of developing complicated company models to forecast earnings.

Prior to the implementation of IFRS, it is interesting to note the potential impact of increasing globalization of markets as Land and Lang’s (2002) research led them to conclude that average earnings/price ratios (also known as earnings yield) across the countries analyzed in their paper (Australia, Canada, France, Germany, Japan, the U.K., and the U.S.) had moved closer together from the 1987–1992 time period to the 1994–1999 time period.

The inverse of the earnings yield is the price/earning (P/E) ratio and is the most ubiquitous ratio used in share price analysis. This thesis highlights the importance of the prospective earnings timeframe with regards to P/E ratios as these can be segregated into short-term earnings expectations (one year or less) and medium and long-term P/E ratios which are deemed to reflect more sustainable earnings levels and are often capitalised to proxy for NPV valuations by overseas investors.

In bull markets there is a tendency for the market to focus on increases in short term earnings and hence, short-term P/E ratios on the back of increases in contemporary commodity price and often irrespective of the perceived sustainability of these commodity prices. In less bullish markets, sustainable P/E ratios based on medium and longer term forecast earnings levels become more important in a similar manner to NPV valuations (particularly given their potential similarity). An old axiom in the resource sector was to *Buy* the sector at high P/E ratios and then *Sell* at low P/E ratios with earnings increases from rising commodity prices. However, it also highlights the expectations of contracting short-term P/E ratios.

2.5.2 Returns Analysis

Historically, that analysis of the return on equity was often applied to the analysis of industrial stocks by market analysts but with only fleeting application to resource companies based on the author's experience. However, returns analysis in resource companies started to attract wider attention in the latter part of the 1990's. During this time resource companies including BHP, Rio Tinto, WMC and Alcoa *inter alia* started highlighting their own return rates to provide data for the market to assess their managements' performance. It was also a time that investment in the resource sector generally provided poor investment returns, particularly with mid-cap and junior companies which reported weak earnings due to low commodity prices. This resulted in many portfolio managers excluding these companies from their portfolios which then used higher investment weightings in BHP Billiton, Rio Tinto and Woodside Petroleum to cover their resource exposure. Prior to this time, the Australian market generally provided greater support to the resources sector due to a number of factors including:

- Less polarisation of the sector with a greater spread of mid-tier companies
- A higher sector weighting in the overall market
- The greater emphasis of specific commodity exposure

The latter point highlights the overall trend of the resource sector. During the 1970s, 1980's and the early part of the 1990's commodities prices tended to be more independent of one another and reflected specific supply-demand fundamentals. With a greater number of mid tier companies, investors selected investments to meet their expectations with specific commodities, for example;

- If the zinc price was expected to increase, they might invest in Pasminco Ltd.
- If the copper price was expected to increase, they might invest in MIM Ltd.
- If the iron ore price was expected to increase, they might invest in Norths Ltd.

This assumption is now questioned in Chapter Three as a consequence of increasing investment in commodities by funds as well as the prevalent M&A activity over the last decade.

Returns analysis primarily focuses on a company's return on equity (ROE) and return on invested capital (ROIC) with the following key return measures:

- Returns on Equity (NPAT/shareholders equity)
- Returns on Invested Capital (NOPAT/Invested Capital)
- Returns on Net Assets, Non-current or Total Assets (EBIT or EBITDA/Net, Non-Current or Total Assets)

These return measures are based on profit and loss accounts with balance sheet data reflecting historical costs (ignoring writeoffs or revaluations) to view the business as an investment case in potentially flat commodity prices. As discussed earlier, resource companies can represent special case situations given the book value of mineral resources are unlikely to bear a relationship to their actual value in terms of their project NPVs. Indeed annual impairment tests often use NPV valuations to test the resilience of the book values of these assets.

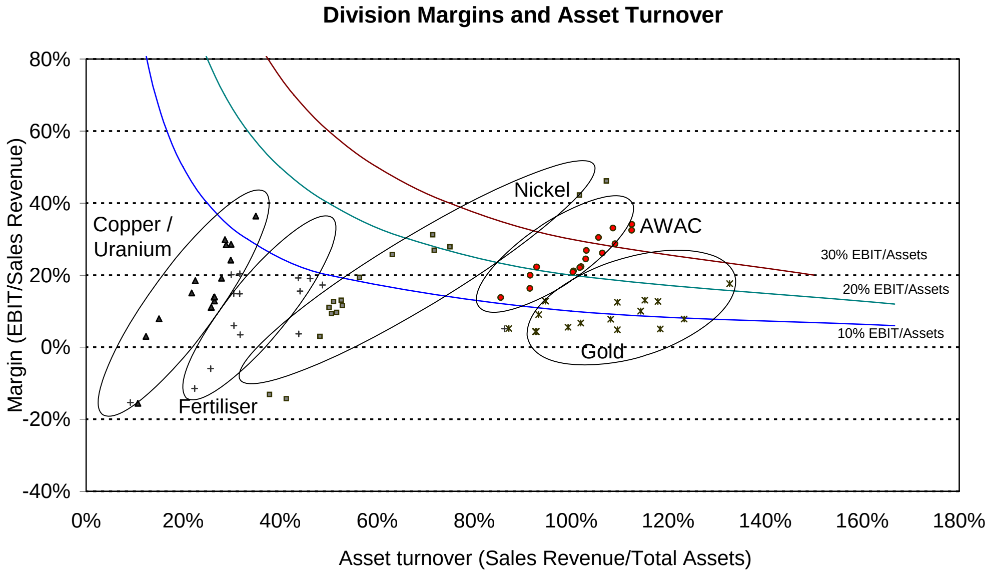
There have been many cases where mineral development projects as well as operating assets have failed to meet expected returns, or for that matter, the company’s cost of capital. This can reflect periods of weak commodity prices but also unexpected technical issues that erode expected margins - a prime example being the Western Australian nickel laterite projects in the 1990s. As a consequence, the resource sector has frequently experienced significant writeoffs, for example, BHP Billiton’s FY2009 pre-tax US$3.6 billion writeoff of its Ravensthorpe nickel project (BHP Billiton, 2009) while unsuccessful exploration projects are constantly written off across the sector. The larger writeoffs are often ‘flagged’ to the market on a number of occasions and prior to the reporting of the results, therefore making it difficult to determine negative anomalous share price returns as a consequence of the writedown. Empirical evidence indicates that the market is focussed on earnings differences to expectations and management’s future business outlook and other items only if they are materially different from expectations. Returns analysis strictly requires the inclusion of past writeoffs in the total asset base (excluding normal depreciation charges), but the fact that resource companies may be forced to impair asset due to unexpected low commodity prices (for e.g. leading to a writedown in reserves and a consequence shortening of project life) are deemed to be outside the control of the company. However in times of strong commodity prices, the revaluation of asset bases is unusual (and restricted) and hence a long life company will experience a reduced asset base (and hence higher returns on the written down assets) over several commodity price cycles if new investment is ignored.

Returns analysis has a special application in larger companies in determining key performance trends and contributions from individual business segments. Brailsford and Knights (1998) use a cash margin calculated as cash flow from operations divided by revenue but more typical calculations use earnings before interest and tax (EBIT) divided by sales revenue. Margins and asset turnover as outlined below can be plotted over time to provide segment trends.

- Asset turnover (sales revenue/total assets)
- Margin (EBIT/sales revenue)

These variables have been plotted for WMC Limited in 2001 (Bartrop and Smith 2001) in Figure 18 prior to its demerger and at a time returns analysis was in vogue for a resource sector competing for investor attention.

Figure 18. WMC Limited's Divisional Returns Analysis.



From Bartrop and Smith, (2001).

Each circle represents a WMC division and contains a cluster of points, each point representing a particular year from 1998 to 2005 (1998 – 2000 were actual and 2001 to 2005 forecast).

Lines indicating similar returns (iso-rets) based on EBIT/Total assets are plotted and demonstrate similar returns can be achieved at high margins with low asset turnover or at a high asset turnover with low margins. At the time of the analysis, the company's best performing business was its joint venture in AWAC (Alcoa Worldwide Alumina Company) which incorporates higher margins with strong asset turnover. The newly formed Fertiliser division was one of the company's poorer performing divisions, with weak margins and weak asset turnover. In fact this low asset turnover is also typical for the Copper-Uranium division and highlights the vulnerability of returns with high capital expenditure and volatile commodity prices. However, it is evident that the new divisions have not experienced the asset writedowns over a number of commodity price cycles as the alumina division.

An advantage with long life assets is the ability for management over time and through normal depreciation to reduce the asset book values to levels where they generate sustainable returns (depreciation more or less matches sustainable capital) and this return will be reflected in the share price of the company. Copeland et al (1996) believe that most companies across business cycles on average achieve a return on invested capital which is approximately equal to their cost of capital – perhaps a self fulfilling prophecy in the resource sector!

2.5.3 Economic Value Add (EVA)

During the late 1990's, the financial industry embarked on measuring the Economic Value Add (EVA) of a company as outlined by Stewart (1990). EVA is calculated by taking the difference between a company's rate of return on capital (r) and its cost of capital (c*) and then multiplying by the economic book value of the capital committed to the business:

EVA = (rate of return – cost of capital) * capital

Or

EVA = (r-c*) * capital

With Stewart's (1990) focus on cash, he seeks to convert accounting entries to cash inflows and outflows including:

- Converting accrual accounting to cash accounting (by adding accounting reserves that are formed by recurring, non-cash bookkeeping provisions such as deferred tax reserve)
- Converting the liquidating perspective of lenders to the going-concern perspective of shareholders (as by capitalising R&D outlays and market-building expenditures)
- Converting from successful-efforts to full-cost accounting (as by adding back cumulative unusual losses, less gains, after taxes)

The return is then calculated using:

R = NOPAT/capital

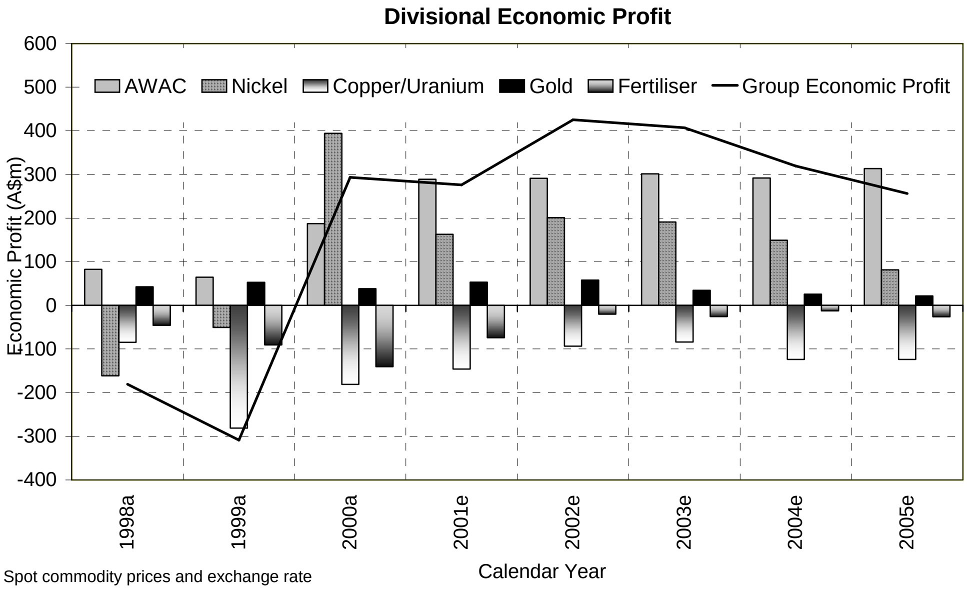
Where:

NOPAT = net operating profit after tax and excludes financing charges

Capital = equity and debt.

Stewart (1990) highlights a number of ‘corrections’ to accounting variables to bring them more in line with cash variables and the reader is referred to his work for greater detail. Within the finance industry in the late 1990’s and early 2000’s there was a trend to incorporate EVA analysis although it was termed Economic Profit. Using the WMC Limited example before Figure 19 outlines the economic profit contribution (NOPAT return on Invested Capital) for each WMC division and the Group’s total economic profit.

Figure 19. Economic Profit Analysis of WMC Limited.



From Bartrop and Smith (2001).

Each bar style represents a business segment of the company. Economic profit is defined as the NOPAT/Invested capital of each segment less WMC’s WACC multiplied by the invested capital of the division. Group Economic Profit is the sum of the divisions’ economic profits (1998 – 2000 were factual and 2001 to 2005 forecast).

The analysis again identifies poorly performing segments and the overall contributions to WMC’s total economic profit. EVA analysis has often been used to help management determine the importance of its various assets and therefore whether divestment of underperforming assets is warranted to improve group economic profit. From the stock market perspective, it is not necessarily the size of the group economic profit but significant changes in the group economic profit that may occur from time to time, which are interpreted to correspond to major share price movements (positive or negative). However, it is difficult to differentiate this effect from fundamental changes in the more widely tracked earnings levels.

2.5.4 Price to Book Value or Market Capitalisation to Book Ratios

Price to book ratios or more commonly market capitalisation (ME) to book equity (BE) ratios (ME/BE or M/B or the inverse, BE/ME) were briefly discussed at the start of this chapter (Section 2.2) and are common factors used in the M&A analysis around the world, (for e.g. see Rhodes-Kropf and Robinson (2008), Jovanovic and Rousseau, 2002, Andrade et al 2001, Fama and French 1995) and hence needs to be addressed more thoroughly in this thesis. Typical North American mergers and acquisition analysis can involve several thousand individual transactions (e.g. Rhodes-Kropf and Robinson 2008, Jovanovic and Rousseau, 2002). It is also known as Tobin's q ratio although this is theoretically calculated by dividing the market value of a company by the replacement value of the book equity.

Fama and French (1995) hypothesised that low BE/ME (a high stock price relative to book value) is typical of firms with high average returns on capital (growth stocks), whereas high BE/ME is typical of firms that are relatively distressed.

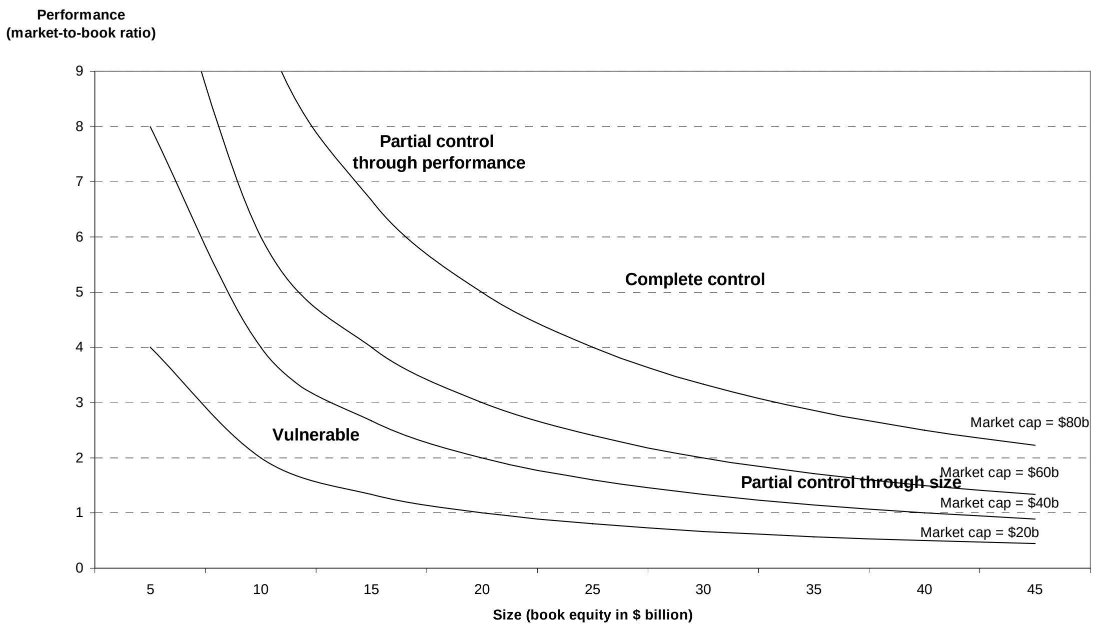
In applying ME/BE or q ratios to resource companies there are a number of problems as partly highlighted in Section 2.2. These include:

- There is a smaller amount of M&A activity relative to other international markets and hence, difficulties in establishing statistically meaningful relationships,
- The discrepancy between ME/BE values relative to replacement values or the NPVs of a company's operations. In Section 2.2 the *q* NPV ratio was outlined as a better measure.
- The extent of resource company writeoffs can be significant and hence a ME/BE ratio on current book values can be attributed to a combination of past writeoffs and market premium with the extent of the contribution of either requiring a careful analysis.

- As with other companies, adjustments are also required for new development capital on projects where the book value has increased but earnings have yet to be earned.
- The replication of past returns on new resource projects can be difficult given the variability of resource projects and unseen challenges emerging during development, commissioning and operating stages.

However, in combining returns analysis with market value, Lowell et al (1998) plotted a company's size as measured by its book equity against its market capitalisation to book value ratio. In plotting this data they developed a 'Strategic Control Map' (see Figure 20).

Figure 20. Strategic Control Map.



From Lowell et al (1998).

Lowell et al (1998) states that a company can be classified into four categories:

1. Vulnerable. Companies in the lower left-hand quadrant are using a fairly small amount of financial capital to generate relatively low returns. Such firms frequently compete with mature businesses and focus largely on domestic markets. Their poor performance leaves them vulnerable: they may be acquired by competitors than can generate higher returns from the same

asset base, or they may simply become irrelevant in the global economy. Lowell et al (1998) state that they face a stark choice: dramatically improving the performance of their existing businesses or divesting them and reinvesting the capital in more attractive alternatives.

2. <u>Complete control</u>. At the opposite extreme, companies in the upper right quadrant are generating high returns from a large capital base, and can therefore exercise complete control over their destinies. Such companies typically compete globally in industries that require distinctive skills. Their high multiples enable them to acquire competitors, and protect them from becoming acquisition targets themselves. The challenge they face is to maintain their stronghold against the onslaught of new competitors while simultaneously capturing new high return opportunities.

3. <u>Partial control through performance</u>. Companies in the upper left-hand quadrant extract high returns from a relatively small amount of invested capital. They typically compete in very narrow, high-value added segments of an industry, where they exploit proprietary knowledge or skills. Because few competitors could do more with these financial assets, such companies have at least temporary control though performance. The challenge they face is to continue finding new products of geographic markets or segments in which to leverage their distinctive capabilities. If they fail, they will be acquired by others capable of taking their nationally based but world-class skills out into global markets

4. <u>Partial control through size</u>. Companies in the lower right-hand quadrant possess scale but produce relatively low returns on capital. Notwithstanding their mediocre performance, their sheer size makes them globally relevant and more difficult to acquire; they have partial control through size. Such companies are likely to be seasoned participants in asset-intensive sectors, and they often expand by replicating their business in several geographic or product markets. The challenge they face is to improve their performance by divesting assets that produce lower returns and using the proceeds to capture opportunities with better prospects. Should they fail, industry leaders may well acquire them as consolidation candidates.

In essence, Lowell et al (1998) caution management that underperformance places their companies at risk of takeover unless they are either too big or too expensive (as measured by price to book value) to acquire. The ‘Strategic Control Map’ draws on Tobin’s q ratio analysis where the inference is that higher market rated stocks takeover lower market rated stocks in order to capture the inefficiencies in asset utilisation which are reflected in the lower market rating.

Given the discrepancies in book value versus project value in resource companies, a more relevant ‘Strategic Control Map’ would involve charting the share price to NPV as a measure of market to book ratio (e.g. *q* NPV ratio) versus overall market capitalisation as a size measure.

2.6 Acquisition Concepts

Acquisitions are implemented to create value to the acquirer. In line with a North American approach to industrial companies, Bower (2001) notes that acquisitions occur for five reasons:

1) To deal with overcapacity through consolidation in mature industries;
2) To roll-up competitors in geographically fragmented industries;
3) To extend into new products or markets;
4) As a substitute for R&D; and
5) To exploit eroding industry boundaries by inventing an industry.

With regards to relevance within the resource sector, this thesis would substitute the above points with the following:

1) To purchase assets cheaply relative to benchmark or fundamental valuations, which are likely to be re-rated in the future;
2) The creation of synergies through the acquirer’s new asset mix and/or the application of different management skills;
3) Removal of a competitor and consolidation for the purposes of supporting future commodity price revenue;
4) As alternative to exploration as a growth option; and

5) To attract a market re-rating, e.g. through an increase in company size and/or increased diversity of assets.

In the Australian resource sector, as discussed in Chapter 7, Numbers 1 and 4 are the most common underlying reason for a transaction while Number 4 typically is a reason behind many foreign takeovers of Australian companies. Number 2 occur on selected occasions in circumstances generally involving nearby assets. However, Number 3 has become more prevalent over the last decade as larger companies seek greater price commodity price control in comparison to the traditional view that resource companies were ‘price takers’. Number 3 can also be broadened out to removing competing investment opportunities.

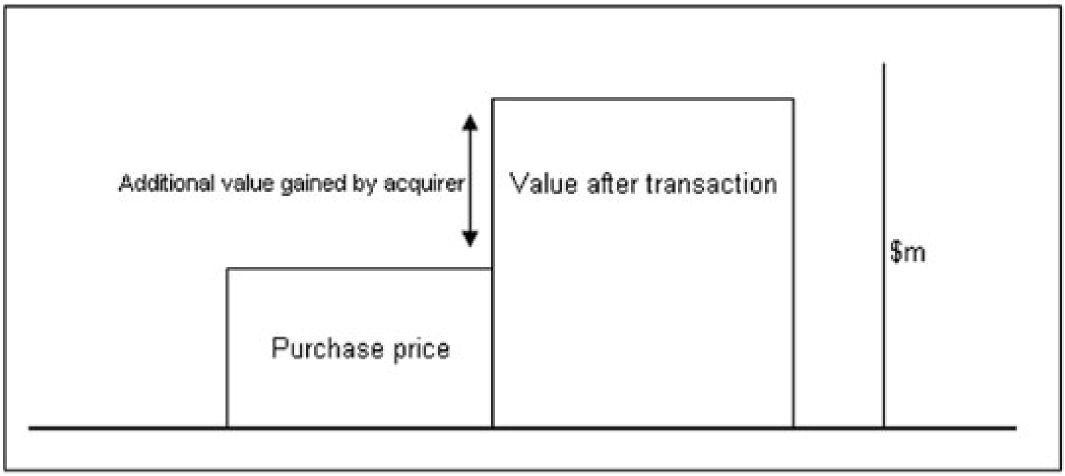
It is evident that most transactions involve a primary justification but will include secondary justifications as part of an overall ‘package’ of expected benefits.

Acquisitions of listed companies generally involve the payment of a premium above the prevailing target’s share price to entice target shareholders to accept the offer. While a takeover (particularly a hostile one) is likely to involve a premium, mergers may not and a ‘merger of equals’ is a common phrase in both management’s parlance to justify a lack of a premium.

The offer may comprise cash or acquirer scrip or a combination thereof and may also include additional ‘one off’ value in the form of special dividends, etc. The premia for cash offers are generally lower than scrip offers given the attractiveness of cash although in some cases institutional shareholders may prefer scrip (e.g. some investors in the 2000 Rio Tinto bid for Comalco) where the market strength of the acquiring company is significant.

Traditional merger and acquisitions research notes that the acquisition of a listed company is normally structured to provide value to an acquirer above the purchase price in the form of a synergy (Sirower, 1997) (Figure 21).

Figure 21. Fundamentals of an Acquisition



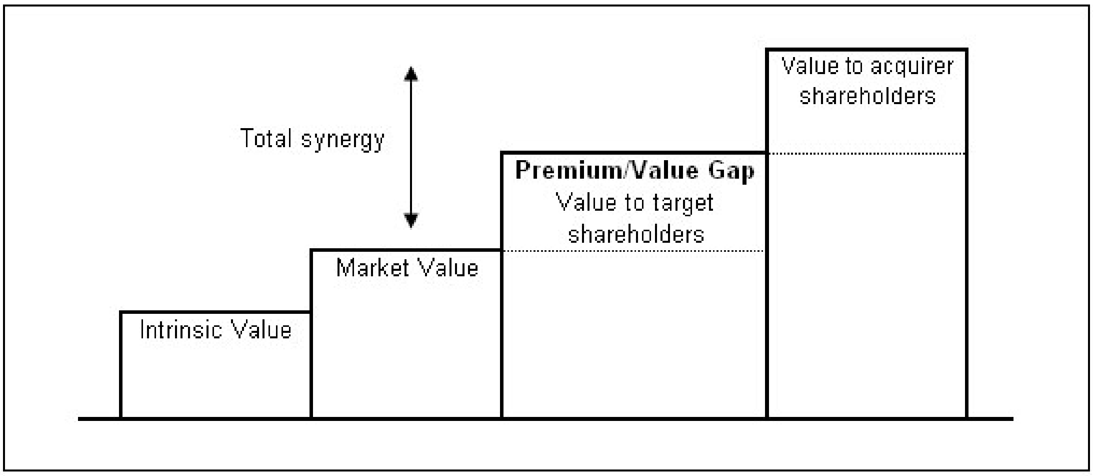
Based on Sirower (1997).

Sirower (1997) defines synergy as *increases in competitiveness and resulting cash flows beyond what the two companies are expected to accomplish independently* .He defines the value of an acquisition to the acquirer in terms of discounted future cash flows as measured by:

Value (NPV) = synergy – premium

The premium paid to the shareholders of the target company erodes part of the synergy gained from the acquisition. Eccles et al (1999) refer to this premium as a ‘value gap’ or an amount that can be paid to target shareholders while retaining a material benefit to the acquirer (See Figure 22). Brailsford and Knights (1998) list synergies as potentially including attributes such economies of scale, economies of vertical integration, complementary resources, tax shields, effective use of free cash flows and improved efficiencies. One or several of these may be the underlying reason for transactions mentioned earlier but the realisation of synergies may not be the underlying reason for the transaction, e.g. as an alternative to exploration for company growth.

Figure 22. The Premium or Value Gap that can be paid to target shareholders in an acquisition.



From Eccles et al (1999).

Sirower (1997) notes that the common acquisition risk stems from the acquiring company's management failure to fully understand and quantify the synergy before embarking on an acquisition. He notes also that it is the payment of an acquisition premium that sets up the unique business gamble and forces a consideration of the performance already embedded in a pre-acquisition share price versus the additional performance required to generate the synergy value. Eccles (1999) reiterates this concept by noting that the synergy value must be derived from new earnings growth and/or changes to the target company's strategy beyond the potential growth previously reflected in the target company's share price. The difficulty is establishing the expectations already impounded in the target company's share price at the time of the acquisition.

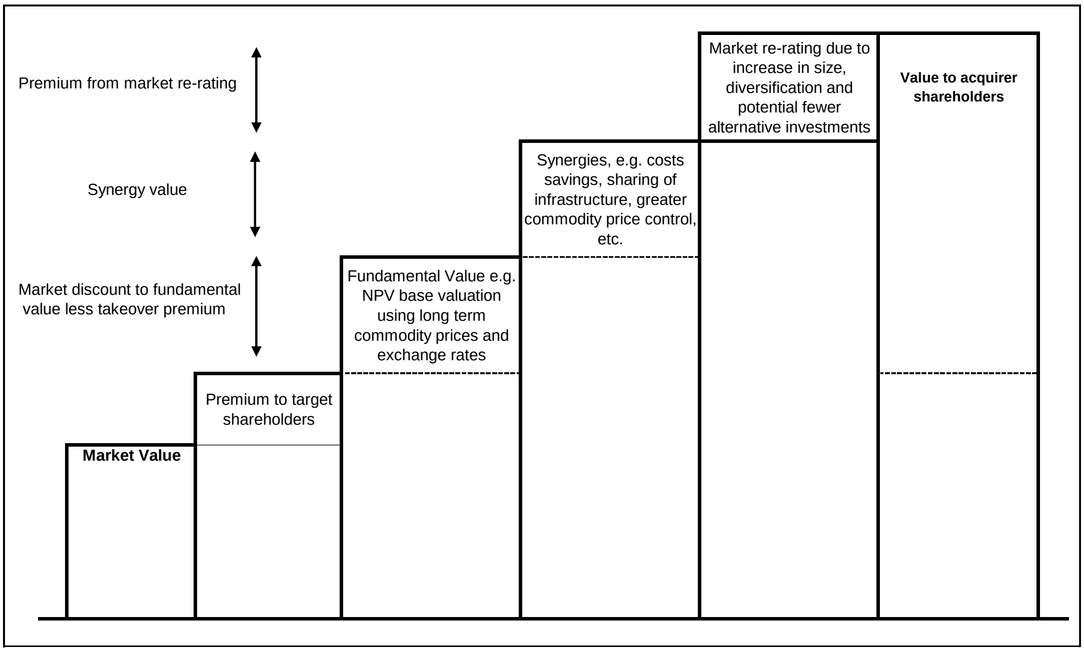
This thesis has adapted Figures 21 and 22 to highlight two common transactions in the resource sector. Figure 23 outlines a takeover where there are three components to the total value attained by an acquirer.

The first component of value is the fact that the market value is below the fundamental valuation and as discussed earlier, this can occur when there are periods of commodity price weakness and little prospect of short-term improvement. In some circumstances, the premium paid to the target company shareholders can be less that the NPV valuation of the company using long-term commodity prices and exchange rates or an alternative valuation measure such as North American multiples of market capitalisation per production, reserve and resource ounce in respect to gold companies. The role of an Independent Expert's report in the target's statement should be designed to reduce this risk but these reports may not sway investor sentiment at certain times. At the very least there is merger and acquisition activity outlined in Chapter 5 which is not offered at a premium to fundamental valuations, the most recent being Chinese Minmetals acquisition of Oz Mineral's assets at the lower end of the Independent Expert's valuations range (see Oz Minerals valuation booklet 2009).

The second component is the value attributable to synergies from the merger and these are always likely to be present to some degree. At a minimum, there is likely to be management and Board rationalisation while higher synergies may involve sharing of infrastructure such as Rio Tinto's utilisation of North's iron ore rail and port infrastructure after its takeover of Norths in 2000 (Norths Limited, 2000)

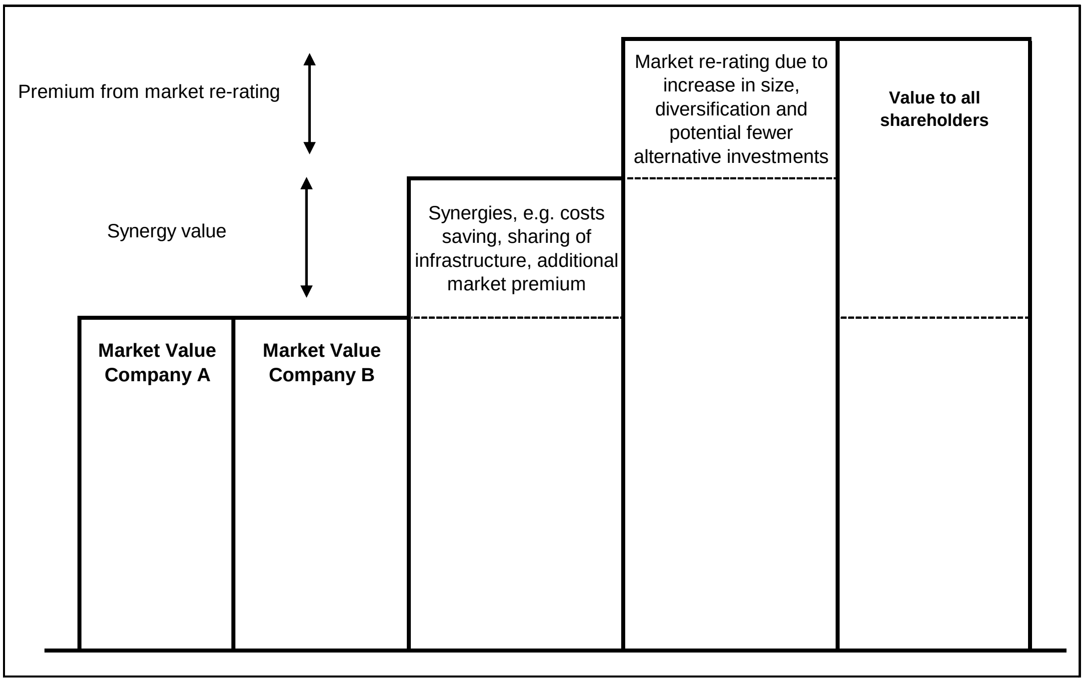
The last component reflects an increase market rating for the acquiring company as a consequence of the takeover. This may reflect a size rating or diversification of assets and while many researchers would attribute this to diminishing investment risk from a financial perspective, in many cases it reflects the increase in 'investability' of a company. This 'investability' has been discussed earlier (Section 2.4.7) and includes other factors such as index weightings and stock liquidity.

Figure 23. Potential value creation in resource acquisitions.



The second example is depicted in Figure 24 and highlights two components of value creation in a 'merger of equals.' These are based on the synergies and the potential market re-rating, both described earlier. The market rerating potential of the combined entity versus the individual components of a merger has been a key 'selling point' for the merits of the merger by company management. This is often not realised as discussed in Chapter 5.

Figure 24. Potential value creation in resource company mergers.



2.6.1 Synergy and Pricing Risk

Chapman et al (1998) expect the synergies including potential operational economies to provide the prime sources of value creation in acquisitions although this value creation frequently fails to materialise. The authors believe that this typically stems from the acquirer's management team being overly optimistic in its assessment of the cost savings and revenue enhancements to be derived from an acquisition as well as underestimating the time required to achieve them.

Another aspect noted by Eccles et al (1999) is that when there is a lack of confidence in the value of the expected synergies, management may resort to emotive persuasive tactics like using clichés such as the transactions represents a 'strategic deal'. An increase in management emotion may drive it to complete the deal at any cost; particularly because many successful executives have competitive personalities.

Establishing a fair acquisition price can be problematic. This is highlighted in the general research by Eccles et al (1999) which surveyed 75 senior executives from 40 companies across the world to determine how they derived appropriate acquisition costs in company takeovers. Interestingly, their survey found that the executives do not believe there is a single, correct price for an acquisition. Instead executives believe that different acquirers can afford to pay different prices for the same target in proportion to their companies' perceived expectations of acquisition benefits, potentially revealing that a higher degree of subjectivity is quantifying synergies. The Eccles et al (1999) survey also found no relationship between the size of the premium paid for an acquisition and the success of the deal although there is little detail on the analysis conducted.

Sirower (1997) has summarised his general findings or 'lessons' in the following points, which are based on previous research on the US industrial sector:

1. Acquisition strategies, on average, destroy value for the acquirer
2. Stock market losses on announcement of an acquisition are indicative of the long-term performance of the acquisition.
3. Higher acquisition premia have a strong negative effect on acquisition performance.

4. The presence of multiple bidders has a negative impact on performance of the acquisition, but this effect is independent of the negative effect of the premium. That is, acquirers do not need to participate in a multiple-bidder contest to predictably overpay!
5. Strategic relatedness moderates the value-destructive effect of the premium but has no independent effect on the performance of acquirers.
6. The use of cash for acquisitions results in better performance than the use of equity (shares).
7. Contested acquisitions lead to the payment of higher premia than uncontested acquisitions.
8. Executing an acquisition through a tender offer versus a ‘friendly’ merger has no independent effect on performance, nor is there a difference in the premium paid.
9. There is not a consistent relationship between the relative size of the acquisition and the acquirer’s performance.

At this stage, previous research is mixed in its support for these ‘lessons’, and it is difficult to analyse Sirower (1997)’s supporting data. However, Andrade et al (2001) note that a myriad of events studies have demonstrated that mergers seem to create shareholder value, with most of the gains accruing to the target company. Rhodes-Kropf and Viswanathan (2004) also comment that synergies often correlate across firms and can contribute to the ‘merger waves’ discussed in Section 2.6.4.

2.6.2 Australian Legal Framework for Mergers and Acquisitions

Levy and Pathak (2009) provide an outline of the regulation and process in Australian mergers and acquisitions which is summarised here. They note that takeover bids are by far the most common form of acquisition of control of public companies in Australia, despite an increase in the use of schemes of arrangement for friendly acquisitions of public companies in recent years. The increased use of schemes of arrangements has been evident in resource company merger and acquisition activity and can offer advantages over more conventional takeovers. The most obvious are that once the Board of a target company agrees to the scheme, both Boards and management are theoretically working towards the implementation of the scheme and there is generally a transfer of information between both companies enabling effective due diligence.

The main source of regulation of takeovers in Australia is Chapter 6 of the *Corporations Act 2001* (Commonwealth or Cth). Chapter 6 contains the central prohibitions and restrictions concerning the acquisitions of shares, permitted forms of takeover bid and sets out the information that must be given to shareholders and the stock market generally in connection with a takeover bid (Levy and Pathak, 2009). Historically, Casey and Eddey (1986) report that the evolution of takeover law followed the findings of the Eggleston Committee in 1969 with substantial amendments to takeover law in the *Companies Act* 1961, largely to provide shareholder protection in the market for corporate control. Later in the 1970s under the Commonwealth/State co-operative companies and securities legislative scheme, the statutory law on takeovers was contained in separate legislation, the Companies (Acquisition of Shares) Act 1980 and termed the Takeover Code. This coincided with a period when takeover defence increased markedly and with an increased proportion of hostile takeovers, particularly with the corporate raiders (see Section 2.6.4.). In the current legislation, Levy and Pathak, (2009) summarise the objectives set out in the Corporations Act. Section 602, which states that the purposes of Chapter 6 are to ensure:

(a) the acquisition of control over a relevant entity takes place in an efficient, competitive and informed market;

(b) the holders of shares or interests, and the directors of the company or responsible entity for the scheme:

   a. know the identity of the person who proposes to acquire a substantial interest;
   b. have a reasonable time to consider the proposal; and
   c. are given enough information to enable them to assess the merits of the proposal

(c) as far as practicable, the holders have a reasonable and equal opportunity to participate in any benefits accruing to holders under a proposal under which a person would acquire a substantial interest in the entity; and

(d) an appropriate procedure is followed as a preliminary to compulsory acquisition.

These principles, commonly known as the Eggleston principles, embody the philosophy of the legislation and are critical to bear in mind when assessing any action of a bidder, shareholder or target company. A breach of the principles may lead to remedial action even if there would otherwise be no breach of any specific provision in Chapter 6 (Levy and Pathak, 2009).

Other sources of regulation of takeovers in Australia are contained in the Foreign Acquisitions and Takeovers Act 1975, the Trade Practices Act 1974, the Listing Rules of the Australian Securities Exchange and legislation dealing with specific industries such as banking, insurance and television and radio. Occasionally, special legislation may regulate the acquisition of shares in a company in a particular type of business or in a specific company.

Chapter 6 contains a central rule which has two aspects:

- A person must not acquire control of more than 20 per cent of the voting shares in a company unless the acquisition is in accordance with the legislation. The threshold of 20 per cent is regarded as the point just below where a person has sufficient voting power to control or influence the activities of the target company.
- A person who has control of more than 20 per cent of the voting shares (but less than 90 per cent) must not acquire control of more shares unless it is done in accordance with the legislation.

To avoid breaching the central rule, a person wishing to increase his or her shareholding must do so under one of the exceptions contained in s 611 of the legislation. The main exceptions are:

- Formal takeover bids
- Acquisition of not more than 3 per cent in a six month period ("creep provisions")
- Acquisitions approved by independent shareholders; and
- Acquisitions resulting from a court approved scheme of arrangement

Lastly, the Takeovers Panel main role is to resolve disputes relating to takeover bids. It has broad power to declare circumstances 'unacceptable' if it considers the Eggleston principles have been contravened even if there is no illegality. The Panel's constitutionality has been upheld by the High Court (Levy and Pathak, 2009).

2.6.2.1 Takeovers

A formal takeover bid may be off-market or on-market although on-market offers are relatively uncommon. The bidder must have given the target company and its shareholders a statement of certain prescribed information (called a bidder's statement). The target's directors must respond with another statement (called a target's statement)

There are volumes of research, published commentary and case law on takeovers and takeover regulations. However, this thesis only requires discussion of the broad procedural aspects to place merger and acquisition activity discussed in Chapter 5 in context.

With regards to off-market takeovers, the process involves:

- Takeover offers must be sent within two months of any public announcement of a proposal to make a takeover offer. The offers must be sent within a three day period and must be sent within 14 to 28 days after the bidders statement is sent to the target.
- A bidder's statement is usually in the form of a booklet and outlines the formal term of the offer, disclosures under the bidder's statement and form of acceptance. It usually includes the key selling or marketing messages for the offer.
- The offer period must last for at least one month but not more than 12 months.
- Within 15 days after dispatch of the offer, the target must lodge the target's statement with the Australian Securities and Investments Commission (ASIC) and then send copies to the bidder, its shareholders and the ASX.

With regard to a market bid, the takeover bid is effected by an announcement made by a stockbroker on behalf of the bidder. The offer commences on the first trading day of the relevant securities exchange after the end of the 14 days after the day that the announcement is made (requiring 14 clear days to pass between the announcement day and the first day of the offer).

Similarly for off market bids, the offer must be open for a period of at least one month and no more than 12 months. There is a similar requirement in the issue of bidder and target statements although the timeframe is compressed reflecting the capacity of the bidder to commence purchasing target shares after two weeks from the announcement.

An important consideration is that the price specified in an offer announcement must equal or exceed the maximum consideration that the bidder or an associate provided, or agreed to provide, for a security in the bid class under any purchase or agreement during the four months before the date of the announcement (Levy and Pathak, 2009). This aspect can affect the behaviour of target share prices after a failed bid, and particularly when the overall market later falls.

The takeover documentation (both bidders and target statements) are important in the analysis of M&A activity, particularly if they include an Independent Expert's report. The Independent Expert's report places a valuation in the public domain which can compared to the recent share price performance. Major discrepancies may indicate poor promotion by the company as well as optimistic forecasts by the independent expert and the valuation itself may be influenced by whether the transaction is hostile or friendly.

2.6.2.2 Scheme of Arrangement

Instead of making a formal takeover bid, it is possible for a bidder to achieve control of a target company by effecting a scheme of arrangement, for example, Xstrata plc's successful merger with MIM Limited in 2003. A scheme of arrangement is essentially an arrangement between the company and its shareholders which becomes binding once the statutory tests are met. Accordingly, it can be used to compel all shareholders to transfer their shares to a bidder in exchange for cash or other consideration (Levy and Pathak, 2009; ASIC, 2008).

The key steps summarised from Levy and Pathak, (2009) in undertaking a takeover by way of a scheme are generally as follows:

- The target and bidder agree to implement the scheme under a binding contract usually called a merger implementation agreement;
- A booklet satisfying the disclosure requirements in s 412 and under ASIC policy is prepared and settled with ASIC;
- An application is made to court for a shareholders meeting to be convened, usually 28 days' notice
- At the meeting, the scheme is considered by the shareholders and must be approved by a majority in number of shareholders at a general meeting who represent 75 per cent in value of shares voted at the meeting
- The matter returns to court for final approval; and
- Finally, the scheme is implemented, usually by all shares in the target not held by the bidder being transferred to the bidder in exchange for payment of the consideration under the scheme.

There is an important restriction on using a scheme of arrangement. Section 411 (17) provides that a court must not approve a scheme of arrangement unless:

- It is satisfied that the scheme has not been proposed for the purpose of avoiding the takeover provisions in Chapter 6 of the Corporations Act; or
- ASIC produces a statement to the court that it has no objections to the scheme.

Levy and Pathak, (2009) note that ASIC will only produce a no objection statement to the court if it is satisfied that all material information relating to the scheme of arrangement has been disclosed and the standard of disclosure in the explanatory memorandum is commensurate with that required under the takeover provisions;

2.6.2.3 Dual Listed Company Mergers

While not common, two high profile dual listed company mergers (DLCs) have occurred in the resource sector. These are the 1995 dual listing of CRA Limited and

RTZ plc to form Rio Tinto and the later 1998 dual listing of BHP Limited and Billiton plc to form BHP Billiton. The CRA/RTZ dual listed created considerable controversy in the Australian market as it was perceived that RTZ plc was conducting a surreptitious takeover of CRA Limited without paying a premium while there were perceptions that BHP Limited and Billiton plc ratio was too generous to Billiton plc shareholders (see Appendix 1).

DLC structures are effectively mergers between two companies in which the companies agree to combine their operations and cash flows, but retain separate shareholder registries and identities (Bedi et al, 2003).

The salient features have been summarised from Levy and Pathak, (2009) and readers are referred to their publication for more detail. These are:

- The two companies retain separate corporate identities and separate stock exchange listings, though commonly the companies will adopt matching corporate names and identities.
- Shareholders in each company continue to hold their existing shares and, accordingly, continue to receive dividends from the company in which they originally invested. The shareholders will, however, effectively have economic and voting interests in the merged group as a result of a contractual requirement that the distributions received by each group of shareholders (both regarding income and capital) must effectively be equalised on a per share basis and as a result of a joint electorate when voting on matters of mutual interest.
- In order to equalise interests, the two companies will agree in the merger agreement on an equalisation ratio. Bonus shares are issued by one of the companies (or alternatively, shares are consolidated) so that the value of shares in each company is equivalent.
- As the two companies remain separate corporate entities, they each continue to have a separate board of directors, but the board will comprise the same people.

Implementation of a DLC merger involves each company having shareholders meeting to pass resolutions, to approve the arrangement and to amend their constitutions to authorise the new arrangements concerning the unified board, voting procedures, takeovers and other matters. For Australian companies this will require a special resolution passed by the holders of 75 per cent of the shares represented at the shareholders meeting.

2.6.2.4 Considerations between Takeover and Scheme

Formal takeovers or schemes of arrangements offer different procedures which can be more advantageous in particular transactions. In particular, schemes of arrangement essentially involve co-operation with the takeover target so once the target board is agreeable, both companies work towards the implementation of the scheme. In contrast, takeover offers have more flexibility in changing the bid structure and lengthening or shortening the time period for the offer.

Table 8 summarises key comparisons between takeover offers and schemes of arrangements. The key determination involves an assessment of the likely relationship with the target and the threat of competing bidders.

Table 8. A comparison of Takeover Offers and Schemes of Arrangements.

	Takeover Offer	Scheme of Arrangement
Friendly or hostile	Friendly or hostile	Friendly
Control of transaction	Bidder; defining timetable and process	Target; as lodges explanatory memorandum and seeks court approvals
Due Diligence	If hostile bid, due diligence may be limited to publically available data	Access to target data usually part of transaction
Certainty	Outcome may be partial ownership if desired	Outcome is either success or nothing
Timing	Can be less than 10 weeks but depends on circumstances	Fixed minimum 10-14 weeks from announcement
Rigidity in structure	Less rigid with flexibility to change terms mid way through process	Very rigid; to change terms may involve going back to court
Ability to attain 100% threshold	The holders of at least 90% of shares must take positive action to accept the bid before the outstanding minority holdings can be compulsorily acquired	In order to obtain 100% ownership, a bidder needs only have a majority of shareholders by number present and voting at a general meeting who represent 75% by value present and voting to approve the scheme. Given that not all shareholders may vote, this may may mean a positive response from the holders of only 50%-60% of shares (or, in some cases, an even lower percentage) may be enough to achieve the necessary approval
Ability for shareholders to block transaction	A holder of 10% can prevent a bidder from getting to compulsory acquisition	Depending on how many shareholders vote, a 10% holding may not be enough to vote down a scheme.
Requirement for an independent expert's report	Only requires an independent expert's report if the bidder and target have a director in common or the bidder has a relevant interest in 30% or more of issued shares when it makes the takeover over	The meet ASIC policy, schemes of arrangement generally require an independent expert's report.
Structural Flexibility	Less flexible	Flexibility allows a number of transactions to be incorporated into the scheme include divestment of one part of the business or the paying of special franked dividends

Based on Levy and Pathak, (2009); ASIC, (2008).

While not discussed further, the principal advantages of DLC according to Levy and Pathak, (2009) relate to tax and include:

- Shareholders do not trigger capital gains tax upon a disposal of shares.
- Shareholders retain benefits of the tax treatment of dividends, e.g. a foreign company cannot pay franked dividends to an Australian resident.
- The DLC enables each entity to retain its own assets and avoid triggering change of control provisions in contract and avoid a disposal (or notional disposal) of assets which may give rise to other taxes and costs.

While these are important considerations, this thesis believes the ability to avoid a takeover premium and the co-operation between the boards of both companies are the likely underlying reasons for the DLCs leading to the creation of both Rio Tinto and BHP Billiton.

2.6.2.5 Anti-Competitive Regulations

As a final word under Australian legal framework and which is also prevalent in global resource acquisitions has been the sanctioning of mergers and takeovers by the competition regulators. This was most recently published in the withdrawal of BHP Billiton's offer for Rio Tinto, and partly based on the fact that the European Commission (EC) antitrust authorities withheld clearance unless BHP Billiton abided by a number of remedies (BHP Billiton 2008)(see Appendix 1). The regulations in the U.S. are termed antitrust law and enforced by the Department of Justice (DOJ) and most global mergers and acquisitions by larger companies require both EU and DOJ approval.

Brailsford and Knights (1998) note that the Australian Competition and Consumer Commission (ACCC) has become increasingly outspoken on mergers and acquisitions in some industries, particularly in banking, which has continued today. Major issues confronting both the ACCC and Treasury now often relate to foreign investment in Australian resources projects, particularly when it relates to sovereign backed companies. The most recent example of this has been the limitations placed on Chinalco's potential investment in Rio Tinto as well as its proposed direct investments in some of its key assets. While an outcome was not required given the eventual rejection of the deal by Rio Tinto management, the ACCC and Federal Treasury had to rule on the Chinese Minmetals purchase of Oz Mineral in early 2009. This deal was ultimately rejected on defence grounds given the proximity of Prominent Hill to the Woomera weapons testing area and Minmetals was instead allowed to purchase the other assets of the company (Oz Minerals, 2009).

2.7 Financial Economic Research

There is a considerable body of financial economic research that investigates aspects of mergers and acquisitions in North American companies listed on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and Nasdaq. The research often utilises data from the Centre of Research in Security Prices (CRSP). While this research tends to focus on the share price performance of bidders and targets, some research also considers accounting profitability measures and trends.

The structure of this section involves outlining Australian research and then incorporates the relevant findings with the broader global research on various topics.

These include: merger waves, scrip versus cash offers, takeover hostility, acquirer performance, characteristics of acquirers and targets, toeholds, independent experts reports and defence strategies.

The thesis also has three sections (2.7.2 *Scrip versus Cash Offers and Premia*; 2.7.3, *Friendly versus Hostile Takeovers* and 2.7.4 *Performance of Bidders and Targets on Announcement*) which have overlapping data given research often addresses all these issues together.

2.7.1 Australian Research

Australian research increased in the 1980s with the spate of high profile takeovers by the corporate raiders (Bond, Brieley, Holmes a Court, Parry, Skase and Spalvins), which delivered greater benefits to both target and acquiring shareholders in comparison to bids by non-raiders (Brailsford and Knights, 1998). These authors note that the culmination of this 1980s activity was the unsuccessful attempt by Holmes a Court to acquire control of BHP in 1986.

Walter (1984) comments that the Australian evidence on takeovers was incomplete at that time with only one major study completed by Dodd (1976) and this appeared inconsistent with overseas evidence at that time. Walter's (1984) research examined takeovers between 1966 and 1972.

Bishop, Dodd and Officer (1987) examined a later period (1972-1985) using an event study methodology similar to Walter (1984). With a similar but more extensive scope, they researched the returns to shareholders of target and bidding firms in successful, unsuccessful and withdrawn takeovers and including multiple bidders as well as companies involved in partial takeovers. They estimate that net gains from this takeover activity during this period to be around $7.2 billion.

The returns to the shareholders of the bidding firms in corporate takeovers was investigated by Bellamy and Lewin, (1992) who also criticized earlier studies for a lack of control of information or wealth transfer effects arising from the method of payment used in the acquisition**.**

Bugeja & Walter (1995) investigated explanations for cross-sectional differences in the size of the premia paid to target shareholders in a sample of 78 Australian takeovers between 1981 and 1989. They tested the following factors: removal of inefficient target management, the resolution of agency costs of free cash flow, the provision of financial slack to allow the target to undertake profitable investments as well as the impact of target managerial ownership (proxied by director's shareholdings) and bidder ownership of the target.

One of the researchers' criteria in the study was that neither the target nor the bidder was a mining company. Bugeja & Walter (1995) comment that this exclusion was in line with most previous Australian takeover research and this stems from the fact that mining companies are considered by researchers to have systematically different financial, operating and risk characteristics. This exclusion of mining companies continued with da Silva Rosa, Izan, Steinbeck, and Walter, (2000).

Brailsford and Knights (1998) focused on other measures to further investigate the performance of acquiring companies following a takeover as well as examining the relationship between financial performance and various financial and non-financial measures which proxy for possible sources of change in firm performance.

The effects of takeover resistance by target companies on the wealth of their shareholders were studied by Maheswaran and Pinder (2005). The researchers used binomial testing to determine whether the deal characteristics in their 133 target companies would be expected to occur by chance.

Eddey and Casey (1987) and (1989) researched defence strategies under the Takeovers Code in the 1980s (see Section 2.6.2 above) and in the latter, analysed the motives behind director recommendations in takeover bids. Eddey (1993) reviewed the influence of the independent expert's report in takeover bids. This was later reassessed by Bugeja (2005).

Brailsford and Knights (1998) researched the financial and non-financial performance of a selection of takeovers between 1981 and 1992.

Le and Schultz (2007) investigated the impact of toeholds on bidder abnormal returns on takeover announcements by Australian listed companies between 1997 and 2004. The Australian literature is largely consistent with takeover announcements having no significant impact on bidder shareholders' wealth (Walter 1984; Bellamy & Lewin 1992; Bugeja & Walter 1995).

Bellamy and Lewin (1992) and da Silva Rosa et al (2001) researched payment methods and bid outcomes.

Bugeja (2001) investigated the effect of independent expert reports in Australian takeovers in a series of papers and included work on independent expert fees (Bugeja et al, 2005) and the independence of recommendations from firms with the target as a client (Bugeja, 2005).

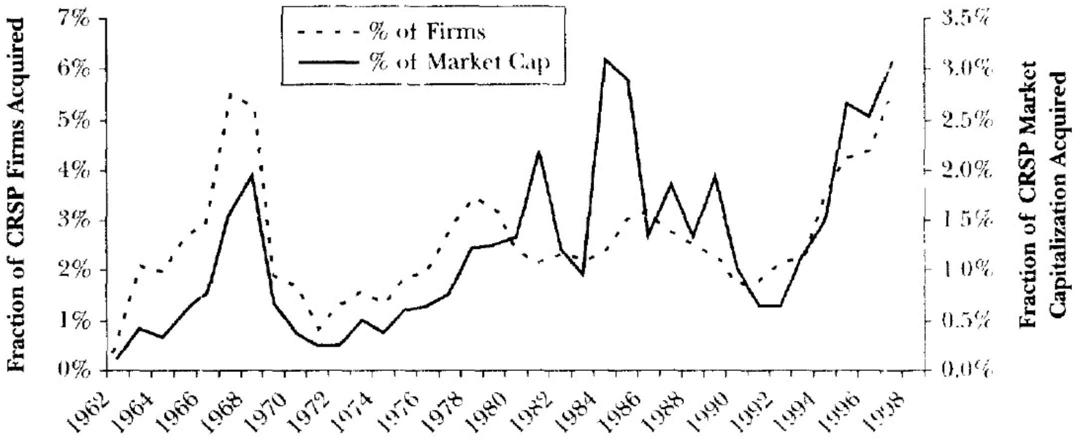
In related research Bugeja and da Silva Rosa, (2008) researched the influence of changing tax legislation on takeover payment methods with the tax deferral using scrip offers from December 1999 while Bugeja and Gallery, (2006) investigated the market value of goodwill of different 'ages'.

2.7.2 Merger Waves

Andrade et al's (2001) summary paper notes that there are two most consistent empirical features of merger activity over the last century: 1) mergers occur in waves; and 2) within a wave, mergers strongly cluster by industry.

These waves are presented in Figure 25 derived from their paper focused on North American takeover activity. It displays two different measures of annual merger activity. The dotted line represents the number of firms acquired during the year expressed as a fraction of the beginning-of-year number of firms in CRSP. The solid line provides a sense of the values involved, obtained by dividing the aggregate dollar value of mergers over the year by the total beginning-of-year market capitalisation of firms listed on CRSP.

Figure 25. Aggregate Merger Activity.



From Andrade et al (2001).

The 1990s was the greatest takeover wave in history and Dong et al, (2006) report that in the 1993-2000 period the total value of transactions was US$4.35 trillion (2001 dollars). This was significantly higher than the total value of transactions in the preceding 15 years of US$1.18 trillion (1978-1993).

The wave features suggested to Andrade et al (2001) that mergers might occur as a reaction to unexpected shocks to industry structure. They considered that the industry shock of deregulation became the dominant factor after the late 1980's and accounts for nearly half of the merger activity since that time within the North American market. In broad terms Schleifer and Vishny (2003) characterise the takeovers of the 1990s as often being friendly, while they were generally hostile during the 1980s, and involved ''conglomerates'' in the 1960s. Casey and Eddey (1986) also note that the 1980s marked a period of increased hostility in Australian takeovers.

Walter (1984) cites that Walker (1973) estimated that 38 per cent of firms listed on the Sydney Stock Exchange at some stage in the 1960 to 1970 period were subject to a takeover bid and that four out of five bids were successful.

In the Australian resource sector, this thesis would concur with the concept of merger waves. These are presented in Chapter 5 although 'opportunities' rather than 'shocks' may be more relevant. As discussed later, on a global basis the Australian market is less relevant than the North American and London markets and can experience times when companies have lower valuations than global peers. This presents acquisition opportunities to overseas companies that can attain higher market ratings on Australian company assets in their home markets. This concurs with Rhodes-Kropf and Viswanathan (2004) who show potential North American market value deviations from fundamental value for both acquirers and targets can rationally correlate with M&A activity. They believe that merger waves and waves of cash and stock purchases can be rationally driven by periods of over- and under valuation of the market. However, in the Australian situation this may sometimes reflect macroeconomic influences which affect the total market relative to global market peers.

Table 9 highlights that the North American market has also experienced considerable consolidation in both the Metals and Mining and Oil and Gas sectors during the past three decades.

Table 9. Top Five Industries Based on Average Annual Merger Activity.

1970s	*1980s*	*1990s*
Metal Mining	Oil & Gas	Metal Mining
Real Estate	Textile	Media & Telecom.
Oil & Gas	Misc. Manufacturing	Banking
Apparel	Non-Depository Credit	Real Estate
Machinery	Food	Hotels

From Andrade et al, (2001).

2.7.3 Scrip versus Cash Offers and Premia

Andrade et al (2001) have summarised the general features of mergers and acquisitions over the three decades in Table 10. They note that a key difference in the mergers in the 1990s over the 1980s was that around 70 per cent of all deals in the 1990s involve scrip compensation, with 58 per cent entirely stock financed. These numbers are approximately 50 per cent more than in the 1980s. They suggest that the predominance of stock financing probably relates to the virtual disappearance of hostility in the takeover market.

The authors define a bid as hostile if the target company publicly rejects it, or if the acquirer describes it as unsolicited and unfriendly. They note that only 4 per cent of transactions in the 1990s involved a hostile bid at any point in time, compared to 14 per cent in the 1980s, and the success rate of hostile bidder was low at acquiring less than 3 per cent of the targets. Consistent with this more ‘friendly’ atmosphere, the average transaction in the 1990s involved only one bidder, and 1.2 rounds of bidding, far less than during the 1980s (Andrade et al, 2001).

Table 10. Characteristics and Descriptive Statistics by Decade, 1993-1998.

	1973–1979	*1980–1989*	*1990–1998*	*1973–1998*
N	789	1,427	2,040	4,256
All Cash	38.3%	45.3%	27.4%	35.4%
All Stock	37.0%	32.9%	57.8%	45.6%
Any Stock	45.1%	45.6%	70.9%	57.6%
Hostile Bid at Any Point	8.4%	14.3%	4.0%	8.3%
Hostile Bid Successful	4.1%	7.1%	2.6%	4.4%
Bidders/Deal	1.1	1.2	1.0	1.1
Bids/Deal	1.6	1.6	1.2	1.4
Own Industry	29.9%	40.1%	47.8%	42.1%
Premium (Median)	47.2%	37.7%	34.5%	37.9%
Acquirer Leverage $>$ Target Leverage	68.3%	61.6%	61.8%	62.9%
Acquirer Q $>$ Target Q	68.4%	61.3%	68.3%	66.0%
Relative Size (Median)	10.0%	13.3%	11.2%	11.7%
Fraction of Acquirer Announcement Returns $< -5\%$	14.9%	17.0%	19.4%	17.5%
Fraction of Acquirer Announcement Returns $> 5\%$	9.6%	11.3%	10.7%	11.1%

From Andrade et al, (2001).

Fuller et al, (2002) studied the returns for firms that acquired five or more public, private and/or subsidiary targets within a short period for time, and hence, any variation in returns were deemed to be due to the characteristics of the target and the bid. With a sample of 3,135 takeovers in 1990 to 2000 period, they found that when bids are partitioned by the method of payment (cash, stock, or a combination of the two), they found that acquisition of public targets results in insignificant bidder returns for cash or combination offers but significantly negative returns to the acquirers when stock is offered.

However, for private and subsidiary targets, acquirer returns are significantly positive regardless of method of payment. The acquirer returns which accompany bids for private firms and subsidiaries are greater for bids financed with equity than for bids financed with cash.

Fuller et al, (2002) also partitioned the returns to acquirers on the relative size of the target compared to the bidder and found that for public targets, as the relative size for the target increases, the returns become more positive for cash offers, more negative for stock offers, and change little for combination offers. However, for both subsidiary and private targets, there is a positive relationship between the target's relative size and the acquirers' positive abnormal returns. As the relative size of the target increases for private acquisition, returns to the bidder using stock are greater than if the bidder had used cash.

A summary of explanations offered by Fuller et al, (2002) are as follows:

1. Bidders receive a better price when they buy non-public firms potentially reflecting lower liquidity (increase difficulties in buying and selling private firms).
2. The presence of a bidding company's influence on target management as a blockholder (large shareholder) therefore ensuring expectations are met on performance and better returns from stock offers.
3. The tax deferral opportunity from stock offers in comparison to cash offers and hence the capacity to accept a discount price for the firm equal to the value of deferring the tax.

The overall findings support other research (e.g. Rhodes-Kropf and Viswanathan, 2004) that suggests a bid with stock reveals that the acquirer views that its stock as being overvalued. It also supports the notion that a bidder should make cash offers when there is high uncertainty about its own firm's value, and stock offers when there is high uncertainty about the target's value. This is supported by Dong et al (2006).

Rhodes-Kropf and Viswanathan, (2004) believe that cash mergers are not better than stock mergers but rather that cash mergers are more likely to occur in undervalued markets. They note the potential for market price misvaluations in the two components of pricing of a company - a firm specific component and a market-wide component. Given that fiduciary responsibility requires the target management to accept any offer when based on its information, yields more than the standalone value, it has a dilemma in determining the degree of overpricing of the bidder and expected synergies relative to its own mispricing. Hence, in bull markets, targets are more likely to over estimate the value of the bidding stock and expected synergies relative to its own mispricing and are therefore more likely to accept a scrip offer – hence the appearance of merger waves. They also note that it is not the case that increasing scrip merger activity ultimately leads to market crashes, but rather it is that market crashes are preceded by increasing scrip mergers.

Interestingly, although somewhat dated, Walter (1984) noted in his Australian study of takeovers between 1966 and 1972 that target shareholder returns are normal or below normal prior to a bid, whereas bidders exhibit above average returns supporting the concept of an overvalued bidder. When the bid is made, target shareholders typically receive significant positive excess returns; whereas bidder shareholders gain no additional benefit.

Table 11 presents a summary of the abnormal returns for targets and bidders under a number of scenarios for 78 Australian transactions between 1981 and 1989 from Bugeja and Walter (1995). The abnormal returns were estimated as the cumulative market adjusted abnormal returns for a 60-day period prior to a takeover announcement till one day following the announcement. The authors defined a rejected takeover if target management recommended shareholders reject the offer at the initial recommendation in the Part B or Part D statement.

Their research identified some key factors that they believe potentially influence the size of premia and included:

- Removal of inefficient target management.
- Managerial Ownership of the Target Firm.
- Bidder share ownership in the target firm.
- Free cash flow of the target firm

- The level of bidder and target firm financial slack (reserve borrowing capacity).

These are discussed in later sections in Chapter 2 and Chapter 7.

Table 11. Abnormal returns around the takeover announcement.

Category	N	Target Returns		Bidder Returns	
Panel A: All Takeovers					
All Takeovers	78	16.03	(5.29)***	–1.80	(–0.59)
Panel B: Classified by Outcome of Takeover					
Successful	63	16.49	(4.68)***	–1.70	(–0.45)
Unsuccessful	13	7.54	(1.38)*	–0.01	(–0.09)
Withdrawn	2	31.00		–17.50	
Panel C: Classified by Target Firm Reaction					
Accept	43	13.74	(2.96)***	0.01	(0.11)
Reject	35	18.83	(5.16)***	–4.54	(–1.43)*
Panel D: Classified by Form of Consideration					
Cash Payment	55	17.18	(4.60)***	–3.36	(–0.76)
Mixed Payment	11	7.73	(1.32)	–1.91	(–0.49)
Equity Exchange	12	18.33	(2.27)**	4.67	(0.87)

* indicates significance at 0.10 level

** indicates significance at 0.05 level

*** indicates significance at 0.01 level

The t-statistic of the test that the mean return equals zero is in brackets.

From Bugeja and Walter (1995).

Over varying event windows (60, 20, 10 and 1 day(s) prior to the announcement and 1 day past the announcement), average target CAR were 16.03 percent, 16.88 percent, 16.29 percent and 9.61 percent respectively. Their suggestion is that the size of the event window is not critical outside a 2-day window which is potentially influenced by information leakage.

In terms of bidder performance over the same event windows (60, 20, 10 and 1 day(s) prior to the announcement and 1 day past the announcement), average bidder CAR were -1.80 percent, 1.26 percent, 0.91 percent and 0.68 percent respectively.

In reviewing Table 11, target CAR are increased if the transaction is successful and target management rejects the offer. It does not appear important whether the payment is by cash or scrip although it was lower if it involved a mixed payment of both.

Earlier work by Bishop et al, (1987) presented evidence that those shareholders of successful bidding firms gained positive abnormal returns before the announcement of the bid (mean CAR of +6.0 per cent for all acquiring firms) and no abnormal returns after the bid. For unsuccessful bidders, similar pre-offer positive excess returns were also observed but the target abnormal returns continued post-announcement date of bid closure. These were attributed to "greenmailers", that is, target shareholders holding out for a higher price for their shares from a subsequent bidder or a company friendly to the target.

Bellamy and Lewin (1992) found that with a sample of 210 bidding firms none of the daily abnormal returns were significant using event studies for the ten days before and after the takeover announcements. However, when the sample was partitioned between cash and tender (scrip) offers, they found that the shareholders of bidding firms using cash offers earned a significant positive abnormal return of 1.3 per cent on the day after the takeover announcement and for a 21-day period around the announcement the CAR was 0.84 per cent. By contrast, when share exchange offers were tested, a significant negative abnormal return of -2.97 per cent was earned by bidding firm shareholders on the day of the takeover announcement. This supports a general hypothesis that cash offers are more likely to be associated with abnormal positive returns as well as the perceived ‘overvalued status’ of takeover scrip when used in a takeover.

This contrasts with the more recent work of da Silva Rosa et al, (2000) who found that the abnormal returns earned by Australian bidders and targets over the bid announcement period are not significantly associated with the proposed type of payment. However, these researchers found that over the long-term post-bid period, bidders who offer shares significantly under-perform regardless of the bid outcome (perhaps also reflecting overvalued status). Importantly, the result is after controlling for firm size, survival bias and method of return computation. Finally, the size of the target relative to the bidder firm and the variability of bidding firms' share price prior to the bid announcement were both positively associated with the probability of a share offer.

They summarize their research to date as indicating:

- Firms involved in cash bids generally attract higher abnormal returns but the evidence on the relative impact of tax considerations and the information content of the medium of exchange remains uncertain;
- The positive abnormal returns to acquirers in cash bids are not as high in percentage terms as the returns earned by cash offers to targets and the returns are not consistent or robust across all countries. They note that the Australian evidence indicates that estimates of the abnormal returns to bidder firms are sensitive to small changes in the event-window around the bid announcement date;
- The relative performance of merged firms in the long-term over the post-acquisition period is empirically predictable by the medium of exchange: firms in cash offers earn higher returns than firms involved in share offers. This result contradicts reasonable expectations of market efficiency but is robust to biases that may have been present in earlier studies; and
- There is no evidence that changes in capital structure affect firms' equity values around the bid announcement period.

With respect to bidders only, Le and Schultz’s (2007) investigated a dataset of 122 takeover announcements made by Australian listed companies between 1997 and 2004 inclusive and found on average that there were no significant bidder abnormal returns in response to takeover announcements. However, they did find a significantly positive association between the presence of toeholds/toehold size and bidder abnormal returns (see Section 2.7.7 below).

Bugeja and da Silva Rosa, (2008) studied 194 Australian takeovers between 1996 and 2003 to determine whether there was an influence of a change in taxation legislation. The change meant that from December 1999, shareholders who disposed of shares in Australian takeovers in exchange for scrip could elect to defer capital gains taxation until the disposal of the shares received. Their results show that, subsequent to the regulatory change, there is a significantly higher probability that equity will be offered as consideration where target shareholder capital gains are greater. They believe that this finding confirms the importance of shareholder level taxation in explaining corporate acquisition structure and adds to previous European and US evidence on factors associated with payment method choice in takeovers.

While this thesis would concur with these findings from empirical observation, the issue tends to confound other research on shareholder returns using scrip versus cash payments.

2.7.4 Friendly versus Hostile Takeovers

Takeovers are often segregated into friendly or hostile, depending on how the target's Board reacts to the offer. As outlined below, considerable research has been focused on the returns to acquirers and targets in either situation but Schwert (2003) points out that public announcement of proposed takeovers are really just part of the negotiating strategies, and there are problems in distinguishing between hostile and friendly transactions.

He notes that private negotiations may be hostile or friendly prior to any announcement and in some cases these negotiations break down and one of the parties decides that public information about the potential bid would enhance its bargaining position. For example, bidders might choose to reveal their intentions to put stockholder pressure on target managers. Likewise, targets might reveal a takeover attempt to attract alternative bidders.

Schwert's (2003) research reviews 2,346 takeover contests in the U.S. between 1975 and 1996 using both share price and financial performance analysis. His conclusions were that most of the characteristics of takeover offers that are related to hostility only seem to reflect strategic choices made by the bidder or the target firm to maximise their respective gains from a potential transaction.

Healy et al (1997) analysed US industrial takeovers between 1979 to mid 1984 by categorizing the sample of takeovers into two types:

1. Friendly transactions that typically involved stock payment for firms in overlapping businesses, and which they called ‘strategic’ takeovers; and
2. Hostile transactions that generally involved cash payments for firms in unrelated business, which were labelled as ‘financial’ takeovers.

Their inference was that strategic takeovers have several potential advantages over financial transactions which included related business synergies, and the opportunity to conduct a more accurate valuation of the target company. The use of scrip also reduces the cost of valuation mistakes because the shareholders of the target company partially bear some of the consequences of errors. They concluded that friendly takeovers were also less likely to experience disrupted production after the takeover in comparison to hostile transactions which also had the potential to destroy the target firm’s intangible assets.

Healy et al (1997) measured a company’s performance by using the acquiring firm’s pre-tax operating cash flow returns on beginning assets which was also adjusted for contemporaneous industry performance. This measure was used to avoid distortion by variations in takeover accounting and financing. In summarising the results of the analysis, the researchers state that strategic takeovers generated substantial gains for acquirers whereas financial transactions broke even at best. They highlight the importance of conducting accurate due diligence on the target and the downside if competing bids emerge.

In the U.K. Shoenberg and Thornton (2006) report that recent hostile transactions involved average bid premiums in the region of 35 per cent to 45 per cent while they found 52 per cent of contested takeovers unsuccessful from their small (56) sample between 1995 and 1999. In Australia, Maheswaran and Pinder (2005) reported that 38 per cent of 133 takeover bids from January 1992 to June 2001 were considered hostile while 62 per cent were classified as friendly. Furthermore the 38 per cent decreased to 24 per cent for the companies that maintained their hostility. Their definition of hostility is defined as when the takeover bid is unsolicited by the target management but as noted here and at the commencement of this section, this ‘hostility’ can change over the course of the takeover.

2.7.5 Performance of Bidders and Targets on Announcement

The typical performance of bidders is summarised by Sirower (1997) in his general review of U.S. bidding companies where he found 59 per cent of these bidding firms had a total market adjusted return (performance) decreasing on the acquisition announcement. Furthermore, the returns for 71 per cent of these underperforming companies were negative over the next 12 months. In line with Eccles (1999), Sirower (1997) notes that this continuing underperformance demonstrates that the market is good at quickly predicting the potential success of acquisitions.

Jovanovic and Braguinsky (2004) note that on news a takeover, the share price of the target firm usually rises sharply, while that of the acquiring firm usually falls but the joint value may or may not rise. This evidence of bidder and combined bidder-target discount has been taken to imply that takeovers often just redistribute rents from acquirers to their targets or that they even destroy rents. They propose a ‘competitive’ model which presents takeovers as being privately and socially efficient and relate bid premia to target specifications.

Table 12 from Andrade et al, (2001) summarises announcement period abnormal returns for both acquirers and targets, as well as for the acquirer and target combined and using a three-day event window for the target and acquirer combined. Interestingly, the combined acquirer-target returns are similar across the three decades, ranging from 1.4 per cent to 2.6 per cent, and averaging 1.8 per cent overall for 3,688 completed mergers. In addition, the authors note that the combined average abnormal returns over this event window are reliably positive, suggesting that on average, mergers do create shareholder value. Even when the event window is expanded to begin 20 days prior to the merger announcement and end on the merger closing date, the combined average announcement period abnormal return is essentially identical at 1.9 per cent. However, they note that the statistical precision is considerably reduced as the event window is lengthened to an average of 142 days, and this estimate cannot be reliably distinguished from zero.

Table 12. Announcement Period Abnormal Returns by Decade, 1973-1998.

	1973–79	1980–89	1990–98	1973–98
Combined				
[−1, +1]	1.5%	2.6%[a]	1.4%[a]	1.8%[a]
[−20, Close]	0.1%	3.2%	1.6%	1.9%
Target				
[−1, +1]	16.0%[a]	16.0%[a]	15.9%[a]	16.0%[a]
[−20, Close]	24.8%[a]	23.9%[a]	23.3%[a]	23.8%[a]
Acquirer				
[−1, +1]	−0.3%	−0.4%	−1.0%	−0.7%
[−20, Close]	−4.5%	−3.1%	−3.9%	−3.8%
No. Obs.	598	1,226	1,864	3,688

Note. Statistical significance at the 5 percent level is denoted by [a].

From Andrade et al, (2001).

The data indicated target firm shareholders are clearly winners in merger transactions. Table 12 highlights that the average three-day abnormal return for target firms is 16 per cent, which rises to 24 per cent over the longer event window. Andrade et al, (2001) report that both of these estimates are statistically significant at the 1 per cent level. In 1998, the median equity market value for target firms was US $230 million, such that a 16 per cent announcement period abnormal return corresponds to US $37 million for target firm shareholders over a three-day period.

Another comparison benchmark is the average annual return for all U.S. publicly traded firms, which is around 12 per cent. Therefore over a three-day period, target firm shareholders realize a return equivalent to what a shareholder would normally expect to receive over a 16-month period (Andrade et al, 2001).

Finally, the authors also report that the average announcement period abnormal return estimate for target firms is remarkably stable across decades. This is interesting in the light of the evidence on clustering of merger activity. Each decade is associated with merger activity concentrated in different industries, but the target firms consistently have abnormal returns of 16 per cent in the announcement period. Together, these two observations suggested to Andrade et al, (2001) that merger premia are fairly similar across different types of merger transactions.

Within the Australian context, Bugeja and Walter (1995) note that previous Australian research found abnormal target returns of approximately 20 per cent in both successful and unsuccessful takeovers in the takeover announcement period.

More recently, Le and Schultz (2007) provide a comprehensive review of bidder shareholder returns on takeover announcements (see Table 13). The authors note that the findings vary significantly depending on time periods, windows examined, geographical locations, and in some cases, event study methods. Nevertheless, they find that the Australian literature is largely consistent with takeover announcements having no significant impact on bidder shareholders' wealth in comparison to mixed evidence from the US market.

Table 13. Empirical Evidence on the Bidder Shareholder Wealth Effects of Takeover Announcements. The table summarises the findings from event studies that examine the bidder shareholder wealth effects of takeover announcements. The categories are: *study* shows the reference for the study, *period* studied shows the years over which the study is conducted, *return interval* shows the frequency over which abnormal returns are computed, *event window* shows the period over which cumulative abnormal returns are calculated where 0 is the date, week or month of the takeover announcement, *CAAR* is the cumulative average abnormal return for bidding firms over the event window and finally, *country* shows the geographic location from which the sample in the study is drawn.

Study	Period Studied	Return Interval	Number of Observations	Event Window	CAAR	Country
Leeth and Borg (2000)	1919–1930	Monthly	466	[0]	0.17[a]	US
	1919–1930	Monthly	466	[0]	1.27**b	US
Asquith, Bruner and Mullins (1983)	1963–1979	Daily	214	[−1,0]	0.9***	US
Jarrell and Poulsen (1989)	1960–1969	Daily	106	[−10,+5]	4.4***	US
	1970–1979	Daily	140	[−10,+5]	1.22***	US
	1980–1989	Daily	159	[−10,+5]	−1.1	US
Dodd (1980)	1971–1977	Daily	126	[−1,0]	−1.16***	US
Servaes (1991)	1972–1987	Daily	384	[0, delisting day]	−1.07**	US
Morck, Shleifer and Vishny (1990)	1975–1987	Daily	326	[−1,1]	−0.7	US
Radd and Wu (1994)	1981–1986	Daily	105	[−1, 0]	−0.29	US
Walker (2000)	1980–1996	Daily	278	[−2,+2]	−0.84*	US
Franks and Harris (1989)	1955–1985	Monthly	51	[0]	1.00	UK
Firth (1980)						
successful bidders	1969–1975	Monthly	434	[0]	−6.3***	UK
unsuccesful bidders	1969–1975	Monthly	129	[0]	−6.0***	UK
Draper and Paudyal (1999)	1988–1996	Daily	256	[−1,+1]	−1.14**	UK
	1988–1996	Daily	256	[−1,+1]	−0.64	UK
Walter (1984)	1966–1972	Weekly	368	[0]	−0.3	Australia
Bellamy and Lewin (1992)	1980–1988	Daily	210	[−10,+10]	1.6	Australia
Bugeja and Walter (1995)	1981–1989	Daily	78	[−60,+1]	−1.8	Australia
Campa and Hernando (2004)	1998–2000	Daily	262	[−1,+1]	0.44	Europe
Goergen and Renneboog (2004)	1993–2000	Daily	142	[−2,+2]	1.18***	Europe

Note:
*** Significant at 1% level;
** Significant at 5% level;
* Significant at 10% level;
a CAAR is calculated using the standard market model; and
b CAAR is calculated using the 0/1 market model.

From Le and Schultz (2007).

Recapping on the importance of the various event study methodologies in the findings, Le and Schultz (2007) have summarised the methodologies in Table 14.

Table 14. Summary of Event Study Methodologies. *Study* refers to the reference for the study. *Method* refers to the event study methodology employed to examine wealth effects. *Window* refers to the period for which cumulative abnormal returns are calculated. *Return Interval* shows the frequency for which returns are computed. *CAAR* shows the reported average cumulative abnormal bidder return over the event window.

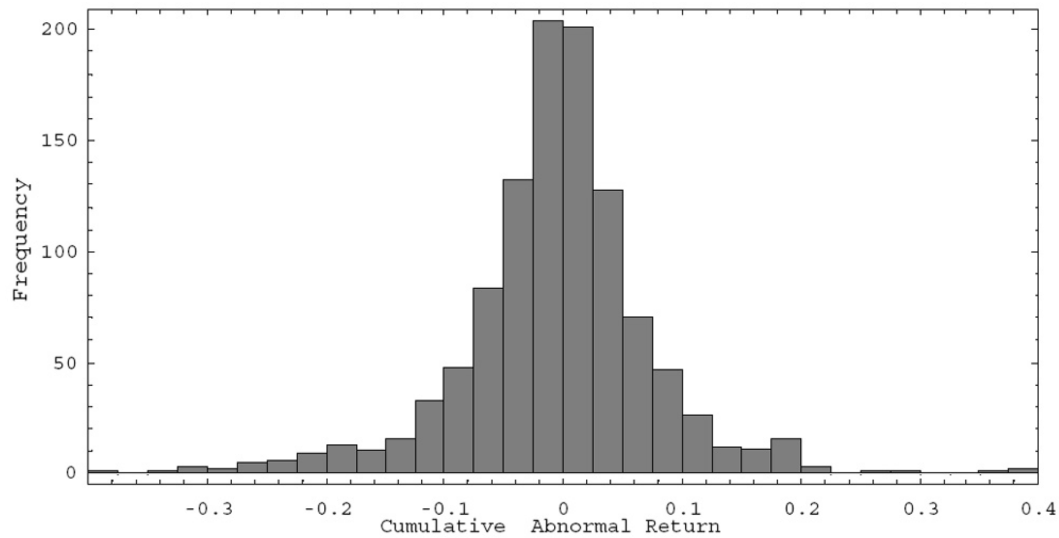
Study	Method	Window	Return Interval	CAAR
Dodd (1980)	Market model	[–1,0]	Daily	-1.16^{**}
Asquith, Bruner and Mullins (1983)	Beta control portfolio	[–480,+20]	Daily	9.2^{***}
Walter (1984)	Market model	[–100,0]	Weekly	30.7^{**}
	Market model	[0]	Weekly	–0.3
Jarrell and Poulsen (1989)	Market model	[–2,+1]	Daily	0.70^{**}
	Market model	[–10,+20]	Daily	1.96^{***}
Morck, Shleifer and Vishny (1990)	Market model	[–1,+1]	Daily	–0.7
Servaes (1991)	Market model	[0, delisting day]	Daily	-1.07^{**}
Walker (2000)	Market model	[–2,+2]	Daily	-0.84^{*}
	Size Matched firm	[–2,+2]	Daily	–0.77
Leeth and Borg (2000)	Market model	0	Monthly	0.17
	0/1 market model	0	Monthly	1.27^{**}
Goergen and Renneboog (2004)	Market model	[–1,0]	Daily	2.98^{***}
	Market model	[–2,+2]	Daily	3.18^{***}
	Market model	[–40,0]	Daily	0.64
	MM	[–60,+60]	Daily	–0.26

Note:
*** Significant at 1%;
** Significant at 5%; and,
* Significant at 10%.

From Le and Schultz (2007).

Hackbarth and Morellec (2008) conducted a short-term event study using an event window of the 3-day period immediately surrounding the merger announcement date, a 90-day estimation period prior to the event period on a database of 1,086 takeovers of publicly traded U.S. firms between 1985 and 2002. They report the same general patterns that have been reported previously in the literature with the returns to shareholders of acquiring firms are slightly negative, reaching –0.52 per cent on average (compared to -0.7 per cent in Table 12 above). The authors visually outline the relatively symmetrical distribution of the cumulative abnormal returns for acquirers in Figure 26.

Figure 26. Acquirers CAR frequency distribution.

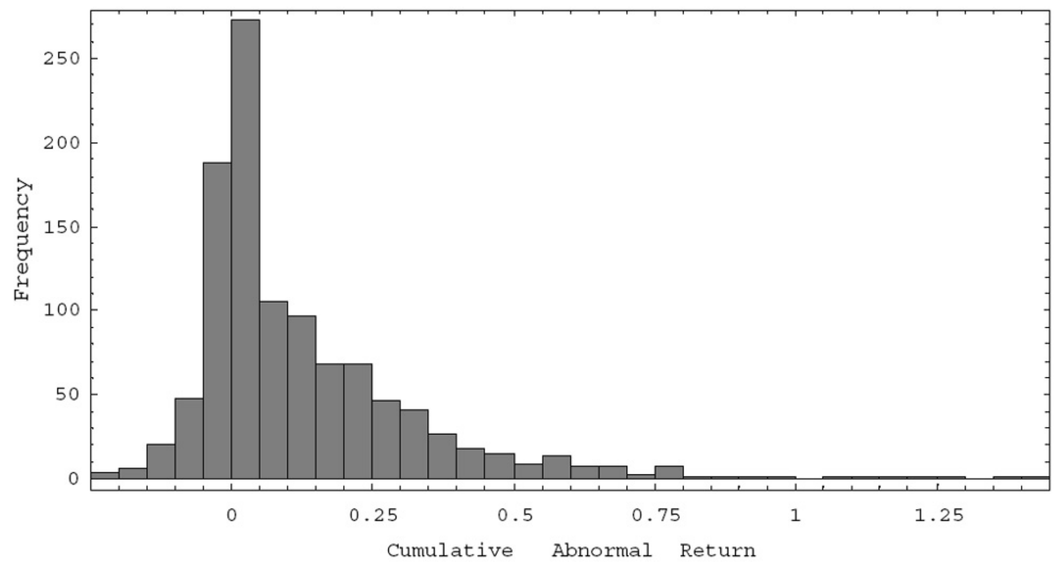


From Hackbarth and Morellec (2008).

Similarly, in the Australian context and using a dataset of 122 takeover announcements made by Australian listed companies between 1997 and 2004, Le and Schultz (2007) found on average that there were no significant bidder abnormal returns in response to takeover announcements.

The authors also report that the returns to shareholders of target firms during the 3 trading day event-window averaged 18.21 per cent (compared to 16.0 per cent in Table 12) and reaffirming that target abnormal returns are economically large. The skewed cumulative abnormal returns frequency distribution are presented in Figure 27.

Figure 27. Target CAR frequency distribution.



From Hackbarth and Morellec (2008).

Andrade et al, (2001) comment that acquiring firm shareholders appear to come dangerously close to actually subsidizing takeover transactions. However, they note that the full sample results hide an important distinction based on financing of these transactions. In particular, they find that mergers financed with stock, at least partially, have different value effects from mergers that are financed with cash.

They present a view that from the acquiring firm's perspective, stock-financed mergers can be viewed as two simultaneous transactions; a merger and an equity issue. On average, equity issues are associated with reliably negative abnormal returns of around -2 to -3 percent during the few days surrounding the announcement and this is perceived to reflect the likelihood of bidder overvaluation by the market discussed earlier. Therefore Andrade et al, (2001) highlight that it is important to separate the stock-financed mergers from the others before making final judgement on the value effects for shareholders, especially for acquiring firms.

Andrade et al, (2001) have summarised average announcement period abnormal returns for sub-samples split on the basis of whether any stock was used to finance the merger transaction in Table 15 and indicate that a negative announcement period stock market reaction for acquiring firms is limited to those that finance the mergers with stock. Acquiring firms that use at least some stock to finance their acquisition have reliably negative three-day average abnormal returns of -1.5 per cent, while acquirers that abstain from equity financing have average abnormal returns of 0.1 per cent which are indistinguishable from zero.

Table 15 Announcement Period Abnormal Returns for Sub-Samples, 1973-1998.

	Stock	*No Stock*	*Large Targets*
Combined			
[−1, +1]	0.6%	3.6%[a]	3.0%[a]
[−20, Close]	−0.6%	5.3%	6.3%
Target			
[−1, +1]	13.0%[a]	20.1%[a]	13.5%[a]
[−20, Close]	20.8%[a]	27.8%[a]	21.6%[a]
Acquirer			
[−1, +1]	−1.5%[a]	0.4%	−1.5%
[−20, Close]	−6.3%	−0.2%	−3.2%
No. Obs	2,194	1,494	511

Note. Statistical significance at the 5 percent level is denoted by [a].
From Andrade et al, (2001).

Andrade et al, (2001) also report that target firm shareholders also do better when there is not equity financing. The three-day average abnormal return for target firms is 13 per cent for stock-financed mergers and just over 20 per cent for mergers financed without stock (Table 15). They believe that this is not a manifestation of larger deals having smaller premia and a greater tendency to be stock-financed because after controlling for deal size, they found the difference remains (1.3 per cent for large stock deals and 17.8 per cent for large non-stock deals). They note that financing method also has a significant impact on inferences about overall value creation from mergers. The combined average abnormal returns for stock-financed mergers are zero, suggesting that this subset of mergers do not increase overall shareholder value. On the other hand, the combined three-day abnormal returns for mergers financed without any stock are reliably positive at 3.6 per cent.

Andrade et al’s, (2001) equity raising concept provides a convenient and logical explanation as to the different returns experienced by acquirers using stock as payment. This differs from Fuller et al, (2002), Rhodes-Kropf and Viswanathan, 2004, Dong et al (2006), etc. who proposes that acquirer underperformance relates to perceptions that bidder management view their stock as being overvalued. Rhodes-Kropf and Viswanathan, 2004 also suggest that the use of stock as payment relative to cash becomes prevalent in bull markets. Elsewhere, Bugeja and da Silva Rosa's, (2008) note in Australian takeovers that changes to taxation legislation in 1999 have encourage bidders to offer stock as payment.

In summary at least there is a general consensus that acquirers who pay with scrip tend to under perform at the time of the announcement relative to bidders that offer cash. Stock payment may also lead to long-term under performance relative to cash offers although this is less conclusive as discussed in the next section.

2.7.5.1 Long-Term Abnormal Returns

There are few studies which have investigated long term returns from mergers with the most recent being the work of Loughran and Vijh (1997). These researchers investigated mergers in the 1970-1989 period and estimated that during a five-year period following the acquisition, on average, firms that complete stock mergers earn significantly negative excess returns of -25.0 per cent whereas firms that complete cash tender offers earn significantly positive excess returns of 61.7 per cent. They also note that over the combined pre-acquisition and post-acquisition period, target shareholders who hold on to the acquirer stock received as payment in stock mergers do not earn significantly positive excess returns.

These findings support the research of da Silva Rosa et al, (2000) who found that over a long-term post-bid period, bidders who offer shares significantly under-perform regardless of the bid outcome (perhaps also reflecting overvalued status)

However, Andrade et al, (2001) note that studies like the above are fraught with methodological problems given that to measure long-term abnormal returns reliably, one must first be able to measure long-term expected returns precisely and they consider that no one has provided a convincing way to do this. Rhodes-Kropf and Viswanathan's (2004) concept of merger waves with an increasingly prevalence of scrip bids replacing cash bids as the market moves higher could lead to a similar finding and reflect ‘bull market’ valuation errors.

2.7.6 Characteristics of Acquirers and Targets

There are a number of theories that relate to the characteristics of acquirers and targets or the success of M&As, particularly based on North American transactions over the last few decades. Theories are supported or discredited with statistical analysis of large data sets (usually thousands of transactions) that are drawn over a number of years (often a decade) and formulae manipulating ME/BE ratios or derived from event analysis.

Theories draw on aspects of the following factors:

- Tobin’s q theory of mergers
- The impact of Agency
- Hubris in bidding management
- Bootstrapping of target earnings and other
- Theories of misvaluations

The main aspects regarding the above factors are described below.

2.7.6.1 The *q*-theory of Mergers

The *q*-theory of investment states that a firm’s investment rate should rise with its *q* ratio (Jovanovic and Rousseau, 2002) while the *q*-theory of mergers translates this concept to mergers which involves an acquirer with a high asset valuation purchasing a target with low asset valuation (Rhodes-Kropf and Robinson (2008). However, Rhodes-Kropf and Viswathathan (2004) extend this concept to simply ‘overvalued firms buy undervalued firms’. Andrade et al, (2001) report that in 66 per cent of all mergers between 1973 and 1998, the acquirer’s *q* exceeded the target’s *q* (see Table 10). .

Jovanovic and Rousseau’s (2002) research concluded that:

(i) A firm's M&A investment responds to its q more (by a factor of 2.6) than its direct investment does, probably because M&A investment is a high fixed cost and a low marginal adjustment cost activity;

(ii) The typical firm wastes some cash on M&A's, but not on internal investment (i.e., the "free cash flow" story works, but it explains only a small fraction of mergers);

(iii) The merger waves of 1900 and the 1920's, 1980's, and 1990's were a response to profitable reallocation opportunities, but the 1960's wave was probably caused by something else.

Their analysis is based on a model which treats mergers and acquisition as a form of reallocating capital and compares the process with the "disassembled" capital market such as equipment and machinery.

Rhodes-Kropf and Robinson, (2008) challenge this conventional view of who buys whom based on q analysis. They note a pattern of research that suggests that 'high buys less high' might be a better description of their data than 'high buys low'. They believe that in economic terms, bidders and targets are quite similar and on average, are less than a decile apart on market-to-book valuations. This holds regardless of adjustment for industry valuation effects. Thus, rather than characterising most merger transactions as high buys low, they believe a better description would be like buys like.

The authors base their analysis on the property rights theory of the firm with a central theme that complementary assets should be bound together under common ownership. When there are significant complementarities between assets, then placing the assets under control of a single firm reduces the hold-up problems and underinvestment that results from the incomplete contracting. The concept that mergers reflect the desire to place complementary asset under common control is a central feature of their model.

Essentially, Rhodes-Kropf and Robinson, (2008) propose that firms search for a merger partner with potentially complementary assets. There are three key factors which are central to their analysis:

(i) Search-firms initiate standard investment projects and at the same time, firms search for Pareto-improving asset combinations with other firms. Firms cannot contract on the creation of distribution of the surplus generated by the asset combination. Placing assets under common control is the only way to realize the synergies from asset combinations.

(ii) Scarcity - when firms find an acceptable partner, they then bargain over the available surplus from the merger. Whether a firm accepts or rejects a particular partner depends on whether it prefers the terms of the current offer to the expected net gains from waiting, which in turn are determined by the likelihood of future merger opportunities, as well as the expected surplus from future transactions.

(iii) Complementarity - This determines how the surplus is created. The authors assume that gains from the merger are related to how the firms complement one another. Mergers are expected to create a greater surplus if the partners are a 'better match' along one or more dimensions, for e.g. leading to better production or better technology.

Overall the researchers believe that the market-to-book ratio contains two parts, one for the stand-alone value for the firm and one from the net present value (NPV) of future merger activity. The NPV in the stand-alone firm arises from the skill or quality of the characteristics inherent in the firm. However, the NPV related to merger arises from the relative bargaining power of the merger firms, not from any inherent investment opportunities they bring to the newly merged firm. This is because unlike investment, a merger must be negotiated. Therefore, the benefit each party receives depends on its negotiating position, which in turn depends on each firm's ability to locate another merger partner. Since both firms are necessary for the merger, the firm with the relatively more scarce assets will more easily locate another merger partner and therefore will garner more of the merger gains.

Therefore the higher relative scarcity causes a firm to have a higher ex ante market-to-book ratio, regardless of whether it is the bidder or the target in a particular transaction. Rhodes-Kropf and Robinson (2008) note that a theory of complements is the natural opposite of the *q*-theory. The *q*-theory of mergers suggest that mergers are about substitution; the acquiring firm substitutes the target's poor management or inappropriate use of assets with superior management and direction to better extract value from those assets. In the q-theory of mergers, the most value is created by pairing the worst performing assets with the best managers whereas the opposite is presented in the above case.

Table 16. Levels and Differences in Bidder and Target Tobin's q. *Scaled M/B Difference* is the difference between acquirer ln(Market-to-book) and target ln(Market-to-book) divided by the standard deviation of the ln(Market-to-book) for the acquirer's industry in the year of acquisition. The units are in percent for a standard deviation, that is 100 is one standard deviation.

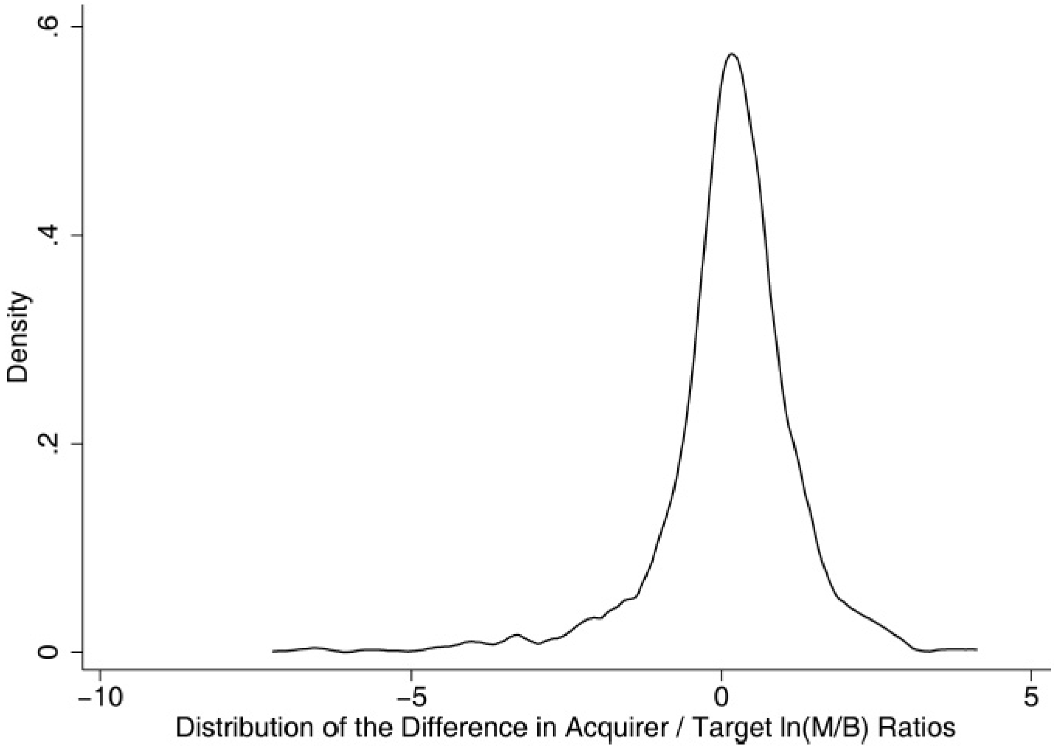
	Sample Size	Percent of Sample	Mean Scaled M/B Difference
Total Mergers, 1981–2001	3,400	100%	14.58
Mean Acquirer ln(M/B): 0.8118			
Mean Target ln(M/B): 0.6816			
Target Exceeds Acquirer M/B	1,274	37%	−89.38
Acquirer Exceeds Target M/B	2,126	63%	77.16
Both Above Respective Industry Median	1,111	33%	11.46
Both Below Respective Industry Median	990	29%	2.38
Target Above, Acquirer Below	419	12%	−138.08
Acquirer Above, Target Below	880	26%	105.7

From Rhodes-Kropf and Robinson, (2008).

Rhodes-Kropf and Robinson, (2008) developed a sample of 3,400 merger transactions that were announced between 1980 and 2001 between publicly listed bidders and targets in the U.S. Figure 28 depicts the density distribution of the difference in market-to-book valuations for bidders and targets. Positive values correspond to high buys low transactions and the authors report that these occur roughly 60 per cent of the time. The plot shows that the mean value of the difference is positive, which indicates that on average, high market-to-book acquirers purchase lower market-to-book targets.

However, they point out that the region to the left-hand size of the origin on the x-axis corresponds to the roughly 40 per cent of the time in which the market-to-book of the acquirer is below that of the target. This low buys high result supports the findings in Rhodes-Kropf et al, (2005).

Figure 28. Distribution of Market-to-Book Spreads. This graph shows the distribution of the difference between the acquirer M/B ratio and the target M/B ratio. The area to the left-hand size of the origin on the *x*-axis is the 40 per cent of the distribution for which the acquirer's M/B is lower than that of the target.



From Rhodes-Kropf and Robinson, (2008).

Indeed, the evidence in Maksimovic and Phillips (2001) is consistent with this view with evidence that in a significant proportion of mergers the target firms' plants are more efficient than those of the acquirer. In these cases, the productivity of the acquirer's plants subsequently increases after the merger. The findings suggest that asset redeployment from low q to high q firms need not be the driving force behind mergers even if mergers are driven by efficiency considerations.

The authors extended the research by examining the joint distribution of acquirer and target market-to-book ratios. Using a bivariate distribution enabled observation of which types of firms are most often involved in mergers. Table 17 groups the population of bidders and targets into bins according to annual NYSE breakpoints of the market-to-book distributions. The *i*, *j*th cell in Table 17 reports the frequency of mergers occurring between targets in decile *i* and bidders in decile *j*.

Table 17. Acquirer and Target Market-to-Book Ratios Using NYSE Deciles. Decile breakpoints are based on the distribution of M/B ratios for NYSE traded firms. Each cell counts the number of mergers from 1980 to 2001 between publicly traded bidders and targets in that decile pairing. The deciles are numbered from 10 to 1 in descending order of M/B. Pearson's χ2 test for independence of bidder and target M/B ratios has a value of 854.91, with an associated p-value of 0.00. The mean acquirer lies in the fourth decile, while the mean target lies in the fifth decile of the M/B distribution. The mean difference is eight-tenths of a decile.

Target Decile	NYSE M/B Decile of Acquirer										
	High	9	8	7	6	5	4	3	2	Low	Total
High	252	95	49	39	26	20	21	8	9	24	543
9	102	79	44	36	23	16	9	2	7	13	331
8	100	51	49	54	25	13	12	12	7	14	337
7	78	76	58	42	30	30	11	9	7	8	349
6	55	41	34	56	45	25	19	23	5	6	309
5	47	35	37	45	62	51	26	16	12	15	346
4	28	30	36	43	53	49	39	30	13	13	334
3	22	26	28	32	41	42	35	24	21	15	286
2	12	26	20	22	42	33	24	24	21	18	242
Low	22	20	22	26	25	33	27	34	26	45	280
Total	718	479	377	395	372	312	223	182	128	171	3,357

From Rhodes-Kropf and Robinson, (2008).

Rhodes-Kropf and Robinson, (2008) point out that the breakpoints are recomputed annually to reflect changes in the distribution of market-to-book ratios for all NYSE firms. Hence, any clustering that appears in the table is not a result of time-series clustering of merger activity. The table illustrates a high degree of correlation between bidder and target market-to-book ratios; Pearson's χ2 test for independence of bidder and target market-to-book ratios has a value of 854.91, with an associated p-value of 0.00. In fact, the mean difference is eight-tenths of a decile, meaning that the average transaction couples bidders and targets that are no more than one decile apart in the distribution of market-to-book ratios.

Table 17 highlights a number of issues. First, while targets' assets are valued less than acquirers' assets, targets on average are valued more highly than the average firm. This can be seen by noting that most of the activity occurs in the upper left-hand region of the table. Thus, both acquirers and targets tend to be in the high market-to-book deciles. Second, the prevailing wisdom that high buys low is borne out by the fact that most mergers lie below the main diagonal; these correspond to mergers in which the acquirer is in a higher market-to-book decile than the target. Finally, the finding of most interest to the authors is that merger activity seems to cluster down the main diagonal. This is the 'like buys like' diagonal. This means that in many cases, bidders and targets come from nearby points of the market-to-book distribution, indicating that if anything, although bidders have slightly higher market-to-book ratios than targets, their asset valuations are generally quite similar. The table indicates why most research has focused on the high buys low result, as acquirers do tend to have slightly higher market-to-book ratios than targets. However, Table 17 also suggests that something may be driving firms with similar market-to-book ratios to merge.

2.7.6.2 Agency

Agency problems are summarised by Brailsford and Knights (1998) to reflect management which undertakes shareholder wealth decreasing transactions in order to gain personal benefit. They note that managerial theory of the firm argues that the interests of management are best achieved through growth and that acquisitions offer a speedy and cost-effective route to growth. However, growth for the sake of growth can be a wealth reducing strategy.

Eddey and Casey (1989) cite that it is generally too costly to align perfectly the interests of directors and shareholders through bonding and monitoring contacts, hence the existence of residual agency costs. In their research studying 400 Australian takeover bids it was encouraging that they concluded that overall, directors have acted in a manner consistent with shareholder interests, even though personal wealth effects are greatest for directors of bid-accept targets.

2.7.6.3 Misvaluations

Schleifer and Vishny's (2003) propose a model based on a belief that financial markets are inefficient, so some firms are valued incorrectly. In contrast, managers are completely rational, understand stock market inefficiencies, and take advantage of them, in part through merger decisions. Dong et al (2006) concurs that these effects stem from the efforts of bidders to profit by buying undervalued targets for cash at a price below fundamental value, or by paying equity for targets that, even if overvalued, are less overvalued than the bidder's offer.

Schleifer and Vishny (2003) consider that their model helps explain who acquires whom, the choice of the medium of payment, the valuation consequences of mergers, and merger waves. They also make several predictions:

(1) Acquisitions are disproportionately for stock when aggregate or industry valuations are high, and for cash when they are low;
(2) The volume of stock acquisition increases with the dispersion of valuations among firms;
(3) Targets in cash acquisitions earn low prior returns, whereas bidders in stock acquisitions earn high prior returns;
(4) Bidders in stock acquisitions exhibit signs of overvaluation, such as earnings manipulation and insider selling;
(5) Long-run returns to bidders are likely to be negative in stock acquisitions, and positive in cash acquisitions;
(6) Despite negative long-run returns, acquisitions for stock serve the interest of the long-term shareholders of the bidder;
(7) Acquiring a firm in another industry may yield higher long-run returns than a related acquisition;
(8) Management resistance to some cash tender offers is in the interest of shareholders;
(9) Managers of targets in stock acquisitions are likely to have relatively short horizons or, alternatively, get paid for agreeing to the deal.

Interestingly, they point out that a model of stock-market-driven acquisitions falls into the rapidly growing field of behavioural corporate finance, which includes corporate policies such as debt and equity issuance, share repurchases, dividends and investment as a response to market mispricing. This thesis would agree that there is a significant amount of empirical evidence that appears consistent with this view.

Dong et al (2006) surmise that target overvaluation encourages target management to voluntarily accept expropriative offers in order to cash out. Bidder and target misvaluation measures should affect expropriation opportunities and managerial incentives, and therefore transaction characteristics including the means of payment (stock versus cash), the form of the offer (merger versus tender offer), bid premium, hostility of target to the offer, success of the bid, and event-period returns. The misevaluation hypothesis also implies bidders' offers will tend to be overvalued relative to targets.

Massa and Zhang (2009) studied the impact of ''style investing'' in takeovers and argue that if the bidder belongs to an investment style in line with the target this may be more popular with the market, leading to an increase in the bidder's value. By using data on the flows in mutual funds, the authors constructed a measure of popularity, which relies directly on the identification of sentiment-induced investor demand, rather than being a direct transformation of stock market data. They believe they show that differences in popularity between bidder and target help to explain their pairing.

The merger with a more popular target generates a halo effect from the target to the bidder that induces the market to evaluate the assets of the less popular bidder at the (inflated) market value of the more popular target (reverse bootstrapping, see Section 2.7.5.5). They also note that both bidder and target premiums are positively related to the difference in popularity between the target and the bidder. However, the target's ability to expropriate the gain is reduced by the fact that its bargaining position is weaker when the bidder's potential for asset appreciation is higher.

2.7.6.4 Hubris

Roll (1986) presents the hubris hypothesis as an explanation of corporate takeovers. He considers that hubris on the part of individual decision makers in bidding firms can explain why bids are made even when a valuation above the current market price represents a positive valuation error. Bidding firms infected by hubris simply pay too much for their targets. He also argues that the evidence supports the hubris hypothesis as much as it supports other explanations such as taxes, synergy, and inefficient target management.

Hietala et al, (2003) further develops Rolls (1986) work by highlighting that it is also possible that managers obtain private, non pecuniary benefits from control and acquisitions that do not benefit shareholders. Such managers may knowingly overpay if the private benefits of doing so outweigh the pecuniary costs. They postulate that the private benefit of consumption decreases as managers own a larger share of a firm's cash flows (or equity) until at some point management obtains effective voting control and can then increase private benefit consumption.

The authors also show that it is often not possible to use target and bidder stock price movements to infer the market's estimates of synergies, bidder overpayment, and changes in bidder and target values except in two generic cases. These are when a sole bidder mounts an unsuccessful takeover attempt and the other occurs when the acquisition contest includes exactly two bidders. These issues are discussed further in Chapter 5 in the discussion of takeover premia and discounts in resource acquisitions.

In using CEO overconfidence as assessment of potential hubris, Malmendier and Tate (2008) conducted a novel study using two proxies for overconfidence: CEOs' personal over-investment in their company (personal option positions) and their press portrayal. They found that the odds of making an acquisition are 65 per cent higher if the CEO is classified as overconfident using their criteria. The effect was largest if the merger was diversifying and did not require external financing. The market reaction to merger announcement (-0.90 per cent) is significantly more negative than for non-overconfident CEOs (-0.12 per cent).

An interesting consequence of bidder management hubris is potentially 'Winner's Curse' which represents a disequilibrium behaviour in which bidders systematically overbid and thus earn a negative payoff upon winning. However, studying the level of competition in 308 takeovers that were announced in the 1989–1999 period and comparing the level of competition to the takeover returns, Boone and Mulherin

(2008) found their analysis did not support winner's curse and that on average under a tender process, increased competition did not lead to overpaying.

2.7.6.5 Bootstrapping

The management of acquiring companies often use statements that imply a transaction will be earnings per share (eps) positive as strong support for an impending acquisition. As noted by some authors (Peirson et al, 1990, Meyers, 1976) it is possible to deliver this eps growth through the funding mix, particularly through debt and its tax deductible interest. Hence, they argue that there may not be any economic benefit from the acquisition as measured against cost of capital measures.

The importance of eps growth is the ability for the acquirer to 'bootstrap' or re-rate the earnings of the target company if the acquirer is trading on a higher P/E multiple. However, bootstrapping can also apply to other aspects, for example in cross-border mergers, where there are different corporate governance standards as researched by Martynov and Renneboog (2008) or as noted later this thesis, mine production where, for example, gold production is sourced from a range of higher and lower quality gold mines. As discussed earlier (Section 2.7.5.3), there is also the scope for 'reverse bootstrapping' as outlined by Massa and Zhang (2009) where the acquirer is re-rated in line with the higher rating of the target's assets.

While theoretically if a transaction is eps positive but lacks economic benefits, bootstrapping will not occur (Peirson et al, 1990; Stewart ,1991; Sirower, 1997), and the merged company market P/E ratio will reflect a weighted average ratio of each earnings contribution prior to the transaction. However, in reality this is generally not the case and this is supported by the importance for transactions to be reported as eps positive to gain market support. Bootstrapping is an important shareholder value creation tool for resource acquisitions and is discussed when reviewing transactions in Chapter 5.

2.7.7 Independent Expert's Reports

As noted in Section 2.6.2.4, an independent experts' report is only required in a takeover if the bidder and target have a director in common or the bidder has a relevant interest in 30 per cent or more of the issued share when it makes the takeover offer. However they are generally required to meet ASIC policy with a scheme of arrangement. Australian research has been focused on the influence of an independent experts report on bid premia and the commissioning of a report is often linked with endogenous factors given the requirements listed above.

Eddey (1993) conducted an empirical examination of independent expert reports in takeover bids using 170 reports that were issued in the 364 cash-based bids that occurred between January 1988 and December 1991. He found that bid premia offered in takeover bids where an expert's report was issued were not significantly lower than bid premia in other bids. He attributed this to the independent experts acting as a countervailing influence on bidders holding a superior pre-bid bargaining position. However, recent work by Bugeja (2005) contradicted some of these findings by Eddey (1993) and his research indicated that target premiums are lower where an expert report is required.

Bugeja's (2005) results also confirmed a higher frequency of price revisions where an expert indicates that the offer is 'not fair'. However, the associated increased offers were insufficient to raise the price to the level in takeovers without expert reports.

Bugeja's (2005) cites Matolcsy (1995) who provides a descriptive study of the providers of expert reports and the common valuation methods used. Using 323 expert reports between 1988 and 1993, the data indicates that no single firm dominates the expert report market and that the main providers of independent expert reports are the large accounting firms. The main valuation techniques used are asset-based valuation methods (31 per cent) and capitalized earnings (27 per cent). Discounted cash flows are used in 8 per cent of bids. This contrasts with the independent experts reports in resource company M&A which are likely to include discounted cash flows as a priority (see Chapter 5).

In the U.S., Kisgen et al, (2009) report that over the period 1994–2003, 80 per cent of targets and 37 per cent of acquirers obtain a third-party assessment of the fairness of a merger or acquisition. These fairness opinions did not affect deal outcomes when used by targets, but they affect deal outcomes when used by acquirers. Their findings were that the deal premium is lower in transactions if the acquirer obtains a fairness opinion, and is further reduced if multiple advisors provide an opinion. However, the acquirer's announcement-period return is 2.3 per cent lower if the acquirer has a fairness opinion, especially if the acquirer pays a high premium, indicating that investors are skeptical of these transactions.

Further work by Bugeja et al (2005) and Bugeja (2005a) found that the fees charged by independent experts for their reports were not influenced by previous client relationships with the target nor was there any statistical difference in the rate at which experts with other business dealings with the target, including the target's auditor, provide an opinion that agrees with that of directors. However, Bugeja (2005a) states that the capital market reaction around the release of reports produced by auditors are viewed as non-independent. This is in line with the defensive stance taken by Grant Samuel in criticism of independent expert reports at that time (Sydney Morning Herald 2005). Grant Samuel is responsible for many independent expert reports in the Australian resource sector.

2.7.8 Acquiring Toeholds or Strategic Stakes in Takeovers

One of the options for bidders is to acquire a strategic stake in a target company prior to announcing a formal bid and as mentioned in Section 2.6.3, this can be up to 20 per cent of the voting shares. Bugeja and Walter's (1995) research highlighted a correlation between bidder's interest and premium offered to target shareholders (see Table 11 earlier) while Eddey and Casey (1989) suggest that directors of target companies are more likely to recommend bid acceptance if the bidder has a substantial toehold position.

As mentioned earlier, Le and Schultz's (2007) research used a dataset of 122 takeover announcements made by Australian listed companies between 1997 and 2004 inclusive, and while they found no significant bidder abnormal returns to takeover announcements on average, there was a positive association between the presence of toeholds/toehold size and bidder abnormal returns.

Eddey and Casey (1989) note that it is generally in the interests of individual target shareholders to accept the bidder's offer when the bidder is a major shareholder to avoid remaining in a minority position, even if the individual shareholder believes that the bid undervalued the target (the ‘Prisoners Dilemma” from game theory where various players have an incentive to act one way yet have individual incentives to act in another). Reasons for this include: the fact that individual shareholders may not be able to command a premium for relinquishing control, the difficulties for target management to implement an auction process, the possibility that locked in minority shareholders may face the risk that the bidder will manage the target in a manner that disadvantages minority shareholders, and lastly, the authors cite research which suggest that in partial bids, the returns have been the lowest for those shareholders who did not accept the bid.

2.7.9 Takeover Defences and Target Resistance

Maheswaran and Pinder (2005) report that there are two generally cited hypotheses as to why target companies resist takeover bids, namely; shareholder interest and managerial entrenchment. The first states that the target management will only resist takeover bids if they believe that the bidder’s offer is below the target’s true market value. In this setting, bid resistance is a bargaining tool that is used by management to increase the wealth of target shareholders by improving the terms of the takeover.

In contrast, the management entrenchment hypothesis states that target management will resist takeover bids that threaten their power, reputation or company-specific human capital. In this setting, bid resistance is a defensive ploy used by self-interested management, which results in a decrease in the wealth of target shareholders.

Shoenberg and Thornton (2006) remind us that there are both pre-bid and post-bid defences. They note the best pre-bid defence is simply management pursuing corporate strategies that will maximise shareholder value, thereby reducing the incentive for any change in control. Other pre-bid defences include altering the capital structure and voting rights (many anti-takeover amendments found in the US are restricted under UK law and in Australia), placing friendly blocking stakes or increasing gearing levels to discourage the possibility of a highly leveraged buy outs and also poison pill strategies with ‘golden handshakes’ for the CEO and senior management. There is also the capacity to enhance public relations to build loyalty to the existing management as well as realising hidden values within the firm. (Clarke and Brennan, 1990)

Casey and Eddey (1986) report that in nearly every contested takeover, target company directors state that the consideration offered by the bidder is inadequate in that it undervalues the target company. Defensive tactics, directors invariably argue, are designed either to force the bidder to raise its bid premium, to entice a market auction for control, or to defeat all current offers until a more acceptable offer is received. Their later research (Eddey and Casey 1989) finds some support for the shareholder interest hypothesis where they find that bid premia on bids that target directors recommend be rejected are statistically significantly lower than the premia on bids that target directors recommend be accepted.

Bugeja and Walter (1995) also examined the impact of target director recommendations on the wealth of target shareholders around the takeover announcement. They found that the cumulative average abnormal returns are higher for bids that directors reject than for bids that directors accept. However, the difference in cumulative average abnormal return between the two groups is not statistically significant. Hence they believe that the overall Australian evidence on shareholder interest versus management entrenchment hypotheses to be inconclusive. This is supported by Maheswaran and Pinder (2005) who also report that both the Australian and U.S. research are inconclusive from their review.

In summary Maheswaran and Pinder's (2005) research found that bid resistance increases target shareholder wealth in the post-announcement period and that the probability of bid hostility increases with the target's size, decreases with the target's performance and is unrelated to the size of the premium offered by the bidder. They also found that bid hostility decreases the probability of bid success, increases the probability of bid revision and has no effect on the probability of competing bidders entering the market.

In the U.K. Shoenberg and Thornton (2006) found statistical analysis indicated that that 'white knights' and 'management buy outs' were the most effective takeover defences and suggested that other commonly employed defence tactics, including the lobbying of stakeholders and regulatory appeals, have a weak and indecisive impact on bid outcome. Furthermore, once in a contested situation, the capacity of executives to use takeover defences either to entrench themselves or to boost the bid premium for shareholders was found to be limited.

2.7.10 Final Comment

Overall there has been substantial research covering many aspects of M&A activity with some significant contributions from Australia, albeit with non-existent studies on resource merger and acquisitions. However, much of the research has been inconclusive with only a handful of axioms to be fully supported. This includes: strong target returns on offer announcement, acquirer underperformance with stock rather than cash payment, higher bidder *q* ratios relative to targets and increased stock offers in bull markets. Elsewhere there are many considerations that may or may not apply to particular takeovers.

As Zollo (2003) states ‘It is particularly striking and at the same time disheartening, then, to observe that, after almost four decades of work, and the massive output produced, the guidance that academia can offer to practicing managers involved in these complex processes is still rather slim.’

A quest for this thesis is to provide firmer outcomes in Australian resource sector M&A.

3.0 CHARACTERISTICS OF THE RESOURCE SECTOR

Resource companies are linked on a global basis by the international pricing of commodities and by the fact that all large and many mid-tier resource companies own assets across a number of countries. This globalization has led to more cross-border M&A activity than in any other sector.

This chapter provides a framework for the evolution of the resource sector in a global and Australian context. It outlines the current components of this sector, reviews key historical features which have influenced sectoral trends leading to its current structure as well as discussing the increasing correlation of specific commodities with the broader commodity market trends.

3.1 Global Resource Sector

The global resource sector within the global stock market has broadly evolved from the development of the mineral assets in mineral-rich countries; viz, Australia, Canada, South Africa and Chile. The world-class assets in these provinces lead to the establishment of a number of dominant companies which have further grown by exploring for and acquiring mineral deposits.

Two of the four largest companies, BHP (now BHP Billiton) and CRA (now Rio Tinto Limited), had modest origins in Broken Hill but the later development of their Pilbara iron ore deposits and with the traditional funding out of London, provided these companies with a base to later grow through mineral exploration and acquisition. Brazilian Vale S.A. was established to develop the iron ore deposits in Minas Gerais, Brazil and has recently increased acquisition activity to diversify its commodity and country exposure, the most notable was the acquisition of Canadian Falconbridge in a contested takeover in 2007. The relatively recent listing of China Shenhua Energy, at rank four, is based on Chinese coal mining and it is now starting to seek joint ventures and acquisitions in foreign countries, particularly by funding new development projects. The fifth, Xstrata plc, has grown to its position almost entirely through acquisitions.

Historically, companies were formed to fund and manage the development of mineral deposits and seek further growth through additional exploration activities, but in recent times, acquisitions have become an increasingly attractive option. Long-life assets with low operating costs are coveted by all companies and industry consolidation has almost stemmed from a 'scramble' of larger entities to acquire these assets, particularly where they have a capacity to secure lower-cost funding. However, given the scarcity factor in quality deposits, a legacy of over-paying for acquisitions may not be a problem in a regime of increasing commodity demand from emerging world economies. The pain of a 'write-down' is only temporary when one has acquired the 'prize.'

As at 29 September 2009 the market capitalization of the global mining sector was US$1.15 trillion based on the Bloomberg Global Mining Index, which incorporates the top 85% stocks by market capitalization in sub-indices. This is dwarfed by some other market sectors and even appears relatively modest in comparison to the size of some large companies such as Microsoft Corporation (MSFT; market capitalization of US$222 billion) or Exxon Mobil Corp (XOM; US$323 billion).

Table 18. The mining sector as a proportion of world stock markets.

	US$ billion	
World Stock Market	$34,220	
Mining Sector	$1,150	3.4%
Top 5 companies	$525	1.5%
Top 20 companies	$893	2.6%

Data from Stock Resource. Sorting of leading mining companies is based on market capitalizations as at 28 September 2009.

The global mining sector itself is dominated by a number of large companies with the top five comprising almost half of the sector by value, while the top 20 companies comprise almost 80% of the sector (Table 19).

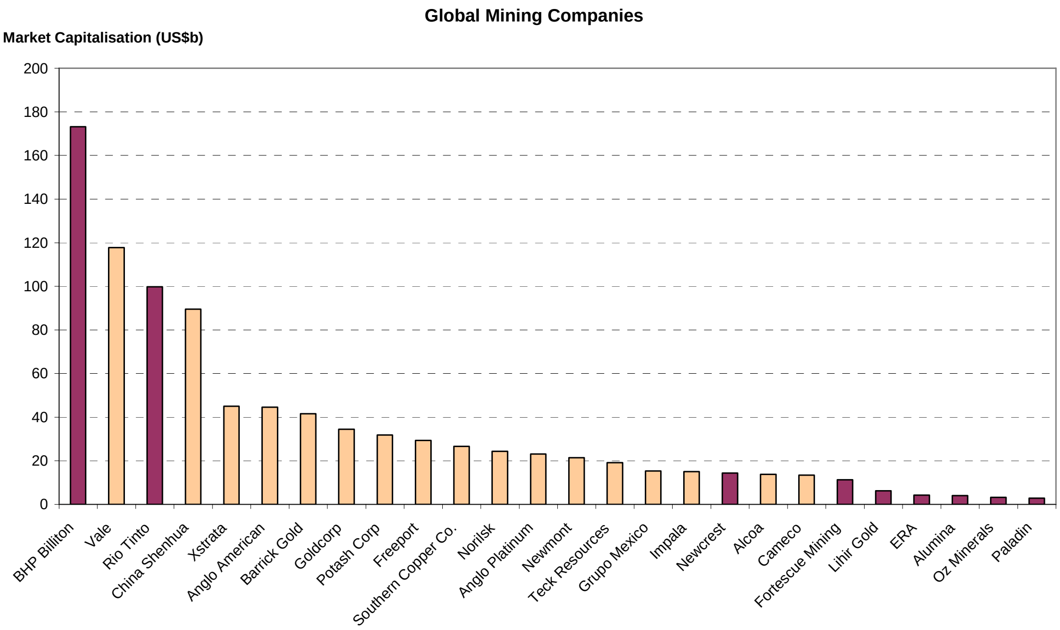
Table 19. The top five and twenty companies as a proportion of the entire global mining sector capitalisation.

	US$ billion	
Mining Sector	$1,150	
Top 5 companies	$525	45.7%
Top 20 companies	$893	77.6%

Data from Stock Resource. Sorting of leading mining companies is based on market capitalizations as at 28 September 2009.

This polarization is evident by charting the market capitalization of the top 25 companies (Figure 29). The four largest companies are at least twice the size of their nearest rivals while BHP Billiton stands out as the largest resource company with a market capitalisation of US$173 billion. The darker bands indicate companies with major Australian listings including the dual listed BHP Billiton and Rio Tinto.

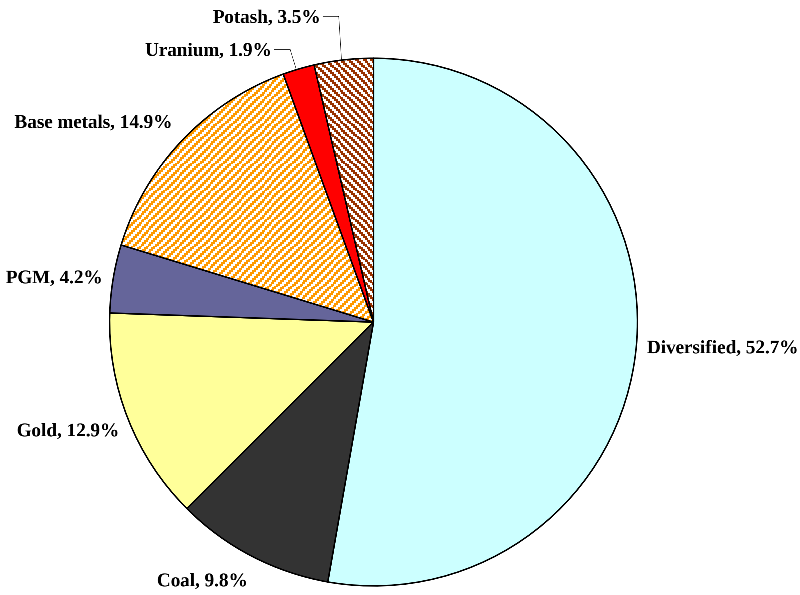
Figure 29. Major Companies within the Global Mining Sector.



Data from Stock Resource. Sorting of leading mining companies is based on market capitalizations as at 28 September 2009.

At present, the global mining sector is dominated by the diversified miners which comprise around half of the sector. The other half is split roughly between gold, base metals and to a lesser extent coal, with smaller platinum group metals (PGM), uranium and potash sectors. Figure 30 represents this sector split based on the top 25 global resource companies as at 29 September 2009.

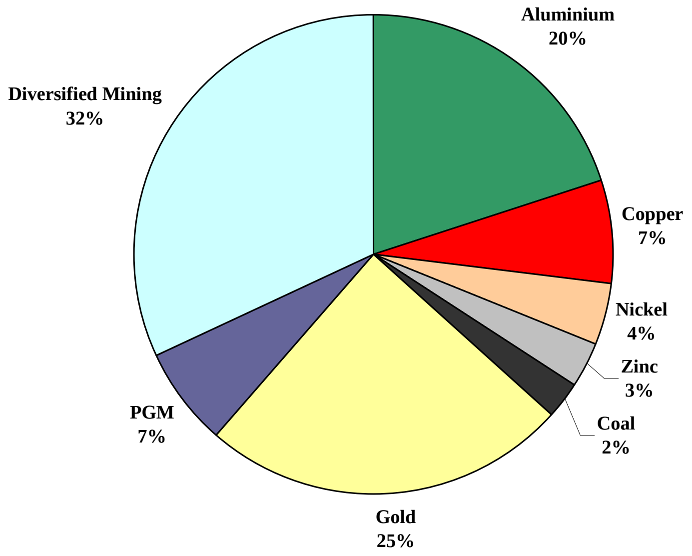
Figure 30. Global mining sector split based on dominant commodity exposure(s) as 29 September 2009.



Based on market capitalisation data presented in Figure 31, Author's sector allocation based on a combination of revenue source, asset base and market perceptions.

This domination by diversified miners has dramatically changed over the last seven years. Figure 31 charts a similar graph for 15 July 2002. It highlights roughly four equal splits between the diversified, gold and aluminium sectors and both the base metals and PGM sectors. In particular the combined aluminum and base metal sector represented around 34% of the entire sector, where the individual dominant base metals can be segregated out. In comparison, in Figure 30, the entire base metals sector including the aluminium sector is represented by 14.9% of the top 80% of the global resources sector.

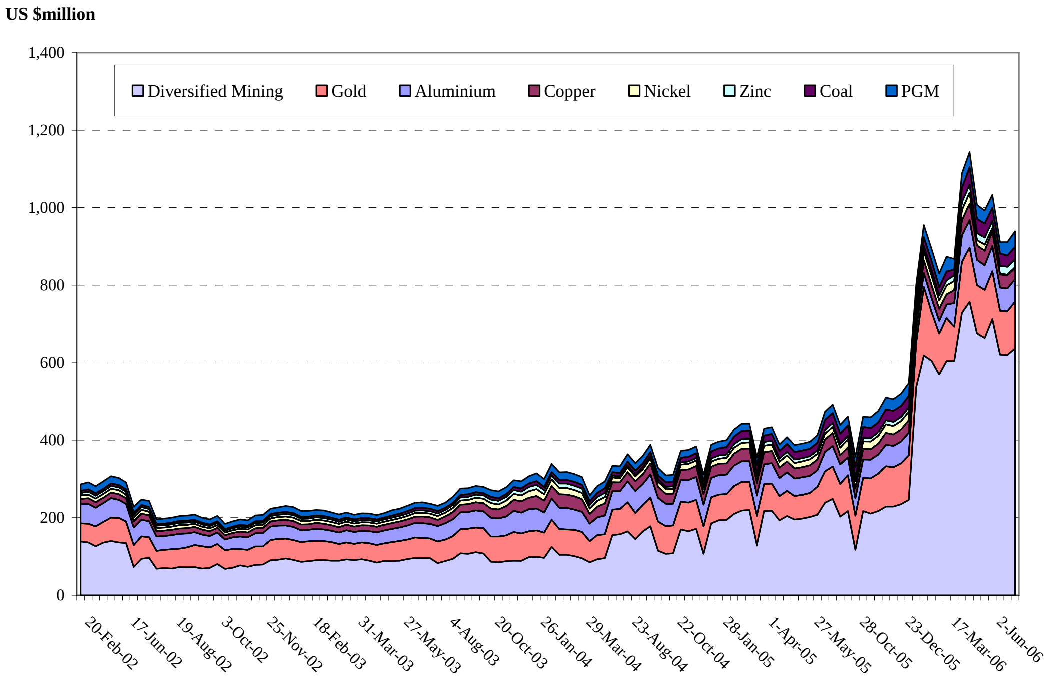
Figure 31. Global mining sector split based on dominant commodity exposure(s) as at 15 July 2002.



Derived from JPMorgan (2002) sector splits.

While this was partly influenced by changing commodity prices and market perceptions of the attractiveness of particular segments at different times, the logical conclusion is that the base metal sector has been largely acquired by the diversified miners. This is supported by the fact that three large recent takeovers involved Rio Tinto taking over Canadian Alcan in 2007, Vale taking over Falconbridge in 2006 and BHP Billiton taking over WMC Resources in 2005. The influence of the consolidation by the diversified miners during the early stages of the recent 2002 – 2008 resources boom is evident in Figure 32.

Figure 32. Sector size in the Global Resources 2002 – 2006 based on market capitalisation of component companies.



Derived from Gambardella (2002 – 2006).

Figure 32 plots the total market capitalisation of companies within sectors as defined by analysts with JP Morgan during this period (including the author). The large increase in the diversified sector in 2005 and 2006 reflects their share price increases (e.g. a 72% increase in the global mining industry to US$791 billion as at 31 December 2005 compared to 31 December 2004 according to PriceWaterhouse Coopers, 2006), additions to the sector (e.g. Russian Kazakhmys plc) as well as takeovers by the diversified sector of base metal companies, e.g. Inco by Vale. Nevertheless Figure 32 reiterates the recent dominance trend of the diversified sector which has in part, stemmed from M&A activity in other sectors.

3.1.1 Australian Resource Sector

Chapter 1, Section 6.0 provides an introduction to the Australia resource sector within the overall Australian Stock Market. Table 20 presents the market capitalisation of the S&P/ASX 200 Resource sector as a percentage of the total market capitalisation of this index. While the mining sector and the resource sector are often used interchangeably in the market, readers will recall that the resource sector includes the oil and gas sector, i.e. part of the energy sector. Table 20 also splits out this component but retains the coal and uranium sectors to be comparable with earlier global mining sector terminology.

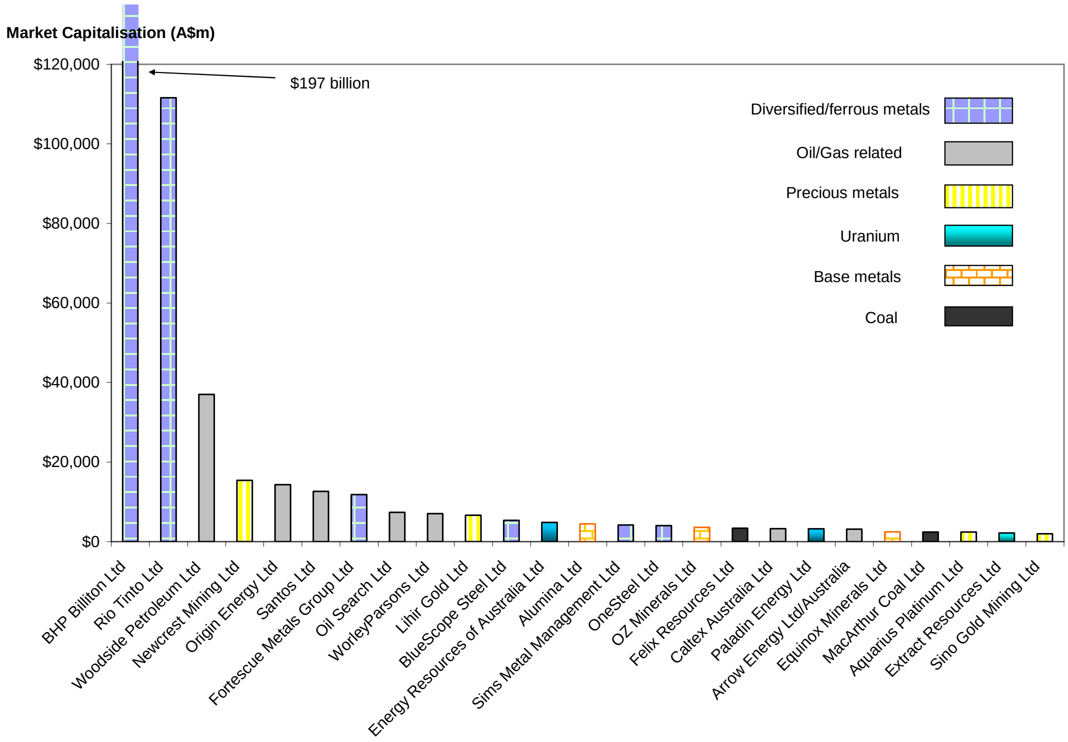
Table 20. Market capitalisation of the S&P/ASX 200 Index and the resource sector.

	A$ billion	
S&P ASX 200 Index	$1,226	
Resource sector	$497	40.6%
Ex - oil and gas	$407	33.2%

Data from Stock Resource.

Figure 33 ranks the top 25 Australian resource companies in terms of market capitalisation as at 30 September 2009. It also colour codes the key commodity sectors of these companies. Not surprisingly, the sector is dominated by BHP Billiton and Rio Tinto and to a lesser extent, Woodside Petroleum. These companies polarize the sector and many investors including larger funds may only hold positions in these stocks to meet adequate exposure to the sector for portfolio diversification.

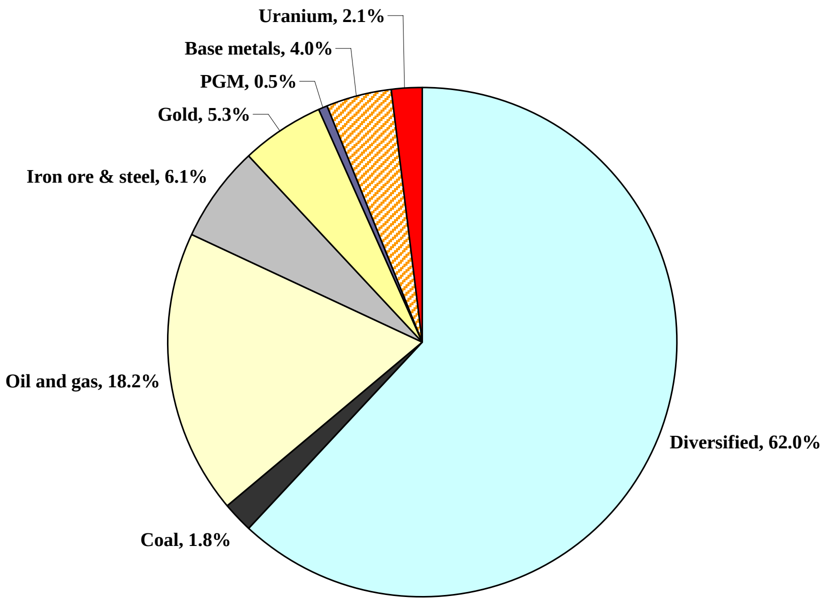
Figure 33. Top 25 Australian resource companies.



Data from Stock Resource.

The next part of the sector is dominated by oil and gas producers (or providing service to this industry) but includes gold producer, Newcrest and new iron ore producer, Fortescue Metals. The rest of the top 25 companies comprise a mixture of coal, gold, uranium and oil and gas producers. Figure 34 provides a split of the market-capitalization-weighted commodity exposure of all the 59 resource companies within the S&P/ASX 200 Index comprising the S&P/ASX 200 Resources sector.

Figure 34. S&P/ASX 200 Resources Sector broad commodity split.

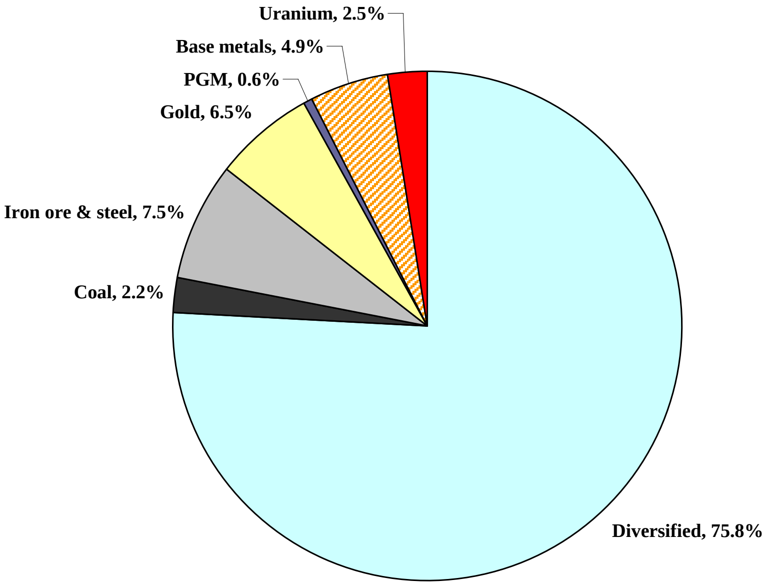


Market capitalisation data from Stock Resource. Author's allocation to commodity exposure as per Figure 30.

Not surprisingly, diversified miners dominate the entire sector with the second largest sector comprising the oil and gas sector. The thesis has segregated out iron ore and steel producers from the diversified miners. This sector has evolved initially from the spin out from OneSteel and Bluescope Steel from BHP Billiton but more recently with increasing iron ore prices, the emergence of a new iron ore sector lead by Fortescue Mining.

Figure 35 excludes the oil and gas sector to rebalance the remaining sectors in line with the global mining split of Figure 30, although Figure 34 segregates out iron ore related companies from diversified mining despite the fact that iron ore mining is a major earnings contributor to diversified miners.

Figure 35. S&P/ASX 200 Resources Sector broad commodity split and excluding oil and gas related companies.



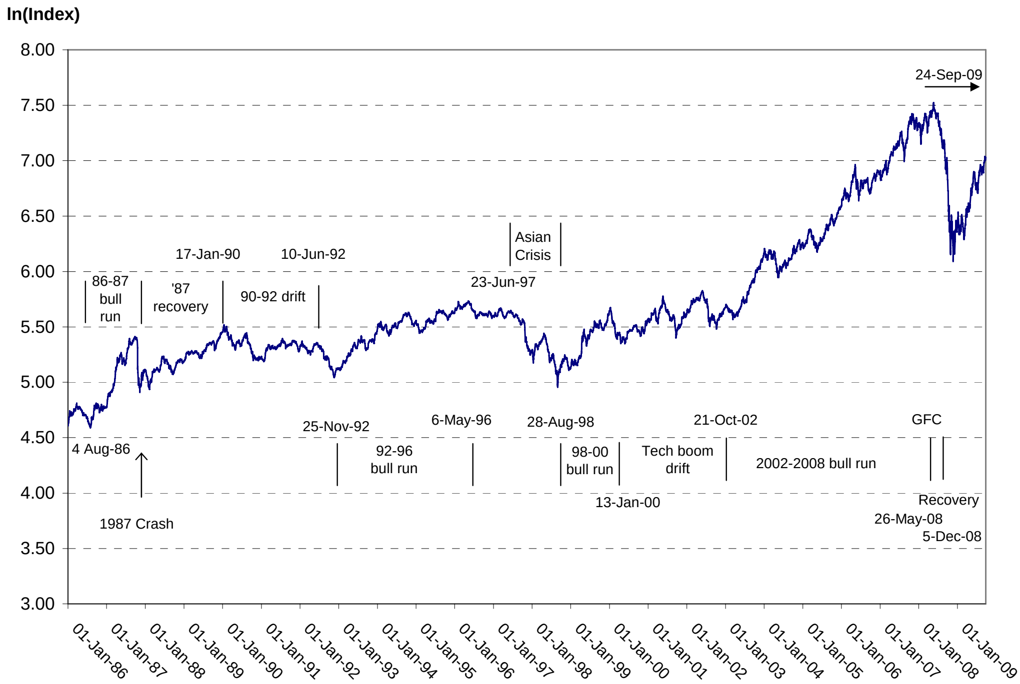
Again, the diversified miners overshadow the other sectors. As discussed in Chapter 6, the takeover of many Australian base metal and gold companies during the 1990s and earlier this decade has enabled sectors such as coal, uranium and PGMs to feature more prominently in the index.

3.2 Major events over the last 20 years

This thesis investigates M&A activity over the past 20 years or so, commencing with the bull run leading to the October 1987 stock market crash. It identifies a number of recognizable disruptive events such as the 1987 crash, the Asian Crisis, the recent the Global Financial Crisis and the related interim periods of recovery during which share prices increased or drifted after a sharp fall.

Figure 36 plots the log of the HSBC 100 Mining Index over this period along with the segregated periods. The log of the index is used given the large size of the recent resources rally which overshadows past cycles if the raw data are used.

Figure 36. Historical periods in the resource sector during the study period.



Data sourced from Stock Resource.

The periods are identified in Table 21 along with start and end dates. Defining these distinct periods is important in later correlation analysis as long-term studies have often demonstrated suboptimal beta-adjusted segment returns compared to the market average (e.g. in the Australian resource sector: Ball 1986, Ball and Brown 1980)

Table 21. Defined periods over the last 23 years.

Period	Start	End	Months
86-87 bull run	4 August 1986	19 October 1987	14
1987 recovery	29 October 1987	11 January 1990	27
90-92 drift	12 January 1990	10 June 1992	29
92-96 bull run	18 November 1992	8 May 1996	42
Asian Crisis	25 June 1997	27 August 1998	14
98-2000 bull run	28 August 1998	13 January 2000	17
Tech boom drift	14 January 2000	18 October 2002	33
Resource boom	21 October 2002	19 May 2008	67
Global Financial Crisis	27 May 2008	5 December 2008	7
2009 recovery	8 December 2008	24 September 2009	9

The important periods are discussed below given events during these periods often influenced investing behaviour.

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3.2.1 1987 Crash

In 1986, the U.S. economy was experiencing a 'soft landing' as economic growth slowed from a period of high growth. The stock market advanced significantly, with the Dow peaking in August 1987 at 2722 points or 44% over the previous year's closing of 1895 points (www.wikipedia.org).

Shiller (1987) reports that the Dow Jones Industrial Average Index fell 22.6% (508 points) on Monday 19 October 1987, which was unprecedented in stock market history for a single day, with the worst preceding fall being 12.8% on Monday 28 October 1929. By the end of October, stock markets in Hong Kong had fallen 45.8%, Australia 41.8%, Spain 31%, the United Kingdom 26.4%, the U.S. 22.68%, and Canada 22.5%. In Australia the 1987 crash is also referred to as Black Tuesday because of the timezone difference.

In a summary of the months leading up to the 1987 crash, the Motley Fool (1997) noted that US bond yields had risen from 7.28% to 10.22% in the preceding nine months, which was close to the longer-term historical average return from stocks at that time. This increasing yield was driven by increasing fears of inflation, the falling US dollar, the widening trade deficit, and rising oil prices. This trend reached a crescendo in mid-October with increasing tensions in the Persian Gulf when Iranian missiles hit a U.S.-flagged tanker off of the coast of Kuwait. Only five months before, an Iraqi missile hit the U.S. frigate Stark, killing 37 sailors.

Other aspects included decreasing confidence in Wall Street given the famous insider trading scandals, with traders Milken, Boesky, Siegel, and Freeman revealing an 'unfair market' with a level of corruption and unfair practices. There was also an influence from program trading and portfolio insurance.

Around the time of the crash, Shiller (1987) conducted a survey of both individual and institutional investors inquiring about their behavior during the crash. He reports that nearly 1000 responses were received and the main results show that:

1. No news story or rumor appearing on the 19th October or over the preceding weekend was responsible for investor behavior,
2. Investors' importance rating of news appearing over the preceding week showed only a slight relation to decisions to buy or sell,
3. There was a great deal of investor talk and anxiety around October 19, much more than suggested by the volume of trade,

4. Many investors thought that they could predict the market,
5. Both buyers and sellers generally thought before the crash that the market was overvalued,
6. Most investors interpreted the crash as due to the psychology of other investors,
7. Many investors were influenced by technical analysis considerations,
8. Portfolio insurance is only a small part of predetermined stop-loss behavior, and
9. Some investors changed their investment strategy before the crash.

On reviewing the results of Shiller's (1987) survey and the events outlined earlier in the lead up to the 1987 crash, one can conclude that there were a number of simultaneous events leading to a loss of confidence on the state of the stock market and that while the timing of the crash was not pre-determined, it was not necessarily unexpected with hindsight analysis at that time.

3.2.2 Asian Crisis

On 2nd July 1997 the Thai baht's peg collapsed and the baht lost roughly 15% of its value against the U.S. dollar. The financial markets of East and South-East Asia – in particular Thailand, Malaysia, Indonesia, the Philippines, and Korea – subsequently headed in a similar, downward direction during late 1997 and early 1998. Baig and Goldfajn (1998) note that the crisis became full-blown and intense foreign exchange and stock market turmoil spread in the entire region, culminating in the collapse of the Korean won. News of economic and political distress, particularly bank and corporate fragility, became common place in the affected countries. Park and Song

(2001) noted that these Southeast Asian countries also experienced a significant decline in their stock prices as well as a sustained, steep depreciation of their currencies

The Asian crisis is interesting in that one line of investigation into its causes is the 'herd' mentality of investors and the potential viewing of these economies as being closely linked. Clavo (1996) cited in Baig and Goldfajn (1998) comments on global investors and argues that since it is too costly for investors to address the state of each economy, it is optimal for them to pull out of a group of related markets simultaneously when they post signs of nervousness in just one of them.

Park and Song (2001) report that prior to the crisis there were a number of disturbing economic trends emerging in these economies which include:

- With the exception of the Philippines, all had experienced a slowdown in economic growth in 1996.
- They had also seen their current account deficits rise substantially. As a percentage of GNP, Indonesia, Malaysia, the Philippines, and Thailand saw their current account deficits deteriorate substantially.
- The countries had experienced large foreign capital inflows in the 1990s.
- The real exchange rates in all four countries appreciated markedly: from 7.6% in Indonesia to 11.9% in the Philippines between 1990 and the first half of 1997.
- The countries accumulated large external debts.
- The rates of inflation in these countries except Malaysia were high in 1996

Hence, these authors suggest that the currencies of these Southeast Asian countries may have been susceptible to a speculative attack which caused the contagion. This has also been referred to as the ‘wake-up call’ effect.

The Asian crisis influenced Australian resource markets as the demise of these export orientated countries was likely to reduce demand for Australian commodities and hence commodity prices. Prior to this time, some of the countries were referred to as part of the Asian Tigers reflecting their previous strong economic growth.

3.2.3 Tech Boom

In the second half of the 1990’s, the production of commodities was viewed as ‘old world’ and the attention was focused on the technology sector and the capacity for the internet to revolutionise retail and commercial business practice. The "dot-com bubble" (or sometimes the "I.T. bubble") is deemed a speculative bubble covering the 1998–2001 period, with a peak on 10th March 2000 when the NASDAQ peaked at 5132.52 (www.wikipedia.org).

While resource shares were left in the doldrums, technology shares delivered outstanding performance, particularly with companies that appeared to have little prospect of short-term earnings. Foster et al. (2002) noted that analysts needed metrics to assess profitability issues but price-earnings multiples for companies reporting negative net income are not interpretable. Therefore variables such as the market to revenue ratio and revenue growth percentages were deemed applicable to a broad set of high-tech companies in their early years by these authors.

Selected percentages of high-tech firms with negative net income in the 1990-2000 period range are presented in Table 22 and pose medium-term sustainability issues.

Table 22. Selected percentages of high-tech firms with negative net income in the 1990-2000 period.

Sector		**1994**	**1997**	**2000**
High Tech	Australia	62.3%	76.5%	68.1%
	USA	39.5%	51.5%	62.8%
Non-High Tech	Australia	37.9%	40.9%	40.3%
	USA	32.1%	35.7%	41.0%

From Foster et al (2002).

These results are consistent with the high-tech sector being "high-risk" in a relative sense and in many respects, similar to exploration companies. Foster et al. (2002) found that in the Australian high-tech sector there was a premium to being a large-scale player. They interpret that economies of scale is the main reason for this premium and again, there are similarities with the resources sector.

During this time when global markets experienced a massive allocations of funds into high-tech companies, commodity prices were approaching all time lows; 1998 saw an oil price as low as $10bbl, and mining companies were struggling to survive with copper prices at about US90 c/lb (Doyle et al., 2007).

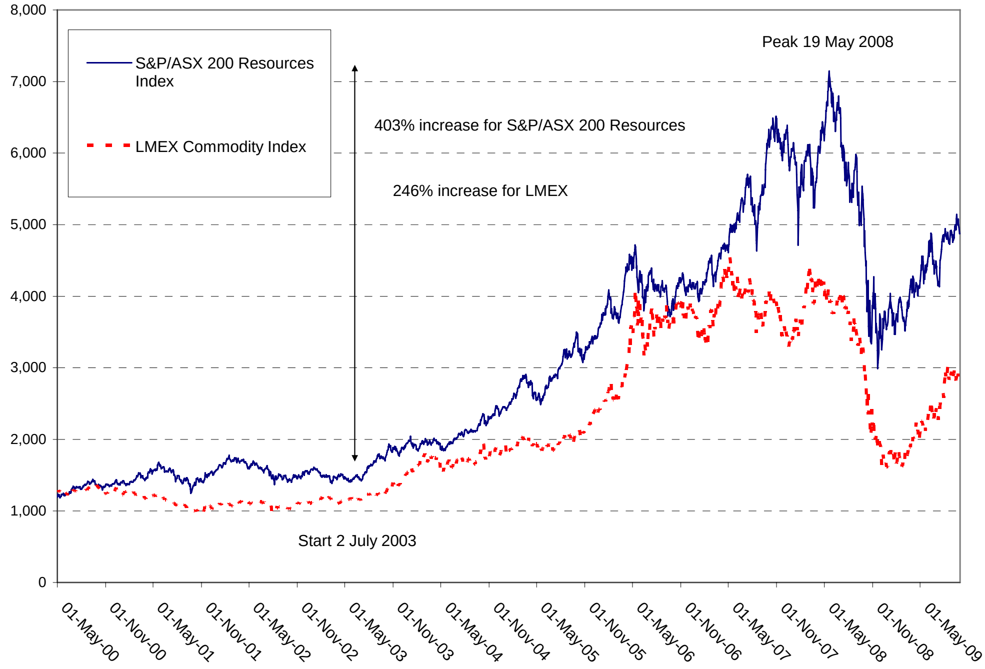
3.2.4 2002 – 2008 Resource Rally

This five-year resources rally is the strongest and longest resource rally on record. Referring to the HSBC 100 Mining Index, on a global basis it is deemed to commence in October 2002 during the time immediately following the 'tech wreck' in which investors returned to old world technologies given their recent losses in the technology sector. It is also deemed to end around the 26 May 2008 with early onset of the Global Financial Crisis. However, the Australian resource rally is defined as commencing 2nd July 2003 and peaking on 19th May 2008.

The rally was fuelled by a perceived increasing industrial demand from China and other emerging economies and while real demand was increasing, this demand was enhanced by additional investor speculative demand. In the early years increasing demand was in the face of relatively stagnant supply given the resource sector had remained in the doldrums for a number of years.

Share prices rose an amazing 403% from the 2nd July 2003 to peak on the 19th May 2008 as measured by the S&P/ASX 200 Resources Index. Over the same period the LMEX commodity index increased by 246% (Figure 37).

Figure 37. The S&P/ASX 200 Resources Index and the LME LMEX commodity index.



Data sourced from Stock Resource.

However, these returns are dwarfed by the performance of global mining companies as measured by the HSBC Global Diversified Mining and the HSBC Global Mining 100 indices which increased by a massive 849% and 593% respectively (Figure 38). Figure 38 highlights the size of the rally relative to the performance of these indices over the preceding 15 years. It also shows the steepness of the fall in resource shares during the Global Financial Crisis and subsequent 2009 recovery.

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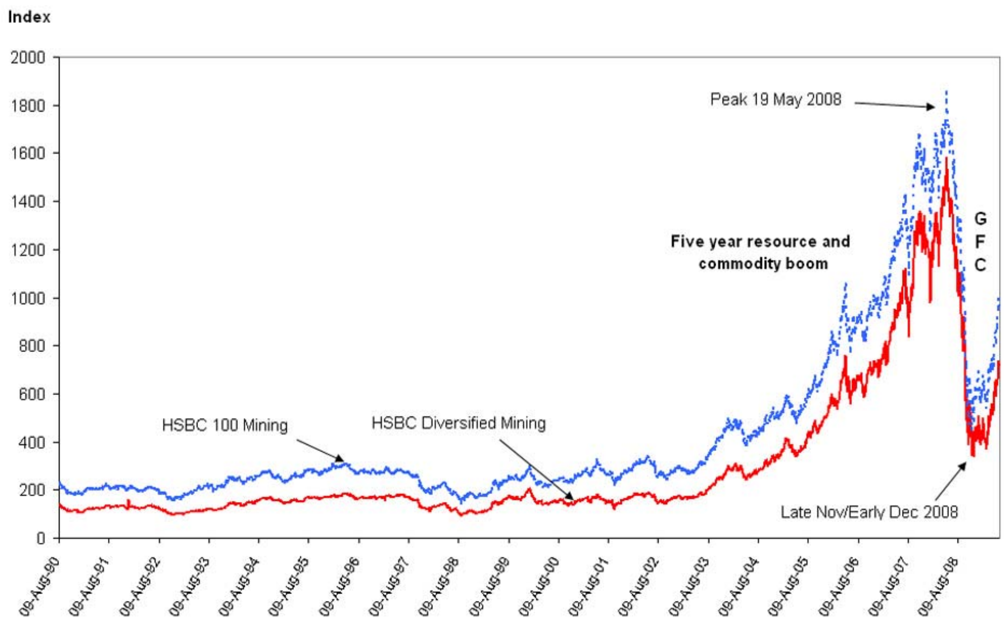
Figure 38. The five and half year resource and commodity rally as evident with the HSBC global mining indices.

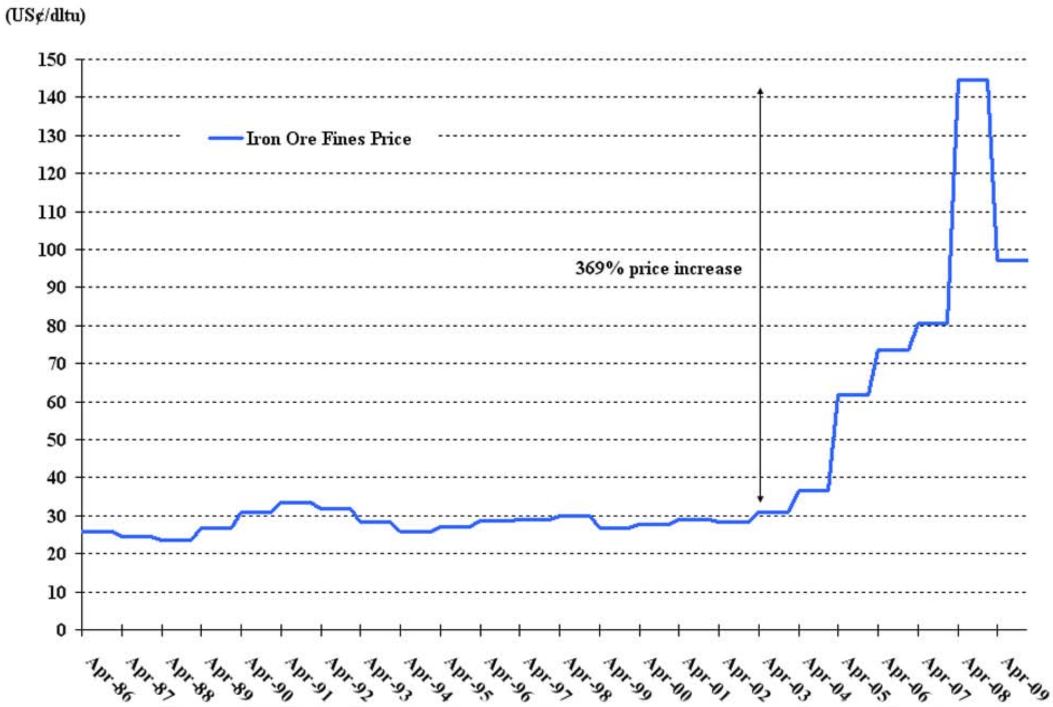


From Bartrop (2009).

Resource shares increased as commodity prices increased as evident in Figure 37 with the LMEX index reflecting a composite of base metal price movements. However bulk commodity prices (iron ore, thermal and metallurgical coal) all increased over successive years in the boom reflecting strong spot prices impacting annual benchmark price negotiations. Figure 39 charts the increase in the Pilbara iron ore fines settlement price,which increased by 369% from the 2003 settlement price (applying for the year commencing 1 April 2003) to 2008 settlement price (for the year commencing 1st April 2008).

This price increase improved the economics of many marginal or subeconomic iron ore deposits across Australia and helped create the iron ore sector discussed in Section 3.1.1 earlier. There was a similar occurrence in coal prices with the emergence of new coal companies, e.g. Felix Resources.

Figure 39. Australian Pilbara iron fines settlement price.



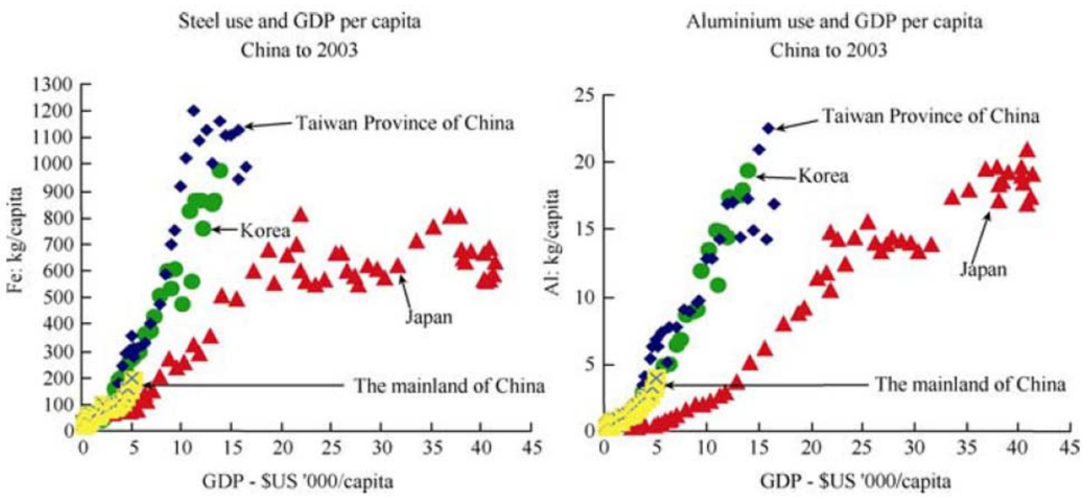
Data sourced from Rio Tinto and BHP Billiton annual settlement price ASX releases.

Garnaut (2006) refers to the boom as a “China boom” in comparison to the earlier “Japan boom” from the late 1950s to 1973 and the still earlier “United States-Germany” boom in the two decades preceding the First World War. He believes that the Chinese growth has a greater impact than the U.S. during its period of rapid industrialization due to:

- The nature of rapid, internationally-oriented economic growth associated with “catching up” with the technologies, institutions and metal intensity applied in the most advanced economies.
- China has a much larger population (almost twice as large) than all of the established advanced economies taken together.
- It has a low per capita domestic endowment of most economically valuable natural resources

One of the major themes during the 2002-2006 Resource Boom has been the concept of applying metal intensity-of-use per capita to Chinese growth and actively promoted by the major diversified miners (e.g. BHP 2009, Rio Tinto, 2008). Figure 40 outlines typical examples with steel and aluminum by plotting each metal usage per capita versus GDP per capita for China and its more developed neighbours. The bullish interpretation is that small increases in the wealth of the Chinese will lead to similar trends of increasing metal consumption but when this is applied over the Chinese population (1.4 billion) it translates into a large additional demand for commodities.

Figure 40. Metals demand and economic growth in Northeast Asia (using PPP exchange rates for China).



From Garnault and Long (2006).

During the boom the major resource companies promoted a ‘new era’ in commodity demand and provided analysis supporting their themes. These themes generally became more sophisticated as the boom progressed as presented in broad chronological order below.

1. A change from the long-term declining trend of real commodity prices entering a period of rising real commodity prices similar to the 1960s.
2. The sustainability of China’s high (+10%) annual compound growth rates for GDP given its low base and the ambitions of the Chinese Government.
3. The increasing intensity-of-use of metals per capita described above and the impact of applying this across a large population base.
4. The impact of urbanization where the metal consumption (primarily steel) increased as workers moved from rural areas to the cities in search of employment. This primarily involved the construction of high-rise apartments to house this migration.
5. Lastly, China was only one of a number of countries following this development route, with India not far behind. Urbanisation itself was applicable to large population bases in both Africa and South America.

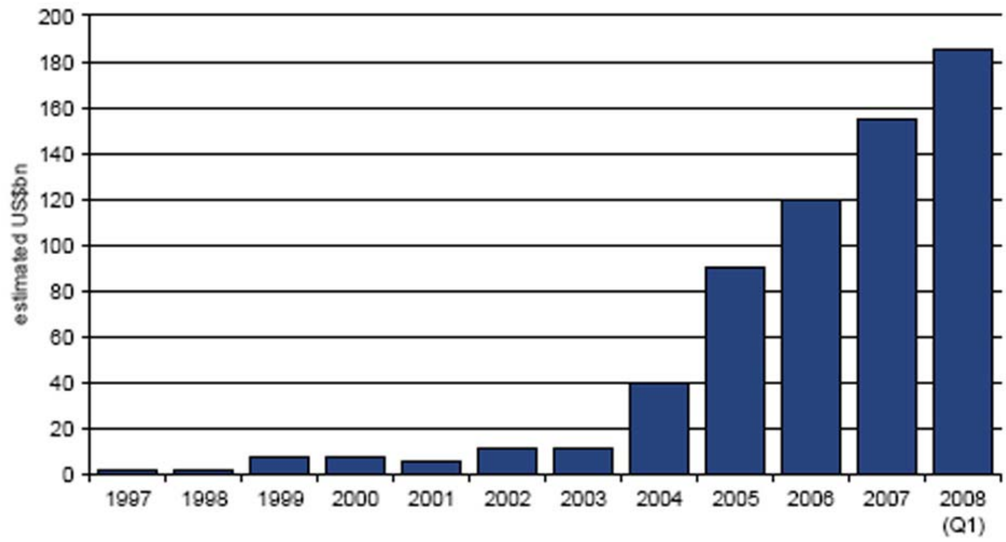
An important contributor to rising commodity prices was the influence of investment funds. Indeed Goodyear (2006) noted that while China and other economies were increasing their commodity demand due to industrialization, this demand and subsequent prices were being exacerbated by the presence of speculative funds in the market – investment that had not been experienced to the same degree in past commodity booms.

The belief that the rapidly developing economies of China and India provided long-lasting fundamentals led to the establishment of many commodity funds and several commodity indices, particularly given that it was argued that commodities provided portfolio diversification benefits (Schneeweis and Spurgin, 2000).

Doyle et al. (2007) report that out of global pension funds assets under management, estimated at US$18.6 trillion, around US$80 billion is estimated to be invested in commodities at that time. In their survey the researchers found that given many fund managers regard commodities as an asset class, institutional investors were expected to build an exposure of at least 5 per cent (equivalent to US$930 billion) to them although this had only partially happened to date.

Figure 41 plots the estimated increase in global funds invested in commodity indexes. While the detail is scant, data appear to exclude futures which are likely to further significantly influence commodity pricing.

Figure 41. Funds Investing in Commodity Indexes.



From the Wall Street Examiner (2008).

Data on fund investment in commodity related products are difficult to obtain, particularly given the secrecy surrounding hedge-fund investments. From the thesis perspective, it is likely that commodity investment accelerated commodity price increases during the bull run but then the unwinding of these positions during the Global Financial Crisis is likely to have exacerbated their fall. It also contributed to a greater correlation in the movement between individual commodity prices and a greater overall response to macro-economic events as discussed in Section 3.6.

3.2.5 Global Financial Crisis

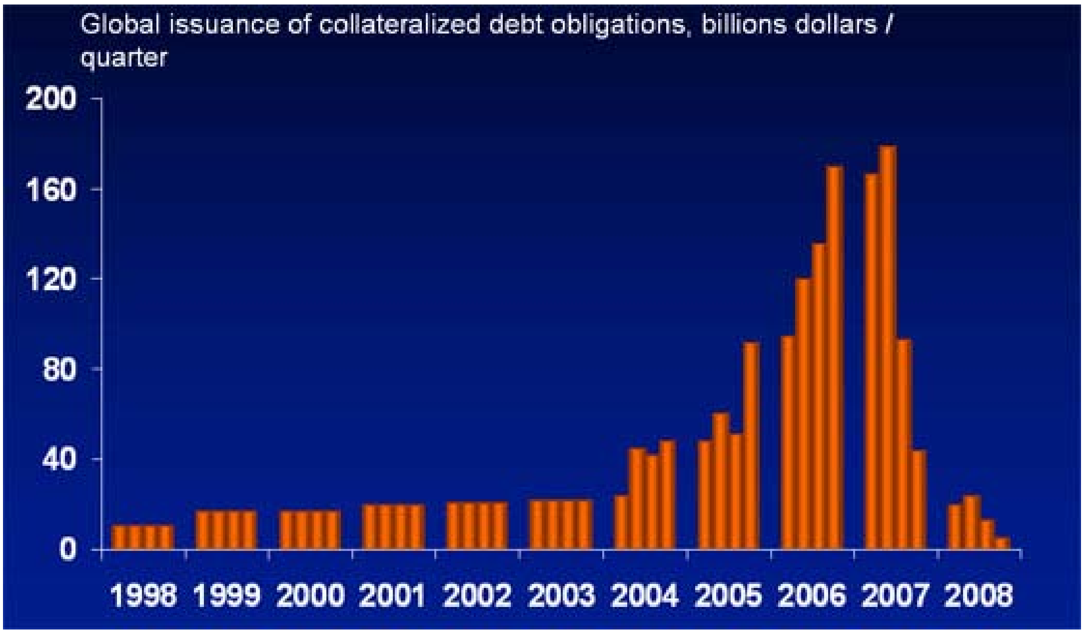
The Global Financial Crisis impacted all financial and commodity markets in response to frozen credit markets and a scramble to rebuild damaged balance sheets by financial institutions which itself involved a global asset sell off and repatriation of funds back to the U.S.

In the 2009 ABARE conference, World Bank Lead Economist Andrew Burns, presented a succinct reminder as to why we are in the current position (Burns 2009). Bluntly, he stated:

'The US-based financial crisis has raised costs, reduced access to credit, increased uncertainty and destroyed wealth worldwide. This has sparked an unprecedented deep and synchronised global recession.'

The initial signs of a developing market correction were felt as early as August 2007 when there was a collapse of the US sub-prime mortgage market after several years of unregulated growth (see Figure 42). This market comprised collateralized debt obligations (CDOs) and the falling collateral values (i.e. US house prices) lead to rapidly diminishing and uncertain CDO values. As CDOs comprised the investment assets of many global banks, funds and other institutions, each experienced a rapid reduction in asset values. This impact and the subsequent necessary restoration of balance sheets created a withdrawal of capital from the markets, a dramatic reduction in lending and the government bail out of a number of large banks, primarily in the US and UK.

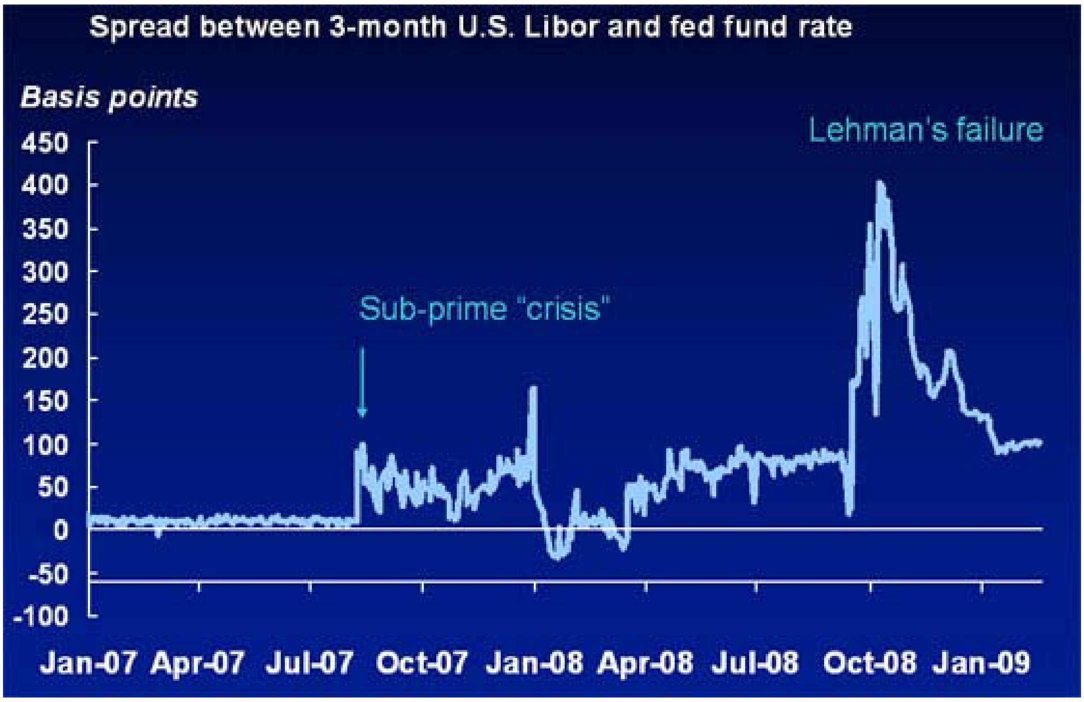
Figure 42. The growth in US collateralised debt obligations.



From Burns (2009).

As highlighted in Figure 43, the collapse of Lehman Brothers Investment Bank in the U.S. was a major event in September 2008 which led to a dramatic increase in spreads between the 3 month US LIBOR rate and the US Federal funds rate.

Figure 43. The spread between 3-month US Libor and the US Federal Funds Rate.



From Burns (2009).

Figure 44, also from Burns (2009) highlights the synchronised fall in world stock markets in US dollar terms.

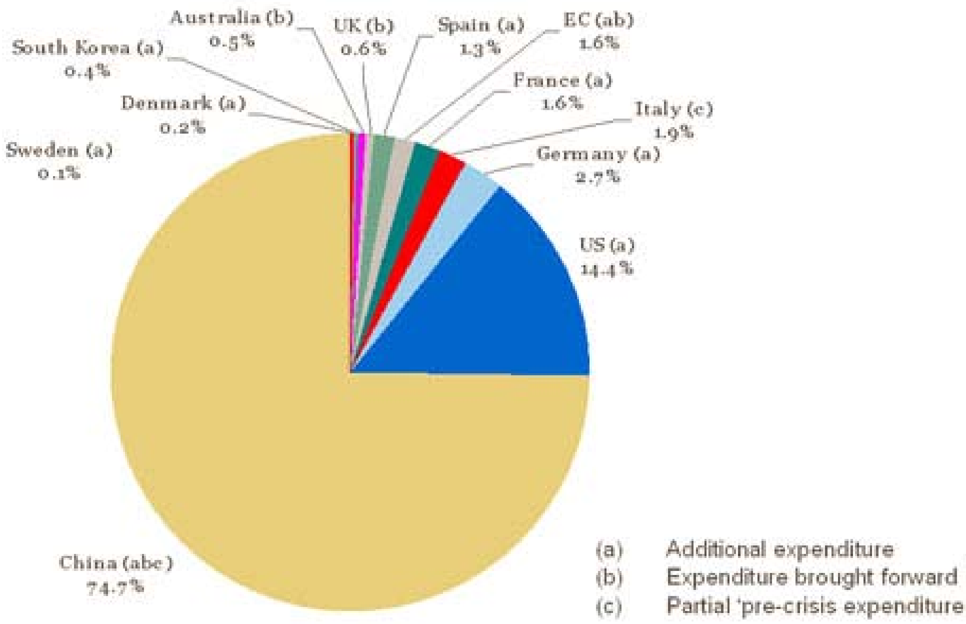
Figure 44. Worlds stock market falls in US$ terms.

From Burns (2009).

A generally rapid response by many Governments has involved lowering domestic interest rates and announcing a series of stimulus packages to encourage domestic growth. The relative size of some of these packages is presented in Figure 45 and highlights the dominance of the Chinese package.

After a period of inventory run down followed by restocking, the Chinese economy has exhibited evidence of the effectiveness of its US$935 billion infrastructure related expenditure which has contributed to a stronger than expected recovery in commodity prices and the resource sector.

Figure 45. Relative size of stimulus packages by country.



From Tulpulé (2009).

In the latter part of 2007 the implications of the subprime mortgage collapse were not fully appreciated by the global resource markets as the less liquid commodities such as the bulk commodities (iron ore and coal) continued to exhibit strength. Senior executives of both BHP Billiton and Rio Tinto promoted a 'decoupling' of China from the US and western world economies claiming China's domestic demand would maintain robust commodity demand (e.g. Rio Tinto 2008). This led to a strong share price performance of the diversified miners and smaller iron ore and coal producers in comparison with the share prices of resource companies exposed to the falling spot-traded LME commodity prices. It also potentially created an unprecedented confidence in resource share investment beyond the levels experienced in earlier cycles.

While base metal prices continued to fall during the first half of 2008, the last significant commodity rally has been oil on market perceptions that it would reach

US$200 per barrel in the short term. However it peaked at US$145.18 per barrel (Nymex WTI) on 14 July 2008 and subsequently fell below US$100 per barrel by mid September 2008.

The ‘decoupling’ of China from the western world was initially borne out to be incorrect (The Economist, 2009) as evidenced by the 33% and 44% falls in the negotiated iron ore prices for Hamersley fines and lump ore respectively for the year commencing 1 April 2009. Earlier, LME commodity prices experienced a nadir in late November/early December 2008 but had commenced a slow period of recovery by the time the bulk negotiations had largely been settled

3.2.6 2009 Recovery

Spot LME base-metal prices continued to strengthen in the second half of 2009 reflecting a higher than expected level of commodity demand from China and later support from increasing commodity investment by hedge and commodity funds. In particular, there were encouraging signs of a slow but sustainable economic recovery in the US and Europe and market sentiment was boosted on the 26 September 2009 when Federal Chairman Bernanke commented that technically, the US was out of recession (Bloomberg 2009).

Indeed, the bulk commodity negotiations in 2010 have also resulted in strong increases in all the bulk commodity prices (e.g. iron ore price have increased by 80-90 per cent; ChinaDaily 2010) although these prices are now on a new quarterly basis rather than annual contracts.

3.3 Commodity Market Size Constraints

The ability for the global resources sector and individual subsectors to grow in size is largely constrained by the industries in which the companies operate. This has influenced company strategies to deliver growth, particularly during the latter part of the 1990s and earlier this decade (Asian Crisis – Tech Boom) when a size premium was evident and reflected the perceived historical poor returns from the mining industry (see Sections 3.2.2 and 3.2.3 earlier).

To appreciate commodity market size constraints, Table 23 outlines world traded production in each metal for the calendar years 2007 and 2008 derived from the various metal study groups, USGS (2009) or ABARE as well as ABARE production forecasts for 2009 and 2010 where these have been made. The production data on bulk commodities are for traded production rather than integrated production while base metals exclude intermediate products, e.g. alumina production is not segregated out from final aluminium production. Table 23 also lists the compound annual growth rates (CAGR) of production over longer timeframes.

Table 23. World traded production of commodities.

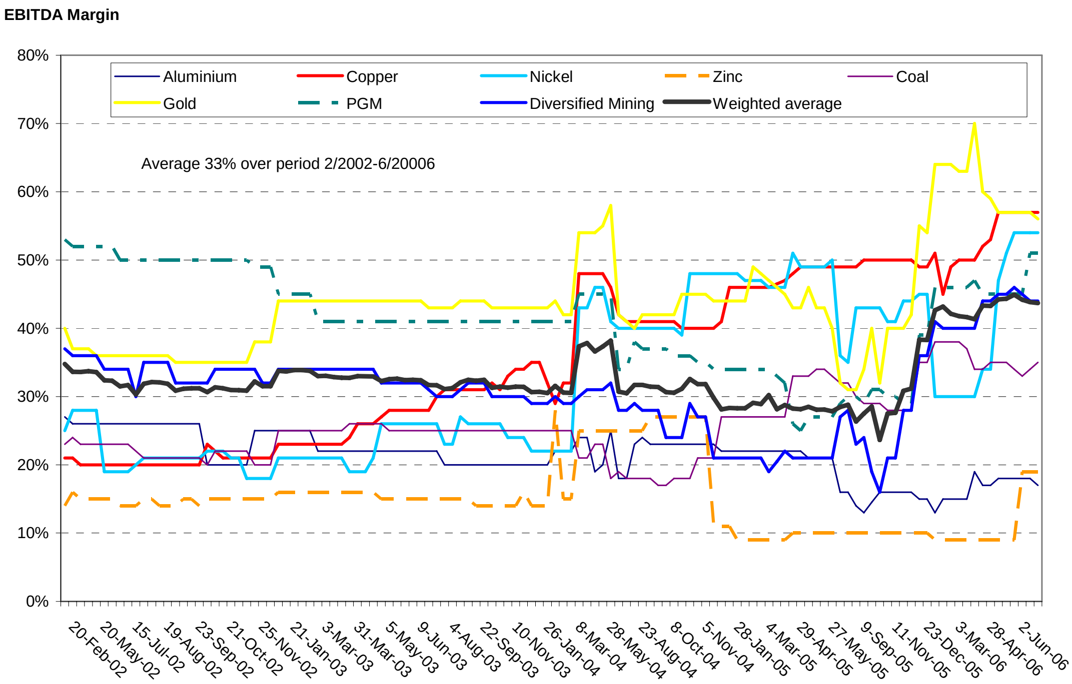
	2007	2008	2009	2010	CAGR	Timeframe	Data source
Precious Metals							
Gold (t)	2,475	2,415	2,473	2,501	-0.4%	10	ABARE
Silver (t)	19,795	na	na	na	1.8%	8	ABARE
Non-ferrous Metals							
Aluminium (kt)	38,000	39,700	36,114	38,228	4.6%	10	U.S. Geological Survey/ABARE
Copper (kt)	15,464	15,458	15,587	16,157	2.2%	11	International Copper Study Group/ABARE
Zinc (kt)	11,143	11,752	10,909	11,345	2.6%	6	International Lead and Zinc Study Group/ABARE
Lead (kt)	3,607	3,913	na	na	3.2%	8	International Lead and Zinc Study Group/ABARE
Nickel (kt)	1,429	1,386	1,197	1,264	1.6%	10	International Nickel Study Group/ABARE
Tin (kt)	335	333	na	na	3.9%	8	U.S. Geological Survey
Uranium (kt)	43.3	50.0	56.1	58.8	7.8%	10	ABARE
Bulk Commodities							
Thermal seaborne coal trade (Mt)	607	704	690	730	7.4%	10	ABARE
Metallurgical seaborne coal trade (Mt)	227	235	207	213	7.5%	10	ABARE
Iron ore (world exports, Mt)	829	887	914	998	7.1%	10	ABARE

The 2007-2009 production data (2009 is grossed for full year production estimate) is then multiplied by the relevant commodity prices deflated to 2005 prices using the Bureau of Economic Analysis U.S. GDP deflator to provide a weighted average gross production value in Table 24.

To determine an approximate stock market value for these commodities, this thesis utilizes data reported by JP Morgan in the 2002-2006 period (Gambardella 2002-2006) as these define a time period around the commencement but prior to the heights of the 2002-2008 resources boom.

The thesis utilized Enterprise Value/Earnings before Interest, Tax, Depreciation and Amortisation (EV/EBITDA) multiples to derive a market value given the greater robustness of this valuation technique across a rising market relative to P/E ratios. Figure 46 plots EBITDA margins for the sectors over this approximate 4.5 year period with the weighted average based on the market capitalisation of each sector at that time. While the chart is cluttered with the number of sectors, the weighted average EBITDA margin (black line) during the period has been between 30% and 40% except as the boom accelerated during 2006. The average EBITDA margin over the period was 33% and is in line with PriceWaterhouseCoopers (2006) analysis of the top 40 global mining companies which display EBITDA margins of 31% and 36% for the calendar years 2004 and 2005 respectively.

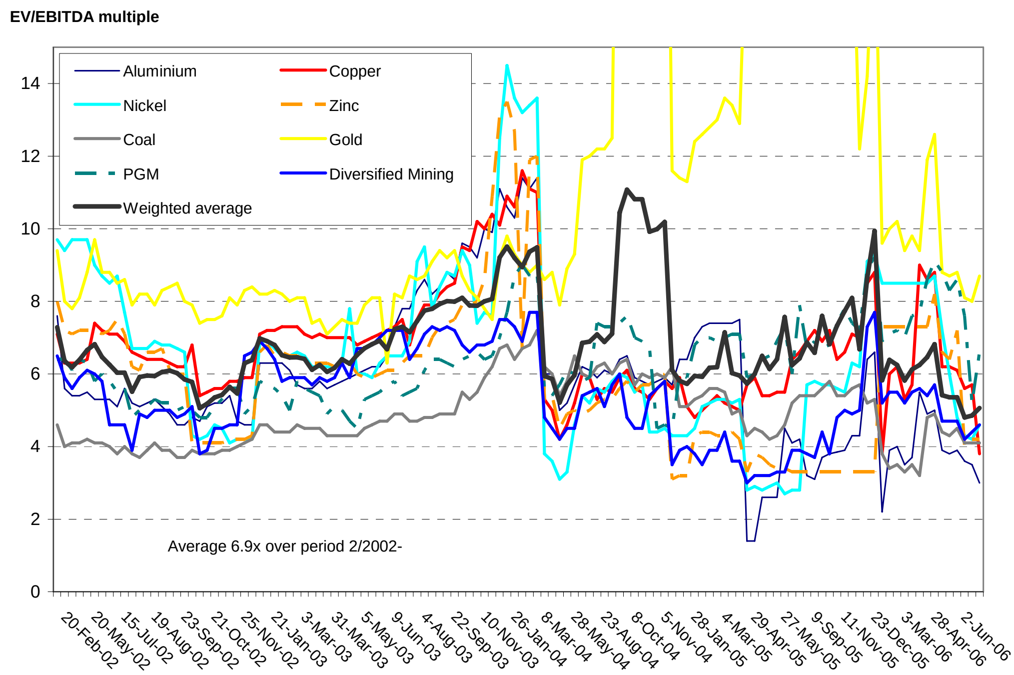
Figure 46. EBITDA Margins for global sectors between February 2002 and June 2006 including the weighted average margin based on the market capitalisation of each sector.



Data sources from Gambardella (2002-2006).

Similarly, Figure 47 plots the EV/EBITDA multiples for each sector and the market capitalisation weighted average across the same time period. Given the forward looking nature of the market, EV/EBITDA multiples are rolled forward to the next year approximately 3-4 months prior to the end of the financial year. The chart highlights the divergence in multiples for the various sectors with extremes of the gold sector relative to some base metal sectors. It also highlights a declining multiple in 2006 as the resources boom takes hold. Again while Figure 47 is cluttered with the various sectors, the weighted average EV/EBITDA multiple tends to range between 6 and 8 for most of the time, with an average over the period at 6.9.

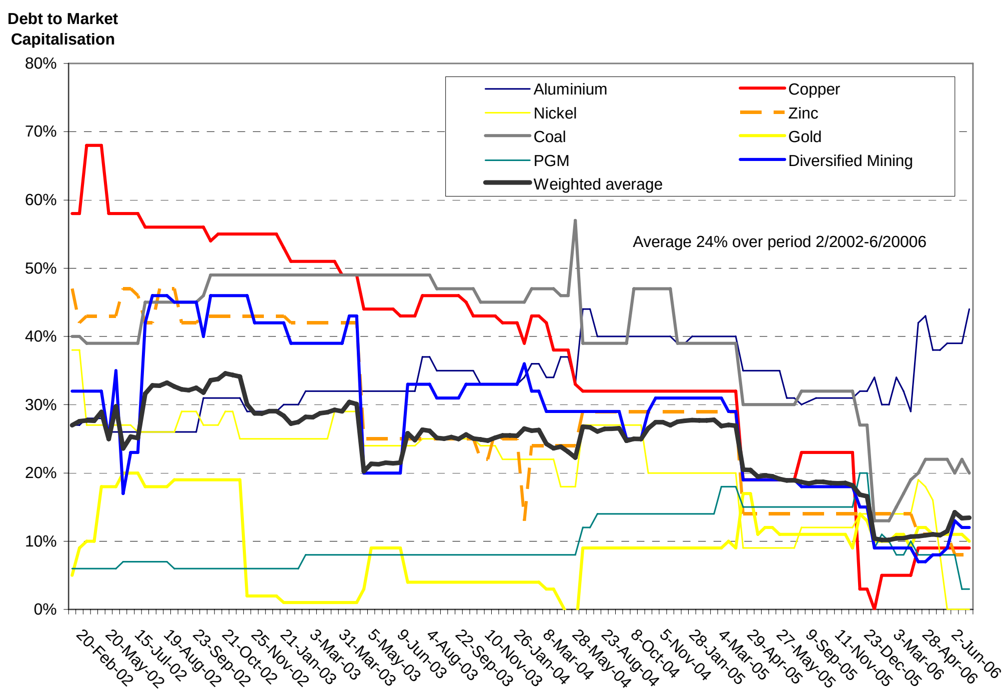
Figure 47. EV/EBITDA multiples for global sectors between February 2002 and June 2006 including the weighted average margin based on the market capitalisation of each sector



Data sources from Gambardella (2002-2006).

Lastly as EV or enterprise value represents the market equity plus net debt, Figure 48 plots the sector net debt to market capitalisation across the same time period. With increasing share prices leading to the increasing market capitalisation of resource companies in comparison to relatively static debt levels, the net debt to capitalisation (cap) ratio decreased as the boom advanced. The weighted average net debt to cap was 24% over the period although it averages 27% prior to 2005.

Figure 48. Net debt to market capitalisation for global sectors between February 2002 and June 2006 including the weighted average margin based on the market capitalisation of each sector



Data sourced from Gambardella (2002-2006).

The weighted average data from Figures 46 to 48 have been applied to the gross revenues derived in Table 23 and which have been indexed to 2005 commodity prices to provide approximate market values for each commodity (Table 24). While estimation is only approximate given a number of errors including non-listed producers, producers of intermediate products, integrated producers of non-traded commodities, etc. the total market capitalisation of the global resources sector at US$930 billion in 2005 is not too dissimilar from current estimates of US$1.15

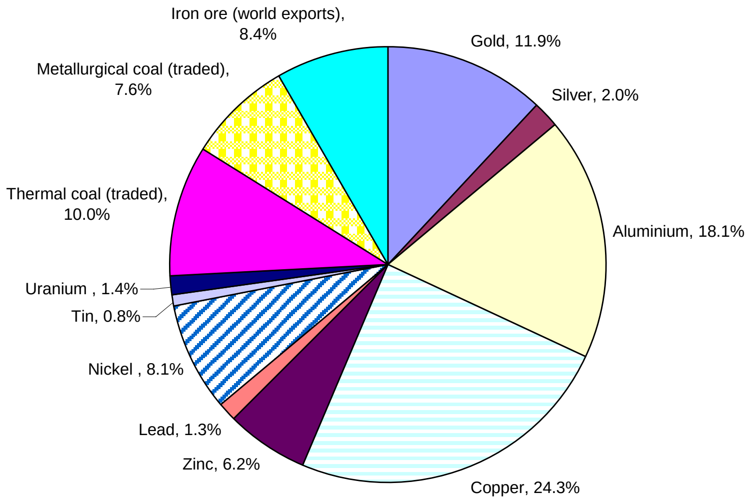
billion outlined in Section 3.1 and further correlation is not warranted given the basis for this estimation.

Table 24. Average potential sector values.

	Weighted Average Revenue per year for 2007-2009 (US$m)	EBITDA Margin	EBITDA (US$m)	EBITDA multiple	Industry value (US$ million)	Industry equity value (US$ million)	CAGR	Timeframe	Data source
Precious Metals									
Gold (t)	$60,479	33%	$19,958	6.9	$137,710	$111,056	-0.4%	10	ABARE
Silver (t)	$8,025	33%	$2,648	6.9	$18,273	$18,273	1.8%	8	ABARE
Non-ferrous Metals									
Aluminium (kt)	$74,018	33%	$24,426	6.9	$168,540	$168,540	4.6%	10	U.S. Geological Survey/ABARE
Copper (kt)	$99,235	33%	$32,747	6.9	$225,957	$225,957	2.2%	11	International Copper Study Group/ABARE
Zinc (kt)	$25,157	33%	$8,302	6.9	$57,282	$57,282	2.6%	6	International Lead and Zinc Study Group/ABARE
Lead (kt)	$5,434	33%	$1,793	6.9	$12,373	$12,373	3.2%	8	International Lead and Zinc Study Group/ABARE
Nickel (kt)	$32,913	33%	$10,861	6.9	$74,942	$74,942	1.6%	10	International Nickel Study Group/ABARE
Tin (kt)	$3,422	33%	$1,129	6.9	$7,792	$7,792	3.9%	8	U.S. Geological Survey
Uranium (kt)	$5,522	33%	$1,822	6.9	$12,573	$12,573	7.8%	10	ABARE
Bulk Commodities									
Thermal seaborned coal trade (Mt)	$40,664	33%	$13,419	6.9	$92,592	$92,592	7.4%	10	ABARE
Metallurgical seaborne coal trade (Mt)	$30,915	33%	$10,202	6.9	$70,394	$70,394	7.5%	10	ABARE
Iron ore (world exports, Mt)	$34,419	33%	$11,358	6.9	$78,371	$78,371	7.1%	10	ABARE

The individual potential market value for each commodity sector is presented in Figure 49. This highlights the dominance of both the copper and aluminium sectors.

Figure 49. Potential market size of the various resource sectors based on Table 24.



What is evident is that most of the potential copper market capitalisation is present in the diversified resource companies as with nickel and similarly this trend is occurring in aluminium. Gold and uranium and to a less degree, zinc (and lead), have remained relatively independent and are the next logical targets for consolidation. Elsewhere, the iron ore sector and to a lesser degree, the coal sector have both grown with the emergence of higher commodity prices (see Figure 39 for iron ore prices) and again more so in the case of iron ore, the presence of numerous deposits which have now become economic.

Another factor promoting diversification strategies are anti-competitive or as referred to in the U.S., anti-trust considerations. While in Australia, the Australian Competition and Consumer Commission (ACCC) now has this jurisdiction, in Europe it is the European Commission and in the U.S. it is the U.S. Justice Department and US Federal Trade Commission. The European Commission has been the most difficult to appease in recent times with the undisclosed conditions placed on BHP Billiton’s bid for Rio Tinto in 2008 in a statement of objections (BHP

Billiton 2008a) and the recent desire for both companies to merge their Western Australian iron ore interests. In the latter case, BHP Billiton has been arguing to abandon the annual benchmark negotiations for iron ore in favour of an index linked to spot prices to assist in gaining support from the commission (Bloomberg, 2009).

It is not uncommon for the US Department of Justice or European Commission to request divestiture of key assets in M&As and this was evident in the 1999 Alcoa Inc. merger with Reynolds Inc. where anti-trust authorities forced Alcoa to divest Reynold's alumina assets as a condition for allowing the merger to take place (see EU, 2000). This was unexpected and Reynold's interest in the Worsley Alumina refinery was considered a key attraction to the merger but both US and European anti-trust agencies were concerned at the potential control by Alcoa of almost 50% of the world-wide trade in untied alumina sales.

Moreover, there are other restrictions on M&A activity including sovereign risk and other factors such as the recent Australian Department of Defence rejection of state-owned China Minmetals from buying the Prominent Hill mine from OZ Minerals in March 2009 in light of its location on the Woomera rocket testing range (SMH, 2009).

As a final comment, it is not only commodity sector size overlain by anti-trust considerations but also sovereign risk issues and the obvious lack of a strategic shareholder (i.e. open register) that leave M&A opportunities relatively limited on a global scale. In fact the scarcity of attractive and executable M&A targets requires increased compromise or non-participation. In addition, the growth imperative is now placing pressure on companies to monitor worldwide exploration discoveries and seek an early foothold in promising advanced exploration projects which could lead to world-class discoveries as discussed in Chapter 6.

3.4 Size Premia and Market Consolidation

While individual acquisitions and mergers have been justified by a variety of factors, there are generally two main reasons which have validated the majority of past acquisitions and mergers:

1. to gain an increase in market capitalisation; and
2. to gain market share in specific commodities

While both strategies have been employed in justifying M&A activity, this thesis believes that transactions in the mid to late 1990's and earlier this decade were primarily by companies seeking to gain increased market relevance. This trend has moved to one of embarking on M&A activity due to target scarcity and an impetus that any remaining targets will soon be acquired.

Prior to the late 1990s, there was an increased focus on asset quality and the creation of synergies. From the mid 1990s, but with increasing relevance during the tech boom, there was focus on M&A activity to control commodity supply as resource companies, then under pressure as 'destroyers of capital' with poor returns, recognized the pitfalls of being price takers. Lastly the A$/US$ depreciated in 1997 and remained below 0.65 for a number of years without a corresponding adjustment in the share price of some resource companies which created cheap takeover targets.

These trends are discussed more fully with the M&A data in Chapter 5 but further background is required on size premia, the increasing correlation of various commodity prices and finally, the A$/US$ exchange rate.

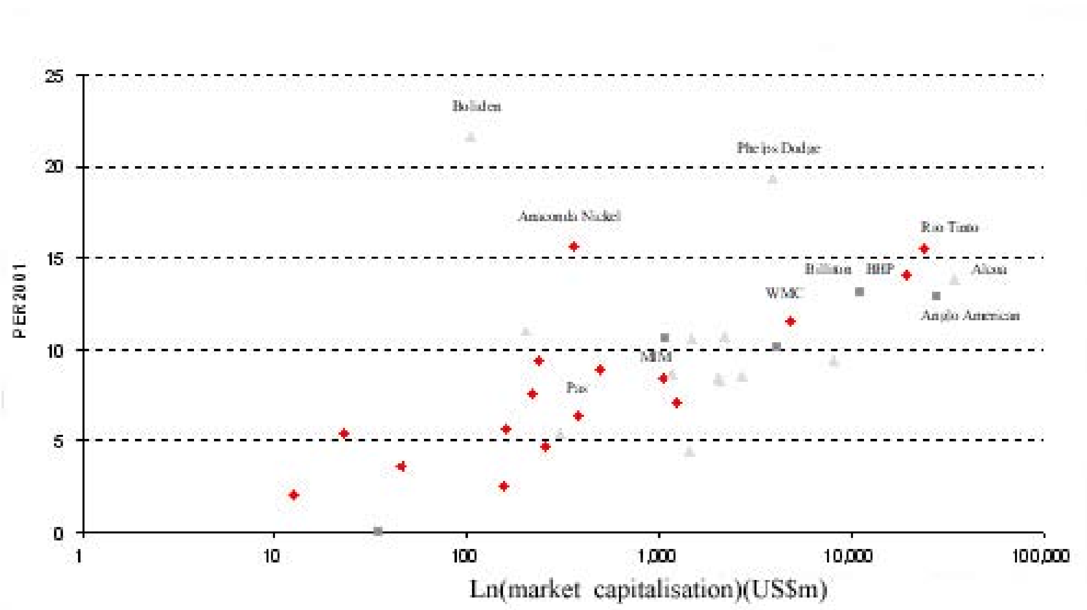
3.4.1 Size Premium

Earlier this decade there was a well recognized size premium within the resources sector, perhaps accentuated during the Tech Boom. This is likely to reflect a number factors occurring at that time including

- The increasing polarization of the resources sector with domination by BHP, RIO and Woodside
- Portfolio diversification easier with larger companies, i.e. less analyst research coverage required.
- Increased liquidity, particularly for global resource investors which have minimum company size and liquidity constraints
- Generally underweight positions within the resource sector

On a global scale Figure 50 plots a cross-sectional view of P/E multiples based on the then consensus prospective 2001 earnings of resources companies versus company market capitalisation in US dollar terms. While many of these companies have since been taken over, there is a clear trend of increasing prospective P/E ratio with increasing size of market capitalisation.

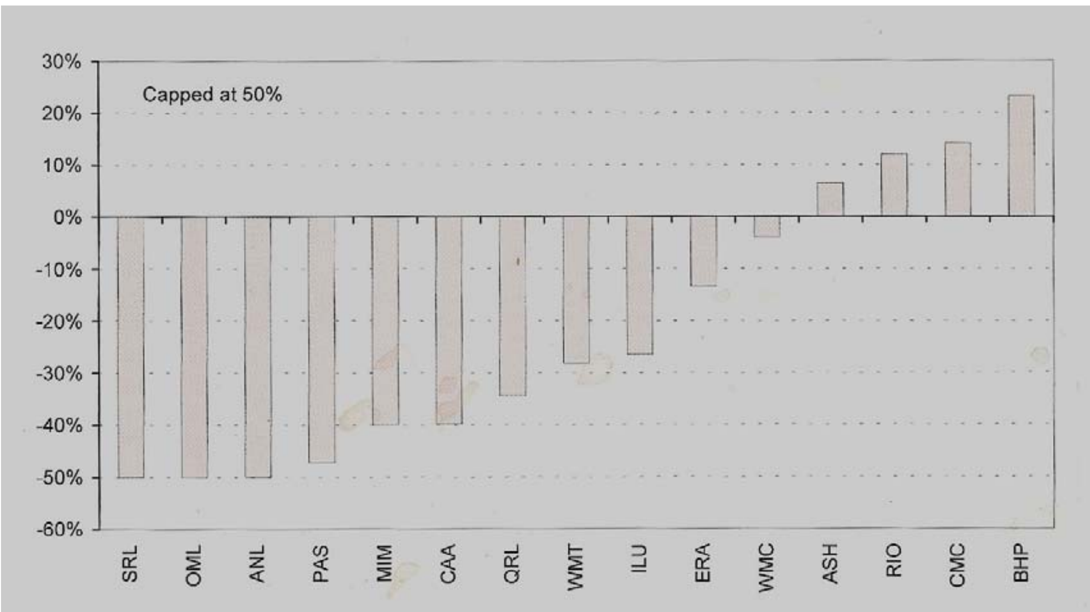
Figure 50. Comparison of market capitalisation and prospective 2001 P/E



Adapted from Bartrop (2001).

In the Australian resource sector at that time, NPV per share premia or discounts to actual share prices also reflected a similar trend of increasing premia for large companies as seen with BHP, RIO, CMC (Comalco) and WMC in Figure 51.

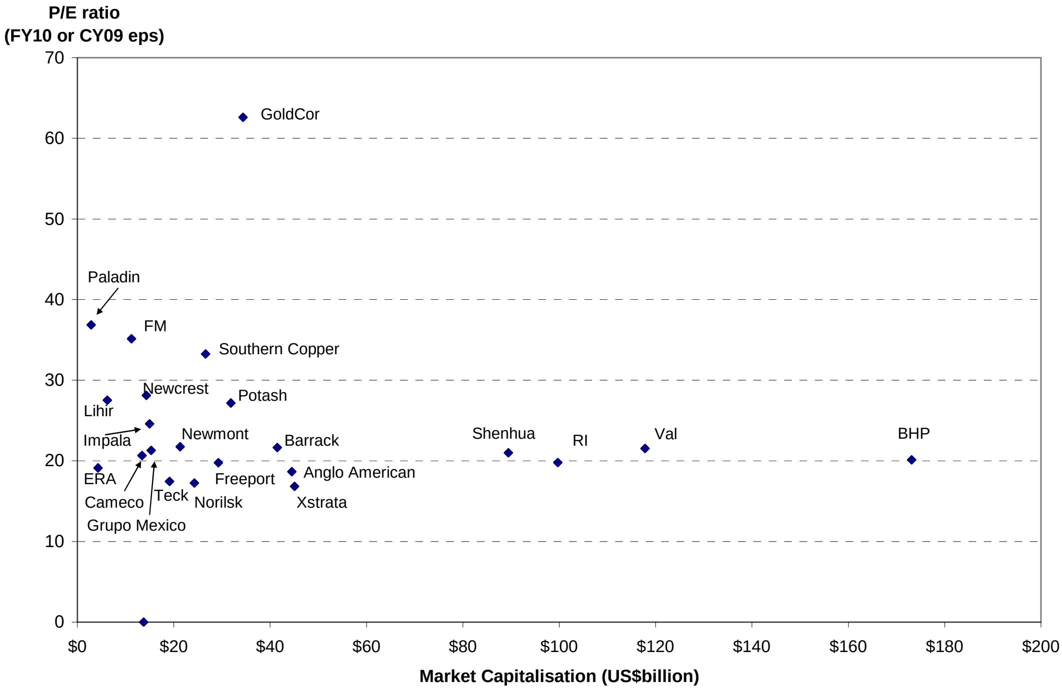
Figure 51. Share price premium (discount) for the resource sector in 2000.



From Bartrop (2000) and based on uniform commodity price and exchange rate assumptions.

However, evidence for these size premia is now not compelling in both global and domestic resource companies. Figures 54-57 chart the top 26 global resource companies in terms for P/E and P/CF ratios. To partially compensate for companies with varying June or December financial year ends, Figures 52 and 54 plot consensus earnings and cash flows per share for FY10 (financial year 2010) for June year end companies and CY09 (calendar year 2009) for December year end companies respectively. Similarly, Figures 53 and 55 plot consensus earnings and cash flows per share for FY11 for June year ends and CY10 for December year ends. The rational is that the market is forward looking but the Global Financial Crisis (GFC) has impacted 2009 calendar year earnings and cash flows and hence CY10 and FY11 earnings and cash flows provide forecasts beyond the GFC. The consensus earnings and cash flows have been derived from Bloomberg. While historically there were adjustments to compensate for variations in financial reporting (see Section 2.5.1), these are now rarely observed.

Figure 52. Company P/E based on FY10 or CY09 earnings forecasts versus market capitalisation.

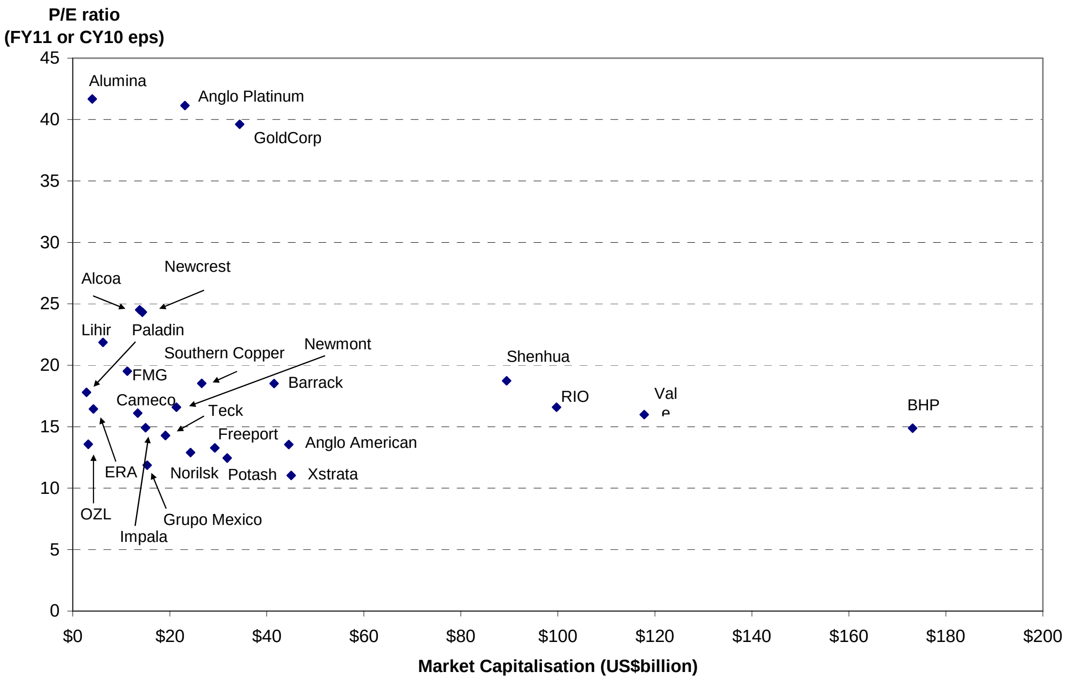


Data sourced from Stock Resource, Prices as at 9 October 2009.

Noting the differing vertical axes, Figure 53 below outlines a tighter cluster of P/E ratios reflecting the impact of the GFC on some companies in Figure 52. Interestingly, the large companies trade at relatively consistent multiples despite the size variation. BHP has been regarded as trading normally around an average P/E of 15x over many years by market analysts as evident in Figures 50 and 54 and on a 12 month forecast. A comparison with the 2001 chart (Figure 50) shows smaller companies tended to trade below 15x earnings in relation to size, whereas Figure 53 shows they trade around a 15x P/E, their positioning likely to reflect company specific attributes (e.g. growth or takeover prospects).

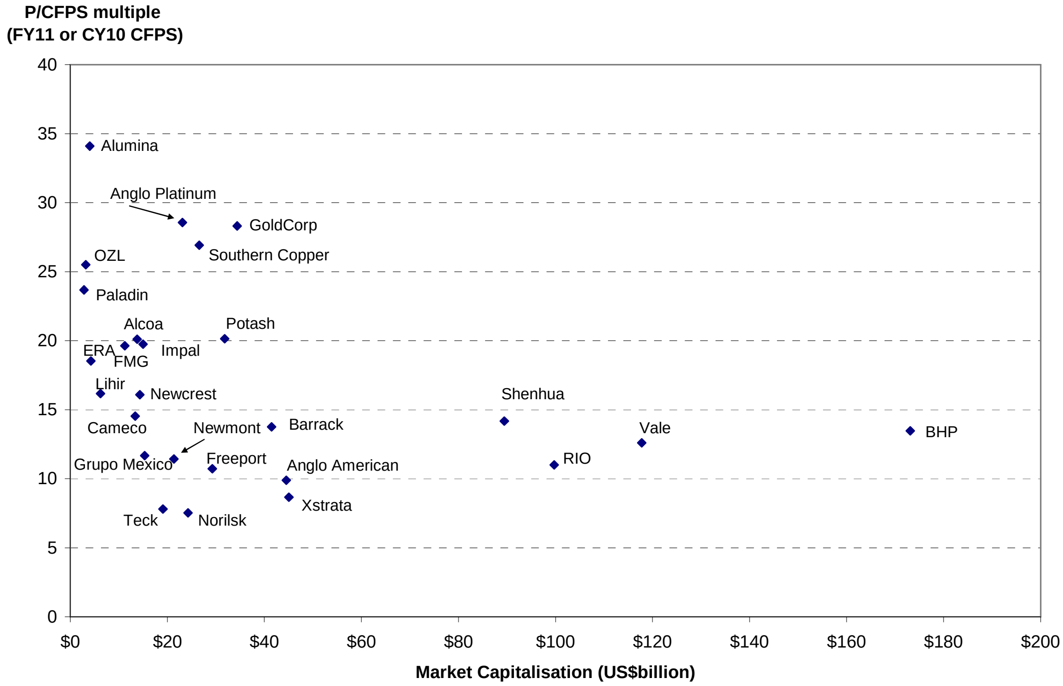
Anglo American's slight premium over Xstrata is likely to at least partially reflect Xstrata's threat of launching a takeover. As at 9th October 2009, Xstrata was under "put up or shut up" ruling by UK regulators, and must make a formal takeover offer by 20 October 2009 (Onstad, 2009)

Figure 53. Company P/E based on FY11 or CY10 earnings forecasts versus market capitalisation



Data sourced from Stock Resource, Prices as at 9 October 2009

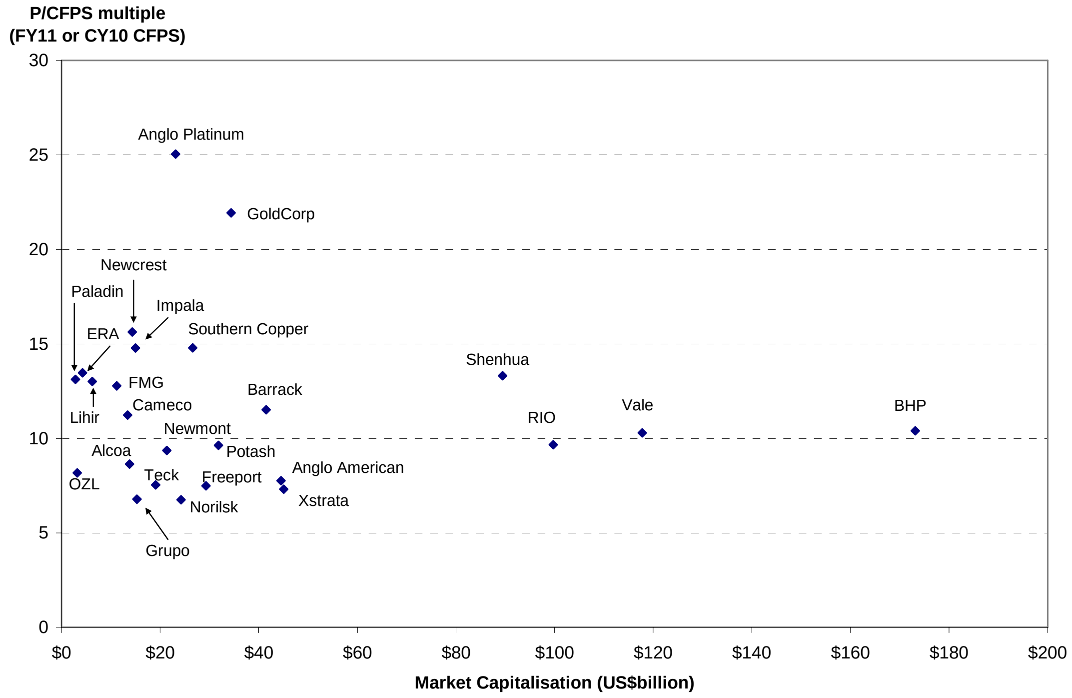
Figure 54. Company P/CFPS based on FY10 or CY09 cash flow forecasts versus market capitalisation



Data sourced from Stock Resource, Prices as at 9 October 2009.

Again the cluster in Figure 54 decreases in Figure 55 as the timeframe is moved forward one year.

Figure 55. Company P/CFPS based on FY11 or CY10 cash flow forecasts versus market capitalisation.



Data sourced from Stock Resource, Prices as at 9 October 2009.

Again the three top companies trade at similar price to cash flow levels in FY11 or CY10 at around 10x. In Figures 52 to 55 there is an empirical trend of decreasing ratios for the next tier companies (Anglo American and Xstrata) which may reflect a poorer quality asset base while many of the base metal companies also trade at price to cash flow ratios lower than the top four companies.

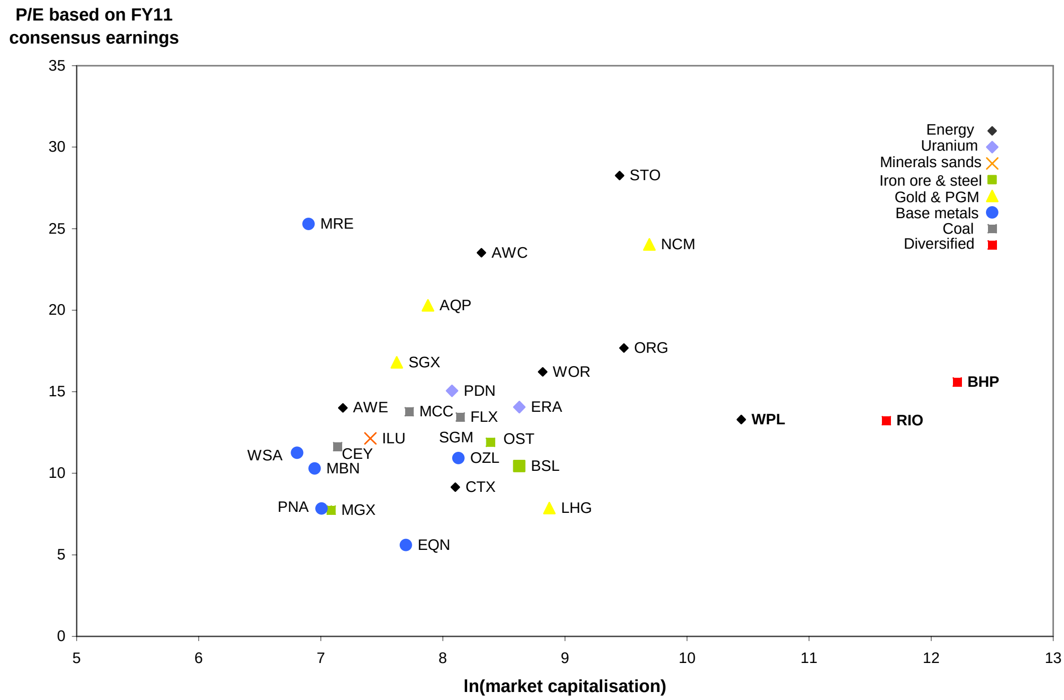
However when outliers are included this is not the case as presented in Table 25. Table 25 also highlights the poor correlation of the P/E and P/CF ratios to company size. Nevertheless Table 25 does indicate that a gold premium is present in both sets of multiples. Despite the limited number of gold/platinum group metal producers, as outlined in Section 3.1, the top 25 companies constitute more than 80% of the global sector.

Table 25. Sector average P/E and P/CF multiples. The Pearson product moment correlation coefficients to total group company market capitalisation are also presented

Sector	Number	P/E FY10 or CY09 eps	P/E FY11 or CY10 eps	CFPS FY10 or CY09 cfps	CFPS FY11 or CY10 cfps
Gold	6	31.0	22.6	17.6	14.4
Basemetals	8	72.1	18.8	18.0	12.7
Diversified	5	19.4	14.4	11.1	9.1
Uranium	3	25.5	16.8	18.9	12.6
Pearson coefficent to company size		-0.3	-0.2	-0.3	-0.2

In the Australian resource sector Figure 56 charts the P/E based on FY11 or CY10 EPS against the log of company market capitalisation given the polarization of the sector. This includes energy companies (oil, gas and utilities/services). Nevertheless there is no clear relationship between sectors although one can argue that most base metal companies trade below RIO and BHP while most gold companies trade at multiples above these companies at this time.

Figure 56. Australia resource companies plotted on P/E ratios based on FY11 or CY10 consensus earnings against the log of their market capitalisation.



Market capitalisation based on share price as at 15 September 2009. Data sourced from Stock Resource.

In summary, while there has been a size premium reflected in P/E ratios and NPV per share premia earlier this decade, current available data do not support the presence of this premium bearing in mind that the data represents one point in time. There is some evidence of a gold premium and while this may reflect the current outlook for the gold price, historically gold companies are noted to trade at a premium to other resource stocks.

There are number of reasons why the size premia may have diminished during the resources boom and these include:

- Increased takeover activity has left the fewer remaining companies vulnerable to M&A activity and their share price incorporates part of a possible takeover premium

- The removal of many of the larger companies by M&A activity has elevated the status of mid tier companies. Some of these companies are developing new projects and are yet to generate sustainable earnings and cash flows.

In Chapter 2 (Section 2.3.5), this thesis discussed the size or small-firm effect whereby the returns on the shares of small companies exceed the returns on the shares of larger companies, both before and after adjusting for beta-risk. This is neither supported nor questioned in this analysis as this analysis is seeking to establish the presence of company premia relative to size and not investment returns over a defined time period.

3.5 Commodity Investment

Commodity price trends are important in the analysis of resource companies share price movements given their influence over earnings and cash flow levels and the value of their mineral resources and prospects. Crowson (2006) notes that, while most mineral products are traded globally, there are often mismatches between regional needs and production. Hence, commodity prices reflect region-specific supply-demand dynamics as well as macro-economic issues. However, there is overwhelming evidence that commodity prices are increasingly behaving in unison globally rather than in a fashion that would be suggested by specific supply-demand fundamentals.

This thesis does not review individual commodities and readers are referred to Crowson (2006), (1998), ABARE (2009) and USGS (2009) publications. However USGS (2009a) has developed leading and coincident indicators of metal price trends which utilize economic data primarily derived from the US. These are summarized in Table 26.

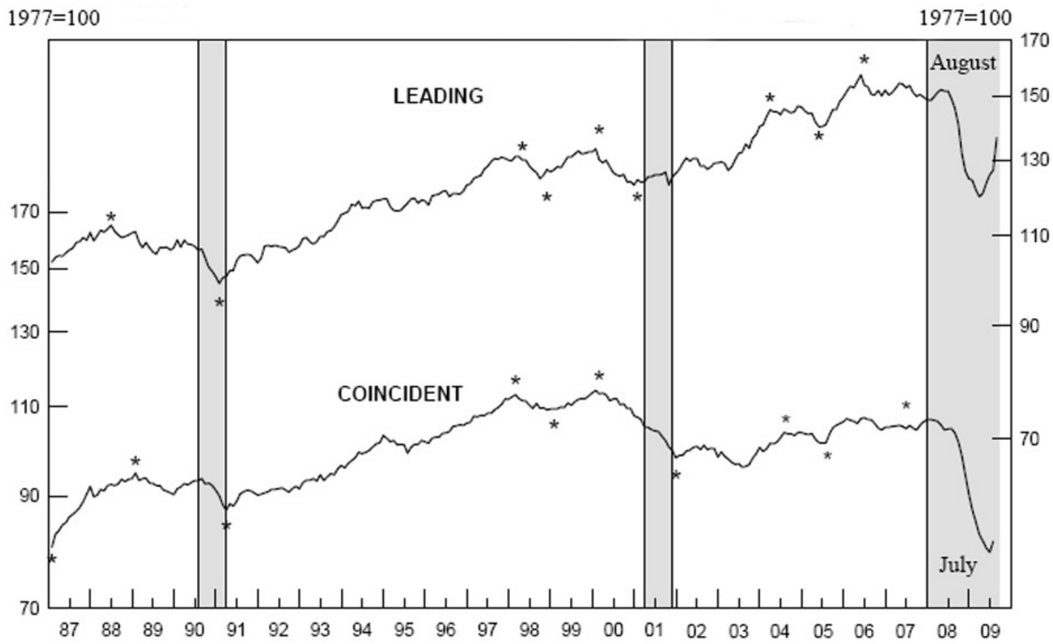
Table 26. Components of the USGS metal industry indicators (leading and coincident).

Leading Index		Parameter	Source
	1	Average weekly hours, primary metals	Bureau of Labour Statistics, NAICS 331
	2	Weighted S&P stock price index, machinery, construction and farm and industrial (30 December, 1994 = 100)	Standard & Poors, USGS
	3	Ratio of price to unit labour cost	USGS, NAICS 331
	4	JOC-ECRI metals price index growth rate	Journal of Commerce and Economics
	5	New orders, primary metal products	NAICS 331 & 335929: 1982$
	6	Index of new private housing units authorised by permit	US Census Bureau
	7	Growth rate of US M2 money supply, 2005$	Federal Reserve Board, Conference Board
	8	Purchasing Managers Index (PMI)	Institute for Supply Management
Coincident Index			
	1	Industrial production index, primary metals	Federal Reserve Board, NAICS 331
	2	Total employee hours, primary metals	Bureau of Labour Statistics, NAICS 331
	3	Value of shipments, primary metal products	US Census Bureau, NAICS 331 & 335929: 1982$

From USGS (2009a).

The USGS is primarily interested in providing trends for the major metals, viz copper, aluminium and steel (scrap) prices. Figure 57 is adapted from USGS (2009a) and highlights the most recent trends in the indices

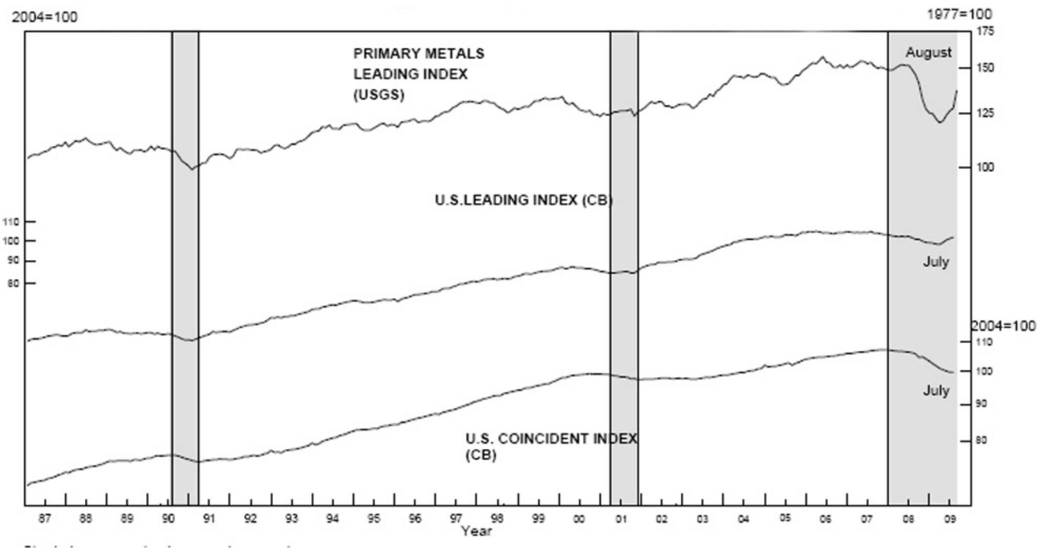
Figure 57. Primary metals: Leading and Coincident Indexes, 1987-2009.



Shaded areas are business cycle recessions. Asterisks (*) signify peaks (the end of an expansion) and troughs (the end of a downturn) in the economic activity reflected by the indices. From USGS (2009a).

The USGS (2009a) note that metals are key inputs in durable goods manufacturing and construction, which account for almost a quarter of gross domestic production final sales. Therefore, the primary metals leading index also gives early signals of major changes in activity for the overall U.S. economy (see Figure 58).

Figure 58. Primary Metals Leading Index and Composite Indices of Leading and Co-incident Indicators for the U.S. Economy.



Shaded areas are business cycle recessions. U.S. Leading and Co-incident indices from the Conference Board (CB). From USGS (2009a).

The research by the USGS (2009a) in developing the leading and coincident metals indices and their usefulness in predicting the overall direction of the U.S. economy verifies the perception that the demand for and hence price of industrial commodities are leveraged to economic growth and therefore so are the companies that produce these commodities. It is not surprising to find in that report that commodities influence a significant portion of the world economy, and can be viewed as the largest 'non-financial' market in the world (Doyle et al, 2007). On an academic front, Roberts (2009) identified peaks and troughs in the inflation-adjusted prices for 14 metals, using monthly average data from January 1947 through December 2007. He found that the duration of contraction and expansion phases are not purely random and have some degree of cyclicality with contractions generally persisting longer than expansions (in contrast to macroeconomic cycles) and that long-term real prices have been trendless.

3.5.1 Fund Investment

As mentioned earlier, fund investment has increased dramatically over the last six years (see Figure 41 earlier), particularly in response to the belief of a ‘paradigm shift’ with the rapid increase in commodity demand from China and other emerging economies. Schneeweis and Spurgin, (2000) in their academic review of the investment benefits of LMEX (the LME Base Metal Index) argue that previous research has shown that commodity investing has the ability to:

1. Diversify a portfolio against economic events such as unexpected commodity price increases that may put pressure on stocks, bonds and other traditional investments.
2. Capture natural sources of return that are available from commodity investing and may not be easily captured using other investment vehicles. Examples of these sources of return include scarcity return and convenience yield.
3. Exploit pricing inefficiencies that may exist in commodity markets opportunistically through active management.

While these are assumptions discussed below, the establishment of LMEX has facilitated that ability to invest in the base metal complex. However a key factor in the increased trading of commodity related products as been the overall easier facilitation of investment with exchanges moving largely to screen trading e.g. ICE Futures closed its open-outcry trading floor in 2005, LIFFE has become a fully electronic exchange, and the LME launched the ‘LME Select’ trading system alongside floor and telephone trading in 2000 (Doyle, 2007).

Domanski and Heath (2007) point out that it is the commercial investors seeking to hedge their production or consumption and not necessarily profit seeking financial investors who provide liquidity in commodity derivatives markets. This thesis notes the similarity to gold hedging where one participant (central banks lending gold at lease rates) is willing to accept a lower return due to the necessity of having reserve holdings for other reasons.

Schneeweis and Spurgin, (2000) outline the three separate sources of return: price, roll and collateral return, which can be derived from investing in commodity futures and commodity indices. They note that normally in financial markets, opportunities for (risk-free) arbitrage exist when the futures price deviates from the relevant spot price plus the cost of carry, e.g. the cost of financing a position in the spot market. However, the scope for arbitrage in commodity markets may be limited by constraints on uncovered short selling. In particular, the stock of commodities available for lending is generally small for energy and base metals. This limitation may allow the difference between forecast spot prices and corresponding futures prices to fall below the cost of carry – an infrequent situation known as backwardation.

Gorton et al's (2007) research based on data between 1969 and 2006 found that the price measures, such as the futures basis (spot price of asset less futures price of contract used), prior futures returns, and spot returns reflect the state of commodity inventories and are informative about commodity future risk premia. The excess returns to Spot and Futures Momentum and Backwardation strategies stem in part from the selection of commodities when inventories are low.

An important issue is that while futures prices converge towards spot price as the delivery date is approached, the initial futures pricing may reflect other factors not purely related to commodity price expectations, e.g. ability to short sell, financing costs and risks, state of market (contango or backwardation). Domanski and Heath (2007) report that intuitively, one might expect large inflows of funds into commodity markets to cause prices to rise sharply, possibly to higher levels than are justified by economic fundamentals. Their prima facie evidence seemed to support this view, as financial activity has broadly increased in parallel with prices during the past four years. However, the results of empirical work on the impact of the growing presence of financial investors on commodity prices are less clear-cut and they noted that several recent studies had indicated that commodity price changes have led to changes in investor interest rather than the other way around. This thesis would agree with this latter proposition. However, as a consequence of increased investment, of the rigidity of some investment funds, of futures ‘roll’ considerations and of the size of commodity investment, there are factors influencing futures pricing beyond the supply/demand factors affecting the 3-months and spot prices under threatened futures delivery scenarios. This is highlighted in a functioning market perspective outlined by Doyle et al. (2007) in their UK Financial Services Authority research.

In terms of the actual commodity investment Doyle et al. (2007) report that given that many of the investors lack the necessary expertise or desire to take on-exchange positions directly, they are more likely to pay a third party to manage their commodity exposure. There are typically three main vehicles for investors to do this:

- index funds;

- hedge funds;
- commodity trading advisers.

The authors report that one large, unnamed multinational bank has estimated that as much as US $200 billion is invested in commodity markets. They estimated that most of this investment is made via index funds (approximately 40% and growing), hedge funds (about 30%) and commodity trading advisors (about 20%), and each of these sectors is expected to grow in investment size over the coming years. This is in a market estimated to have increased six fold to $8 trillion by the end of June 2007 in response to the surge in investor interest in commodity investments (BIS, 2007).

Index funds enable investors to ‘buy the market’ in a single investment; those running the funds take on the expense of trading and researching the individual commodities in the index. Buying the market also ensures a balanced and diversified basket of commodities – losses from one should be counterbalanced by gains from another. Index funds are long only, and all their transactions relate to futures, hence there is no physical ownership of the underlying inventory involved. Index funds buy a forward position, then sell it as it approaches expiry, and use the proceeds from the sale to buy forward by one or two months again or as it is generally referred to ‘rolling’ their position.

Doyle et al. (2007) note that being un-leveraged and only long, index funds are susceptible to poor performance in falling or contango markets, or both – a key issue noted by this thesis given their growing size and perhaps somewhat in part naive investors group! Index funds contrast with hedge funds given flexibility to sell short as well using leverage to increase yield.

Index funds grew dramatically in the five years to 2007 with the number of funds continuing to increase. Key features of some major funds are as follows (Doyle et al, 2007):

- The largest is the Goldman Sachs Commodity Index (GSCI) which was launched in the 1980s and by the early 1990s had grown to US$1billion assets under management. In 2001 its value was in the range of US$4-5 billion, and in 2007 had increased to US$55-60 billion. The fund is heavily energy weighted (see Table 27).
- Dow Jones AIG Commodity Index which has an estimated US$10- 15billion assets under management.
- Deutsche Bank Liquid Commodity Index (<US$5 billion) was launched in 2003 with just six highly liquid commodities.
- Rogers International Commodity Index (<US$5 billion) was launched in 1998 and is the widest ranging and currently consists of 35 commodities.

The component weightings of these funds are outlined in Table 27.

Table 27. Weightings by component of several large index funds.

Index Fund	DBCI	AIG	GSCI	Rogers
Components	6	19	24	35
Energy Complex	55%	33%	69%	44%
Industrial metals	13%	18%	11%	14%
Precious metals	10%	8%	2%	7%
Agriculture	23%	30%	12%	30%
Livestock	nil	10%	5%	5%

Adapted from Doyle et al (2007).

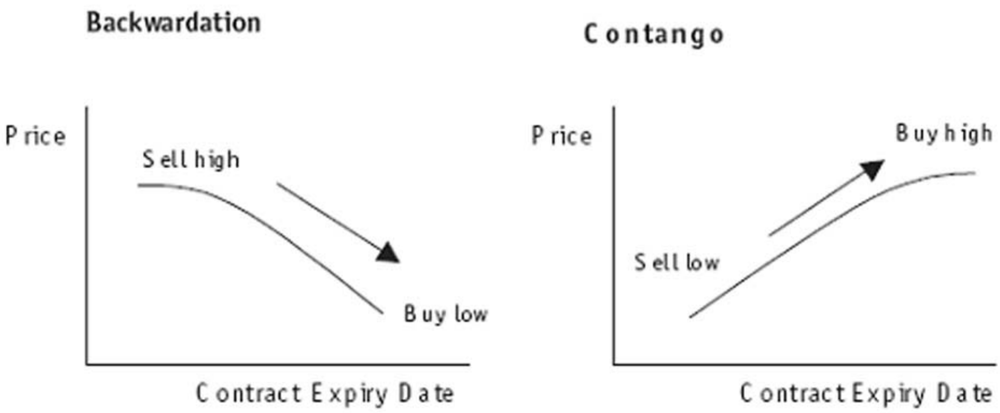
In terms of index roll, passive index funds will normally roll contracts at a time dictated and hard-wired into their investment agreements with customers. Typically this will take place over a five-day period where 20% of contracts are rolled each day. Doyle et al. (2007) comment that rolling periods for indices have become predictable to the rest of the market, which means the market can move against them. The notional amount of commodities underlying the investments of index funds is very large. They cite the example that taking the GSCI on its current (2007) asset allocation, 3.96% of an estimated US$60 billion is invested in copper. At the then market prices (about US$7,020/tonne) this equated to about 340,000 tonnes, or more than twice the amount of copper currently in LME warehouses.

These positions create massive amounts of open interest (i.e. contracts that are ‘live’ – having not yet come to expiry or closed out), and while the large monthly rolls seen with these indices create large amounts of trading, in real terms some of the participants that Doyle et al. (2007) interviewed expressed concerns that liquidity in the nearby (i.e. front contract months) has become tighter in some markets. During the roll periods there are many funds trying to roll around the same months, so they need an equal number of counterparties heading in the opposite direction; as counterparties dry up, future prices will rise, and ‘spot’ prices will fall.

Doyle et al. (2007) reported that survey participants have admitted that the effect of US$55+ billion of investment cannot be ignored and will have some effect on price. However, gauging the extent of this effect is difficult with such a significant roll of futures contracts causing a move in the market but only in the short term mainly in the week of the roll, and there is an expectation that markets tend to correct afterwards. Survey participants also agreed that price movements were being exaggerated following fund investments, and that news relating to market fundamentals are affecting the price of certain commodities much more than they would have done before such speculative investments became widespread.

The rolling of futures positions can also result in a profit or loss for these funds depending on the structure of the forward curve at the time. Figure 59 from Doyle et al. (2007) demonstrates how this relationship works. If the market is in backwardation (forward price curve declining) index funds earn a positive ‘roll yield’, or ‘roll return’, if the market is in contango (forward price curve rising), then they will lose money through a negative roll yield.

Figure 59. Forward curve structure and the effect on roll yield.



From Doyle et al. (2007).

In times of strong backwardation index funds derive much of their gains from roll yield. As some commodities have shifted into contango investors have begun to question if this is the right time to be entering the commodity markets. At the time of their research in a period with increased fund inflow and ongoing strong commodity markets Doyle et al. (2007) noted their survey participants expressed a variety of concerns including:

- The risks of the roll period mentioned earlier reducing liquidity,
- High commodity prices leading to potential investor losses,
- Index fund rigidity in contract rolls as for example when an index fund may continue to roll forward positions despite a contango and accrue a negative yield, and
- Increased commodity allocation to actively managed funds and fund themselves changing roll strategies (e.g. DBLCI becoming more active in the trading of futures during roll periods).

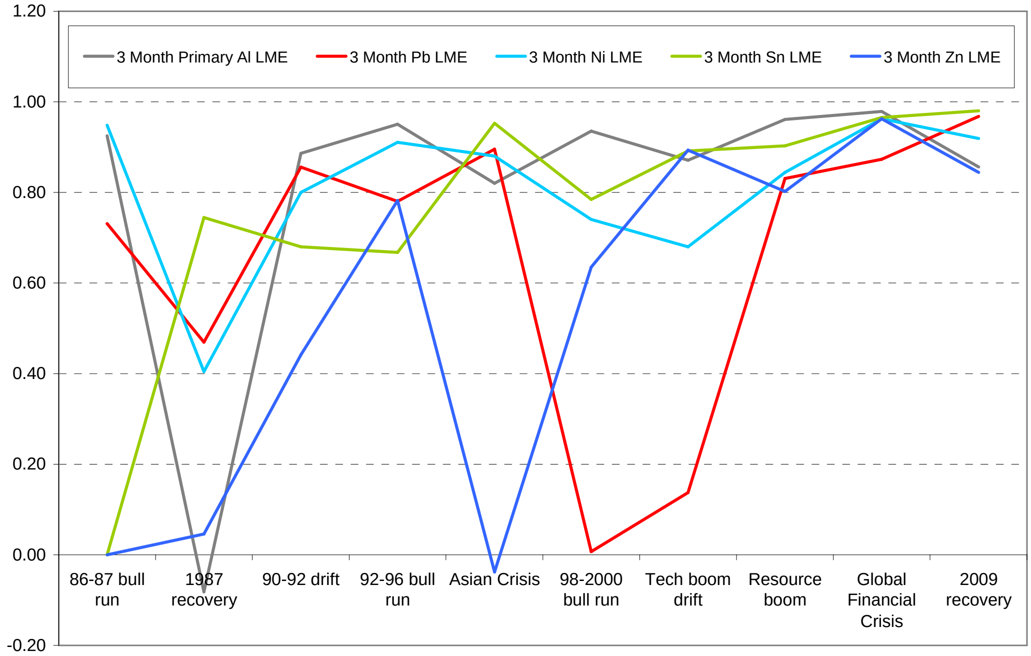
3.6 Commodity Price Correlations

During the 2002 – 2008 resources boom and increased commodity investment outlined earlier, there was an expectation that commodity prices were likely to move increasingly together in a ‘complex’ rather than individually. In Chapter 4, it is also argued that resource company share price movements have become more synchronous with movement in commodity prices rather than pre-emptive as evident in the 1990s and earlier.

To test the potential of an increasing correlation of commodity prices with one another over time, this thesis used the copper price as the base price series for testing the other base metals and precious metals. Copper is often regarded as the bellwether of the metals given its relative large market size and liquidity. Indeed, Kasriel and Schap (2001) note that focusing on copper prices for determining broader market trends gains credibility from the facts that copper plays an important role in the manufacture of a broad range of goods and that the copper purchases must occur early in the process.

To test for correlation changes the Pearson product moment correlation coefficient has been calculated for base metals and precious metals against the copper price over the periods defined in Figure 36 and Table 21. To observe the correlation changes over these periods, the coefficients have been plotted for 3-month LME primary aluminum, lead, nickel, tin and zinc in Figure 60.

Figure 60. Pearson product moment correlation coefficients for daily base metal prices for 3-months future delivery against the copper price on a similar basis over the defined periods from Table 21 (see Table 28 below).



Correlation of Base Metals to Copper Price

Futures prices sourced from Stock Resource.

This thesis suggests that Figure 60 does indicate an increasing correlation between all metals, particularly over the last 7 years in comparison to the 1990s and late 1980s. This is expected given the increasing presence of financial investors in commodities, led by the conviction of a structural change in commodity demand from China and other emerging economies. As outlined with the Asian crisis (Section 3.2.2) this could reflect the ‘grouping’ of base metal investments to avoid individual metal supply/demand analysis (similarly to individual analysis of Asian economies) or simply the overwhelming expectation of Chinese and other emerging economic demand to ‘swamp’ the necessity for individual commodity analysis or a combination of both.

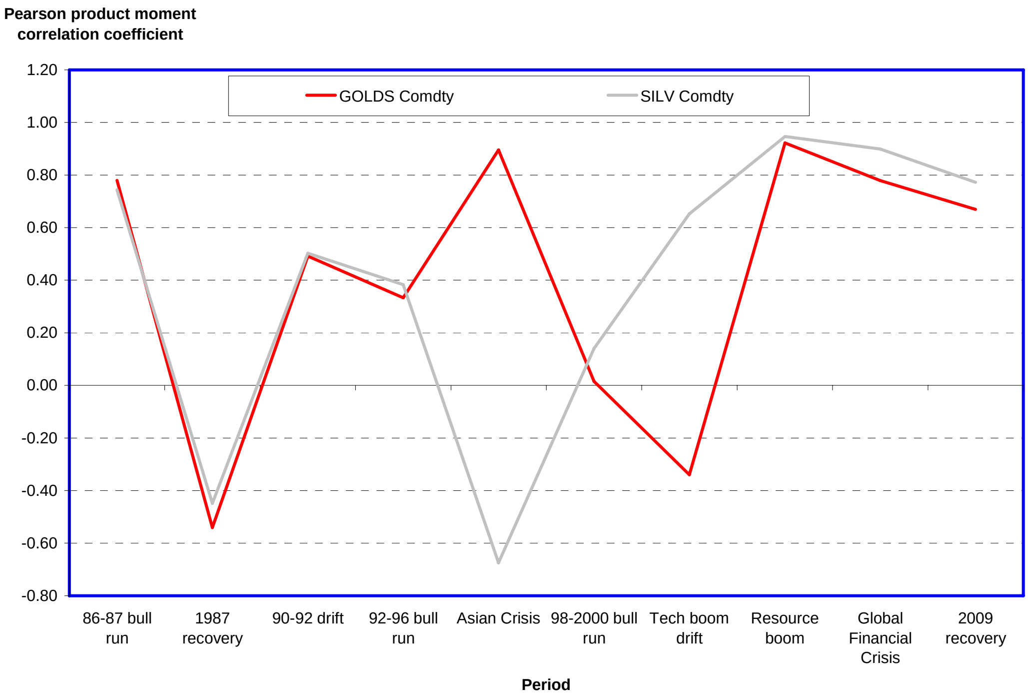
The other important factor which is continually stressed through this thesis is the timeframe for analysis. Table 28 outlines the data presented graphically in Figure 60 which outlines the relatively high base metal price correlations to the copper price but also the variability during some periods. Table 28 also presents the correlation coefficients of the entire 1986-2009 period for each of the metals with copper. Again, while relatively high, there are periods when the correlation for individual metals has been stronger.

Table 28. Pearson product moment correlation coefficients for daily base metal prices for 3 month future delivery against the copper price on a similar basis over the defined periods from Table 21.

Period	3 Month Primary Al LME	3 Month Pb LME	3 Month Ni LME	3 Month Sn LME	3 Month Zn LME
86-87 bull run	0.92	0.73	0.95	na	na
1987 recovery	-0.08	0.47	0.40	0.74	0.05
90-92 drift	0.89	0.86	0.80	0.68	0.44
92-96 bull run	0.95	0.78	0.91	0.67	0.78
Asian Crisis	0.82	0.90	0.88	0.95	-0.04
98-2000 bull run	0.94	0.01	0.74	0.78	0.64
Tech boom drift	0.87	0.14	0.68	0.89	0.89
Resource boom	0.96	0.83	0.84	0.90	0.80
Global Financial Crisis	0.98	0.87	0.96	0.97	0.96
2009 recovery	0.86	0.97	0.92	0.98	0.84
Total (1986-2009)	0.83	0.89	0.87	0.86	0.87

In contrast Figure 61 plots the correlation coefficient with gold and silver against copper, this time using spot prices for gold and silver. Despite differences between using spot and futures base metal prices, this thesis would suggest the correlation is not as convincing which is not surprising given the different attributes of gold.

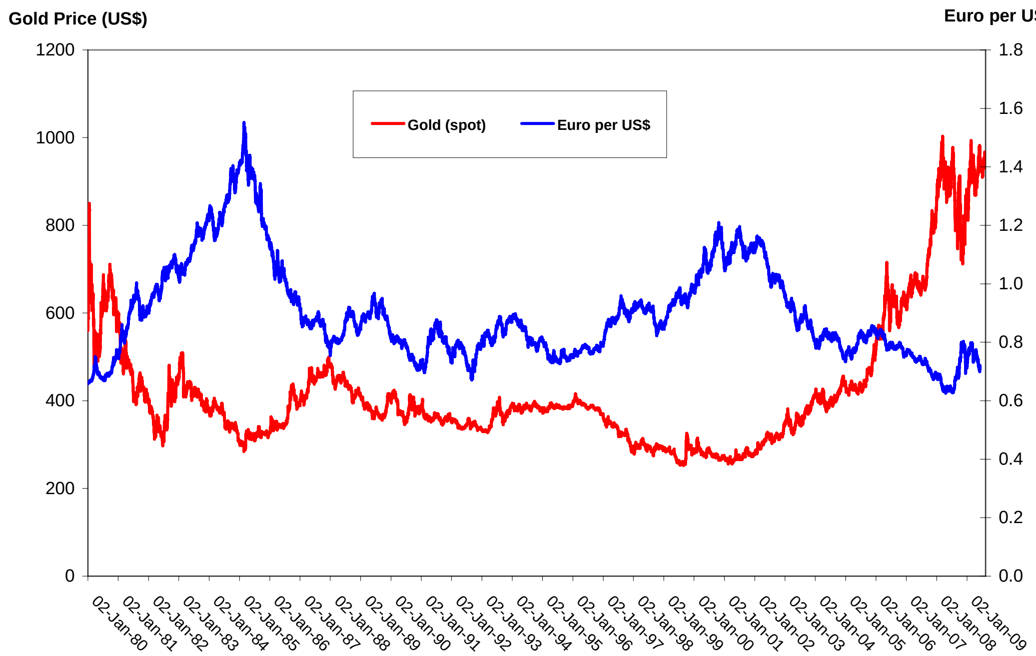
Figure 61. Spot gold and silver prices versus the daily copper price based on 3 month future delivery.



Gold provides hedges against currency debasement and devaluation, in particular, the US dollar, although these after often lumped under the general term as an 'inflation hedge'. Most of the gold that has ever been mined is still in existence (jewellery or hording, particularly central bank reserves), and hence, the price is not as sensitive to declining world production levels as that of the industrial metals. Silver is somewhat different with industrial applications (e.g. photography) as well as hedging characteristics and many North American investors (and to a lesser degree elsewhere) follow the silver market.

There is a myriad of literature on gold and gold investing and readers are referred to the World Gold Council for further information (http://www.gold.org/). The relationship between the gold price and the strength of the US dollar is well recognized and Figure 62 plots the US dollar gold price with the EUR/USD exchange rate. The euro (EUR) replaced the European Currency Unit (ECU) on 1st January 1999 (1:1 parity) and is the second largest reserve currency and the second most traded currency in the world after the U.S. dollar (BIS, 2007).

Figure 62. Gold price in US$ terms and the EUR/USD exchange rate.



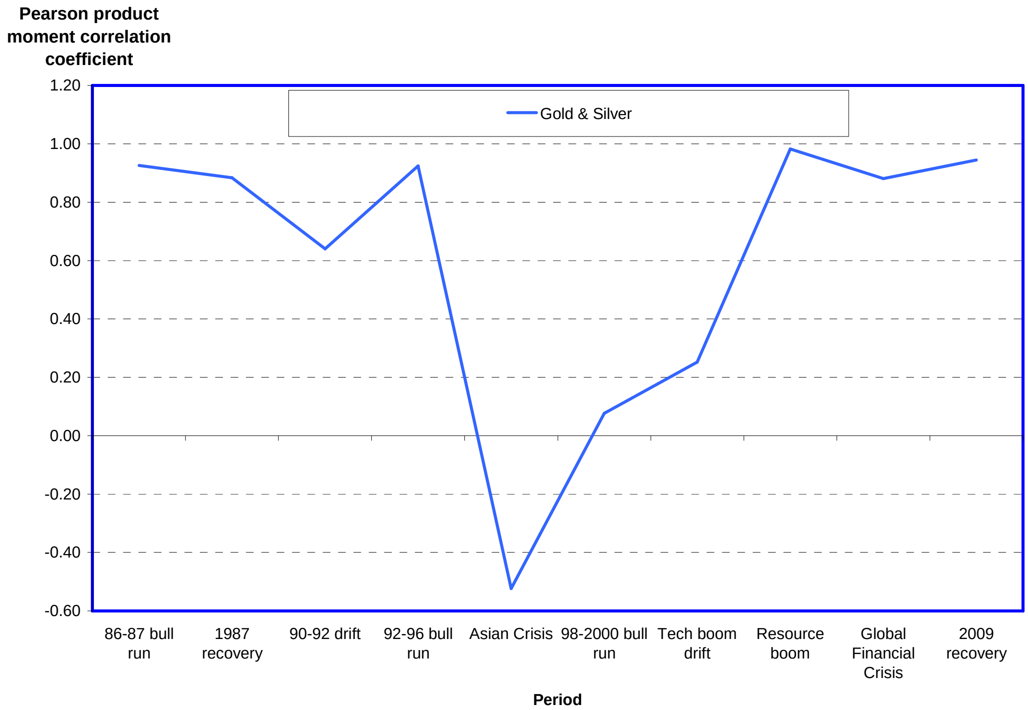
Data sourced from Stock Resource.

Empirical observation of Figure 62 presents a clear inverse relationship of the US dollar gold price and the strength of the US dollar. As evident, the gold price has increased since 2001 but with acceleration during 2005 and later in 2007. At this time commentary was directed at the increasing US budget and current account deficits (twin deficits) and overall risks to the state of the US economy, e.g. high oil prices, terrorism (BBC News, 2005).

The gold price can be linked to industrial metal prices through firstly, the relative strength of the US dollar against other currencies, and secondly, by the inflationary impact of increasing industrial metal prices. In the first the instance, all US dollar denominated prices of metals generally increase with US dollar weakness while in the second, increasing metal prices may be stimulated by higher demand from China and other emerging economies and which may be unrelated to US dollar strength.

Figure 63 outlines the correlation co-efficients between gold and silver over the defined periods. As expected from the differing gold and silver price characteristics discussed earlier, there are a range of correlations with some periods showing strong correlations.

Figure 63. The correlation between gold and silver prices over the same intervals as Figure 61.



Silver investors can follow the gold/silver ratio which reportely for 4,500 years has been below 16:1 except since the 1980s (Bullionvault, 2009). It is now 60:1 and some investors expect an increase in the silver price or fall in gold price to ultimately restore the ratio to historical long-term levels, although the reasons why it should do so are unstated.

3.7 The Australian/US dollar exchange rate

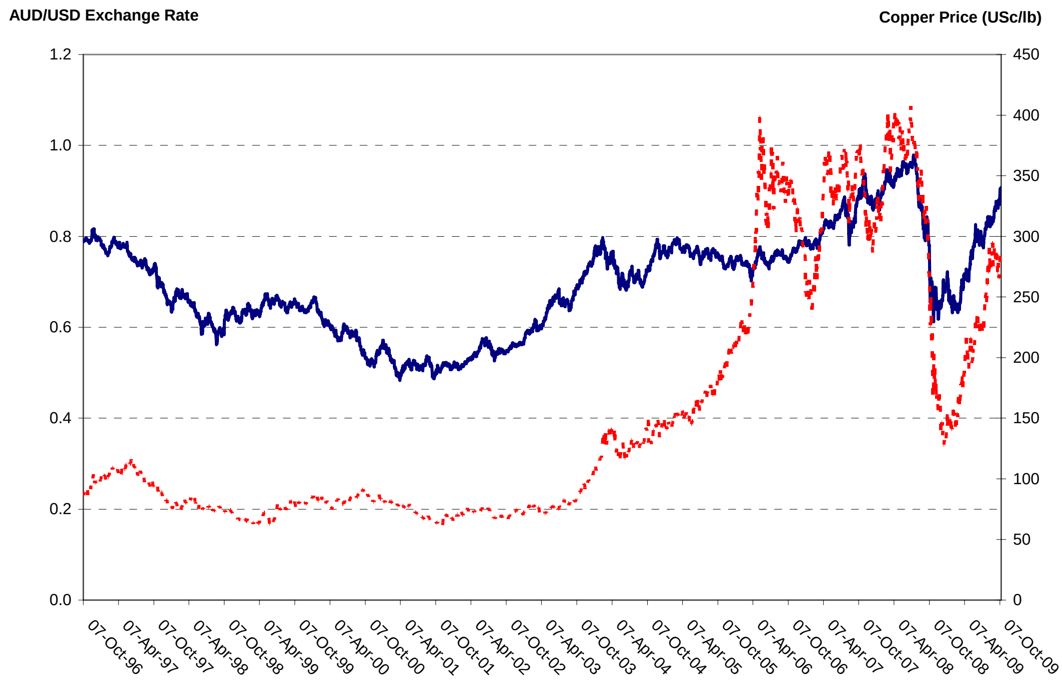
The importance of resources to Australia was recently highlighted by Mr. Marius Kloppers CEO of BHP Billiton in a Minerals Week presentation (BHP Billiton, 2009a) when he noted his company presently contributed to:

- 8% of Australian GDP
- 130,000 direct employees (supporting further 200,000)
- Significant indigenous employment
- A$21 billion tax revenue per annum
- A$150 billion in mineral commodity exports per annum

Not surprisingly, Australia is viewed as being a resources-rich nation and key exporter of raw materials to the rest of the world. Pitchford (1993) notes that the prices of commodities have far greater amplitude of fluctuation than do prices of final goods and services. This has attracted significant investment over the last seven years, as Australian dollar mineral assets are viewed as being leveraged to economic growth in Asia. Pitchford (1993) notes that with fluctuations in international commodity prices being the most important shocks affecting the Australian economy, the Australian dollar is in effect a commodity currency.

Figure 64 charts the AUD/USD exchange rate and the LME spot copper price (in USc/lb) since 1996. There are observable correlation trends, particularly at the start of the resources boom and later from the start of 2007 until the correction following the Global Financial Crisis. The recent appreciation of the AUD with increasing copper prices is also evident.

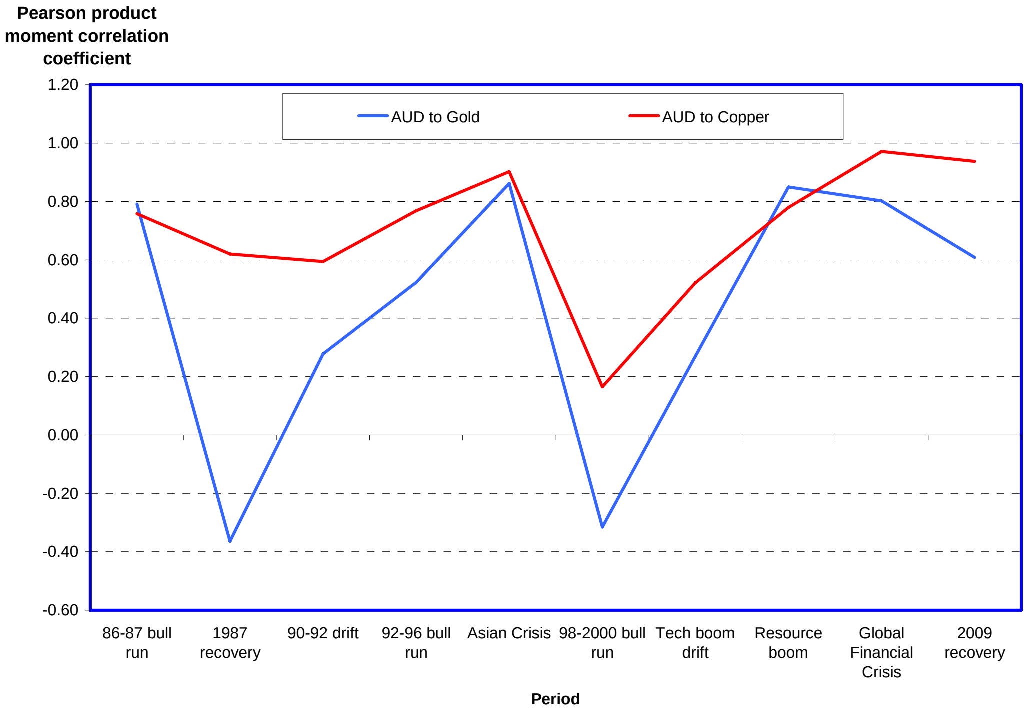
Figure 64. AUD/USD exchange rate and LME Spot Copper Price.



Data sources from LME, RBA.

In the past, the strength in the Australian dollar has often been related to the gold price, however, Figure 65 indicates an overall stronger correlation with the copper price.

Figure 65. Pearson product moment correlation coefficients for the AUD against the copper price for 3-month future delivery and the spot gold price calculated on daily prices over the previously defined periods.



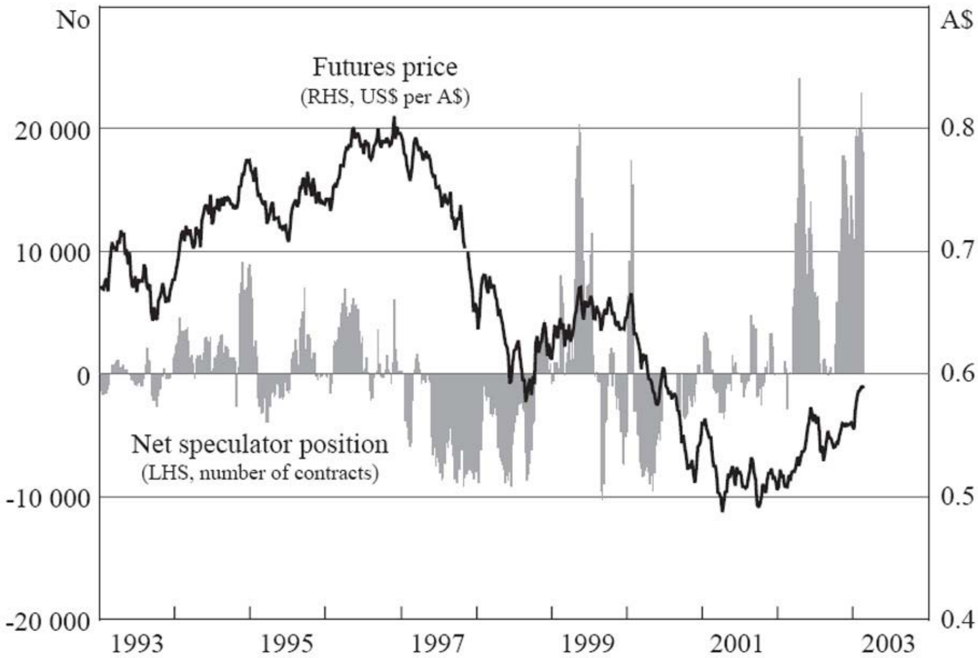
Data sourced from Stock Resource.

Blundell-Wignall et al. (1993) also report that peaks and troughs of the world commodity price cycle are highly correlated with Australia's terms of trade and overall, the terms of trade is one of five important factors that they have recognized as influencing the Australian dollar exchange rate. The other four are:

- Net foreign indebtness
- Domestic investment booms that could not be financed adequately out of domestic saving;
- Real interest rate differentials; and
- Speculative factors not based on any 'fundamentals'

Kearns and Manners (2004) research has suggested currency speculators have been profiting on the movements of the Australian dollar that given as a group of speculators, they appear to have a long foreign currency futures position when the futures price is rising and appear to be short when the price is falling. In particular they were short during the depreciation of the Australian dollar in 1997 at the time of the Asian crisis.

Figure 66. Futures price and net speculator positions in the A$



From Kearns and Manners (2004).

As a 'commodity currency' the Australian dollar is responsive to increasing commodity prices and Figure 66 suggests that the observable trends of currency speculation often correlate with events in commodity markets. The BIS (2007) in its

Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity noted that transactions with institutions such as hedge funds, mutual funds, pension funds and insurance companies, more than doubled between April 2004 and April 2007 and contributed more than half of the increase in aggregate turnover. Importantly, factors underlying the strength of this segment included strong investor activity in an environment of trending exchange rates and low levels of financial market volatility, a trend shift among institutional investors with a longer-term investment horizon towards holding more internationally diversified portfolios and a marked increase in the levels of technical trading.

This type of investment activity is likely to re-enforce Australian dollar exchange rate trends in regimes of increasing or decreasing commodity prices, and hence like the earlier discussion on the increasing correlation among commodity prices (Section 3.6), increase its commodity currency status.

4.0 Resource Company Share Price Movements

Although now somewhat dated, there have been several papers written on the long-term underperformance and/or higher risk nature of the Australian resources sector relative to its industrial counterpart. Ball and Brown (1980) found that while mean returns were similar between industrial and resource stocks over a 21-year period, resource investors were not compensated for the risk attached to resource stocks and this risk was not as diversifiable as expected. Further research on this topic (Ball 1986) questioned the ability of the CAPM to explain the discrepancy.

McDonald (1993) optimistically attempted to explain the risk-return discrepancy with the marginal investor deemed to be a ‘global investor’. Therefore he argued that the risk associated with Australian resource stocks could be adequately diversified away against a well-diversified portfolio such as the Morgan Stanley Capital Index (MSCI) and therefore lowering the apparent domestic cost of equity. While this research is now more than ten years old, it reiterates a longer-term debate over a perceived risk-return discrepancy in resources.

However given the long study periods involved (e.g. 21 years), this thesis would not expect superior returns from a ‘Buy and Hold’ strategy in the resource sector. Chapter 3 mentions that until recently, commodity prices have been falling over the longer term (30 years) in real terms and hence resource sector earnings growth has been dependent on aggregate production volume increases and/or operating cost savings. This is likely to be difficult to achieve in the future in a regime of increasing costs and possibly decreasing real commodity prices trends as well as in light of the unreliability of exploration to deliver new production growth (see Chapter 6). Therefore a common investment strategy has been to overweight the sector in times of rising commodity prices (reflecting periods of world growth in industrial production) and underweight the sector during other periods. This can be complemented by long-term investment in a select group of diversified companies to meet portfolio diversification.

Ord (1998) simply explains the performance of the Australian resource stocks as a function of the ups and downs in the theory of gambling (prospect theory) and that the CAPM is inadequate in explaining its past performance. While some aspects of resource investment have similarities to gambling, particularly in relation to junior explorers and the risk of mineral discovery (discussed in Chapter 6), there is a rational investment proposition in backing specific management teams as well as discriminating among exploration projects. In a diversified exploration portfolio, there is an argument that exploration companies can offer skewed returns. For example, if one project delivers a material mineral discovery it may result in multiple increases in the share price whereas discovery failure is deemed the status quo and while the share price may modestly weaken, investors will be more interested in the timing of the next exploration project and the company's available funding.

This chapter seeks to explore the mechanisms of share pricing in resource companies and advance a probabilistic weighted value model with a decay factor. It has similarities with the arbitrage pricing theory (APT – discussed in Chapter 2, Section 2.2.3) approach but with more flexibility given changing rather than constant probabilities of success.

4.1 Share Price Movements

This thesis has discussed aspects of the movement of share prices in Chapter 1 (Section 1.6.1) and supports the adage that movements in the share prices of resource companies are predominantly stimulated by perceived changes in the valuation of the company on a per-share basis. While this concept is expanded later in this chapter, it is prudent to review some of the other definitions that were also outlined with Chapter 1.

This thesis refers to events which lead to perceived changes in company valuations as share price 'drivers'. There is an important distinction between 'drivers' and sustainable changes in company valuations as a share price driver may or may not lead to an actual underlying change in the fundamental valuation of the company – it may be only perceived at the time of the emerging driver.

The mechanism is interpreted to involve a continuous process stimulated by emerging share price drivers along the following steps:

5. A share price driver emerges resulting in a market perception that the company fundamental valuation may change.
6. Share price movement (positive or negative).
7. Ongoing assessment as to the credibility and sustainability of the new valuation.
8. Potential refinement of the share price movement (positive or negative).

This mechanism employs the Bayesian probability theorem which involves reasoning and learning with uncertain statements. To evaluate the probability of a hypothesis, the Bayesian analyst specifies a prior probability, which is then modified depending on a range of possible future events. As noted in its Wikipedia definition (http://en.wikipedia.org/wiki/Bayesian_probability) Bayesian probability interprets the concept of probability as "a measure of a state of knowledge", in contrast to interpreting it as a frequency or a physical property of a system.

In its broad definition, Wikipedia notes that there are two views on Bayesian probability that interpret the *state of knowledge* concept in different ways. According to the *objectivist view*, the rules of Bayesian statistics can be justified by requirements of rationality and consistency and interpreted as an extension of logic. According to the *subjectivist view*, the state of knowledge measures a "personal belief". While there is no doubt that subjectivity permeates investment decisions, particularly in response to persuasive company management or promoters, it is expected that ultimately an objectivist view will prevail in market pricing.

One of the derivations of Bayesian probability theory is Cox's theorem which is worth briefly discussing given that there is a natural inclination to assume that it applies in the emerging driver/implied value/value refinement model. Arnborg and Sjödin (1999) highlight that a key axiom in Cox’s theorem is that the plausibility of a proposition determines the plausibility of the proposition's negation: one decreases as the other increases. Because "a double negative is an affirmative", this becomes a functional equation

$$f(f(x)) = x,$$

stating that the function (*f*) that maps the probability of a proposition to the probability of the proposition's negation is an involution, i.e., it is its own inverse. However, this is not the case in the proposed three-step emerging driver/implied value/value refinement model given negative information does not necessarily enhance the probablility of the proposition.

In a simple case, let us assume that there is an increasing copper price which acts as a driver for resource company A Limited. As mentioned in Chapter 1, changes in value can often be segregated between:

- An expectation of a material change in future earnings and cash flow levels leading to an increase in the value of the asset base of the company; and/or
- A change in the value ascribed by the market to the value of this asset base.

Of course changes in the first point can lead to changes in the second although this is more generally not the case. As cited in Chapter 1, a market rerating for a particular sector may occur due to an event (driver) such as a highly priced takeover of another company within the sector, or an overall market rerating perhaps due to decreasing official interest rates which leads to an increasing attractiveness of investing in equities, etc.

In Chapter 1 this thesis discussed an example involving company A Limited which is a copper concentrate producer. The expectation is that an increasing copper price will increase the value of A Limited and its share price in response to:

- Increased earnings and cash flows from higher copper prices from A Limited’s operating copper mines
- The increased value of A Limited’s unmined copper reserves, resources and copper exploration programs (reflecting increased future earnings and cash flows and takeover attractiveness)
- Increasing attractiveness of the copper sector relative to other resource segments and the market in general.

The summation of these effects can be ascribed $\Delta \nu$ is the change in value stemming from the share price driver, which, say, could have been an overnight increase in the LME copper price. However, the total change in value ($\Delta \nu$) may not be fully impounded into the share price due to uncertainties and these include:

- The perceived sustainability or longevity of the copper price increase
- The implications for further increases or decreases

The market will assign a probability to these factors and hence the change in value, $\Delta \nu$ will be probability weighted according to the confidence the market has in the above two items. Hence, the change in share price (S) can be described as:

$$\Delta S = P(\Delta \nu)$$

Where:

$\Delta S =$ The change in company value reflected in the change in the company share price

$P(\Delta \nu) =$ The probability weighted change in value

This is a relatively simple process leading to the change in value of a resource company as expressed through its share price from an emerging share price driver. However, it is important to note that the two separate factors may be quite unrelated – the perceived change in value and the probability that this value change is real, sustainable and capable of being expressed in the share price.

This latter point is evident in the earlier discussion on the share price impact from new announcements (see Chapter 2, Section 2.4.7). In that section this thesis argued than the following equation could describe the potential share price movement by a company after a material announcement as:

$$\Delta S_i = \mathrm{P}change * f(C_n.A_n.I_i.L_i).MS$$

Where:

$\Delta S_i =$ Actual share price change of stock *i*

$Pchange =$ Potential share price change reflecting the materiality of the news in an average market

$C_n =$ A measure of the confidence in the news

$A_n =$ A measure of the market pervasiveness of the news

$I_i =$ The quantity of investment funds capable of being directed to stock *i*

$L_i =$ A measure of the free float and shareholder 'tightness' or liquidity of stock *i*

$MS =$ A broad market factor depicting recent market sentiment, e.g. is the announcement in a rising or falling resource market?

In this discussion, these factors would all constitute part of the probability weighting for the announcement to be a share price driver. In fact a typical assessment by an investor might be to determine the relevance of the details in the announcement and then briefly consider the above factors in terms of whether the announcement will deliver a sustainable appreciation in the share price.

Furthermore the author reports that in the course of interacting with many fund managers and investors over 15 years, their observed *modus operandi* in assessing potential investment opportunities firstly involves an assessment as to 'what is the value proposition?' and secondly, 'How likely will it be achieved?' This thesis argues that these are the two key components in any investment proposition and seeks to address both factors – the potential return as a consequence of the value driver and the probability of actually achieving it. In combination they impart a probability weighted value change largely responsible for share price movements.

Nevertheless, driven value changes are difficult to verify in the broader market where individual shares and the market as a whole are consistently bombarded with probability weighted value changes as well as undiversifiable economic factors. However, M&A transactions can remove a significant proportion of the background 'noise' to outline the proposed market dynamics as discussed in the next section.

4.1.1 Model Evidence in M&A Transactions

The most obvious evidence of this segregation into two components is in M&A activity. The share price driver is often the announcement of the impending takeover or merger offer with the value reflected in the bid premium above the current share price. In a common M&A scenario the share price will match the bid price less a discount due to:

- The risk that the takeover will not succeed, e.g. not meeting minimum acceptance conditions, not receiving Foreign Investment Review Board of Australia (FIRB) approval, etc.
- The risk that the bidder cannot fund the takeover if there is a cash component.
- The return required by arbitragers to purchase stock on market and accept the takeover offer.

But adding a premium due to:

- The prospect of the offer price being increased.
- The prospect of a competing bidder emerging.

In terms of constraining these variables further, we can investigate schemes of arrangements as outlined in Chapter 2 (Section 2.6.2). Schemes of arrangements essentially involve a friendly transaction that requires target shareholders' and the Court's approval (see Table 8 for a comparison with takeovers). This means that the ability to increase the offer price is severely limited (see Section 2.6.2), the timeframe is generally at least 10 to 14 weeks and the outcome is either complete success or failure. Furthermore an Independent Expert's report is required to ensure that there is a reasonable level of disclosure.

Therefore, overall it is reasonable to assume that the presence of an Independent Expert's report will significantly mitigate the risk of bidder not being able to complete the transaction (e.g. financing issues will be disclosed, FIRB approval granted if required, etc.) while the scheme itself is likely to be viewed by the market as limiting the scope for any increases in the offer by the bidding company. Therefore, the share price will match the bid price less:

- The return required for arbitragers to purchase stock on market and accept the takeover.

But adding:

- The prospect of a competing bidder emerging.

This thesis has drawn on two M&A examples to highlight the proposed emerging driver/implied value/value refinement model but it is pointed out that these cases are not particularly special in broader M&A activity and this model is commonly observed elsewhere.

4.1.1.1 Case 1, Xstrata plc Scheme of Arrangement with MIM (Holdings) Limited

The first case is the successful takeover of MIM (Holdings) Limited by Xstrata plc via a scheme of arrangement in 2003. This case is used in other analysis in this thesis and is further discussed in Chapter 5.

On the 21 November 2002, MIM Limited (MIM) announced that it was in discussions with Xstrata plc (Xstrata) in relation to a transaction that could lead to a change in control of MIM. Several months later on the 26 March 2003, MIM announced that it was still continuing these discussions with Xstrata (MIM ASX Releases, 2002, 2003).

On the 7 April 2003, MIM and Xstrata announced a proposed transaction under which Xstrata, through a wholly owned subsidiary, would acquire all the shares in MIM for $1.72 cash per share. This valued MIM at $3.4 billion (net of debt) or $4.9 billion including MIM's net debt position.

In this thesis, the time period between 21 November 2002 and the formal offer announced on the 8 April 2003 is referred to as the 'discussion period'. This period corresponds with the period of greatest uncertainty given that Xstrata had indicated that it sought to acquire MIM but had not indicated the price or terms of the potential acquisition and the MIM Board had not indicated its level of co-operation.

MIM stated that a scheme approach was required by Xstrata to enable Xstrata to secure the funding necessary to offer MIM shareholders cash for their shares (MIM 2003). The timetable for the scheme of arrangement is presented in Table 30.

Table 30. Key Dates for the Scheme of Arrangement.

Event	**Date**
Date and time for determining eligibility to vote a the Scheme Meeting:	Friday 6 June 2003
Scheme Meeting of MIM shareholders:	10.00am Friday 6 June 2003
Court hearing for approval of the scheme:	Thursday 12 June 2003
Suspension of trading in MIM shares:	Thursday 12 June 2003
Record Date for determining entitlements to Scheme Consideration:	Thursday 19 June 2003
Implementation of Scheme:	Friday 20 June 2003
Despatch of cheques for Scheme Consideration:	Friday 20 June 2003

From MIM (2003).

The scheme of arrangement is deemed friendly given the Board resolved by a 6:1 majority that the scheme was in the best interests of shareholders and recommended that shareholders vote in favour of the scheme in the absence of a superior competitive bid. The only dissenting executive director on the Board (MIM 2003) was MIM's Managing Director, Mr. Vince Gauci.

In the 2003 Xstrata takeover of MIM, the MIM share price followed a path which reflected the changing probabilities of firstly, an offer emerging, and secondly, the likely success of that offer. The profile of the share price and annotated events are presented on Figure 67.

Once the offer price of $1.72 had been announced on the 8th April 2003, the minimal share price discount to the bid price appears to reflect solely the required a return for an investor (fund) from purchasing the shares on market and then waiting for the scheme to be approved and then accepting $1.72 terms in large volumes. At that point in time it was considered highly unlikely that a competing bidder would emerge as:

- The transaction had progressed to the stage where Xstrata had gained MIM Board approval and MIM had been considered by the market to have been 'in play' for the previous 4.5 months.

- The MIM Board had previously and with limited success attempted to solicit third party interest in bidding for the company.
- The deemed quality of MIM's assets (2nd tier) and the size of Xstrata in market capitalisation terms left few potential counter bidders (Anglo-American and Vale were considered the only potential contenders)
- Xstrata had negotiated a break-fee with a cap of $51.7 million.

At the highest probability of success, the share price traded at approximately a 1.5 per cent discount to the offer price and this commenced on the 11 April 2003. Hence, with the consideration paid on the 20 June 2003, there was potentially a two month holding cost. The interest holding costs at that time along with brokerage could potentially leave a margin of 1 per cent or less for the transaction and therefore large purchase volumes were required to deliver material profits to fund managers. This thesis believes the market was perhaps optimistically assigning a probability of 100 per cent to the success of the transaction at this time – an expectation managed by Xstrata. Therefore under the formula:

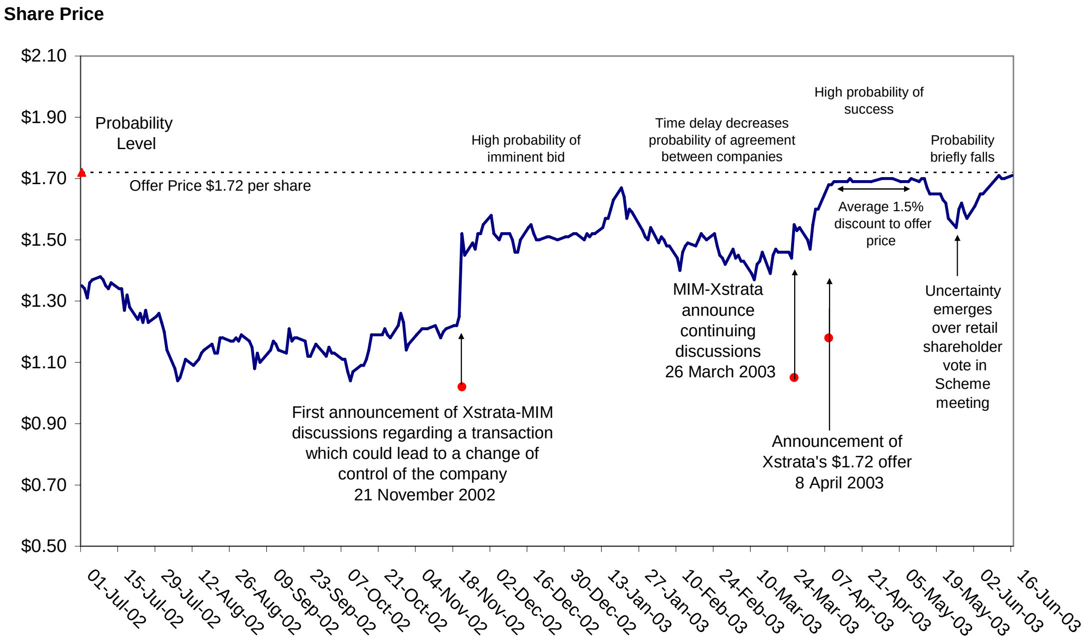
$$\Delta S = P(\Delta v)$$

It can be argued that:

$v =$ \$1.72 offer price less costs (1.5%) = \$1.695 (Trading range: \$1.69-\$1.70)

$P =$ 100%

Figure 67. The MIM share price and interpreted changing bid probabilities.



Data sourced from Stock Resource, MIM ASX releases, 2002, 2003.

During mid-May 2003 there was an increasing groundswell of opposition from retail investors to the proposed merger and given the voting requirements relating to a scheme of arrangement, there was a chance that retail investors could vote down the scheme. Recapping from Chapter 2 (Section 2.6.2), a scheme of arrangement requires more than 75 per cent of shareholders (irrespective of the size of individual shareholdings) to vote for the proposal. As evident on Figure 67, from the 14 May 2003, the share price fell to a low of $1.54 before then recovering as Xstrata embarked on an aggressive public relations exercise to promote the merits of its bid.

With the offer set at $1.72, the only variable changing is the probability of bid success or:

$$\Delta S = P(\Delta v)$$

If we assume that a share price of $1.69-1.70 reflects $P = 100\%$, then a share price fall to $1.54 suggest that P must have fallen to 91 per cent before recovering to 100 per cent after the scheme meeting on the 6 June 2003 (Table 30).

The likely success of the bid as expressed to fund managers by Xstrata management provided the confidence to these fund managers to purchase MIM in the large volumes at the modest discount to the offer price to profit from then accepting the offer price. This process means the success of the transaction becomes self fulfilling.

4.1.1.2 Case 2, Competitive bidding for Norths Limited

The second case involves the competitive bidding for Norths Limited (Norths) between Rio Tinto Limited (RIO) and Anglo-American plc (Anglo-American) in 2000. Analysis of the takeover is also presented in Chapter 5 and Appendix 1.

On 23 June 2000, RIO announced its intention to make a takeover offer for all the listed shares of Norths that it did not already own for cash of $3.80 per share. The offer was made by Rio Tinto Investments Pty. Limited, a wholly owned subsidiary of RIO and valued Norths at A$2.80 billion (Rio Tinto, 2000). RIO also announced that it had acquired a 14.5 per cent interest (106,894,910 shares) in Norths through recent on-market purchases of North shares at an average of A$3.80 per share.

The company announced that it had received FIRB's approval for the acquisition on the 24th July 2000 (Rio Tinto 2000a) and in the following month it received approval from the European Commission (EU) and the Australian Competition and Consumer Commission (ACCC) (Rio Tinto 2000b). These approvals were key conditions of the bid.

RIO's bid for Norths was targeting potential synergies between the iron ore operations of both companies in the Pilbara region of Western Australia (Rio Tinto 2000, Wisenthal, 2000, Counsel, 2000). It followed a breakdown in negotiations between the companies over access to Rio Tinto's extensive railway infrastructure near North's controlled Robe River iron ore operations. On behalf of the Robe River Associates, North had been seeking access to Rio Tinto's Hamersley's rail facilities. This was estimated to save around $350 million of the total $1 billion cost of developing the 20 million tonnes per annum West Angelas mine. RIO's Hamersley Iron also had limited additional capacity at its port facilities in Dampier and the economics of expanding this port were not as attractive as expanding North's Cape Lambert port (Counsel, 2000).

The takeover also offered product and geographical diversification with North's pellet production and presence in North America and at that time there was also a threat that Norths was about to bid for Brazil's second biggest iron ore producer, Caemi (Counsel, 2000). The importance of North’s iron ore assets to RIO was highlighted by RIO’s CEO at that time when he stated ``By combining our companies' iron ore businesses, we will become the world's second largest producer with diversified resources, products and markets," (Rio Tinto, 2000).

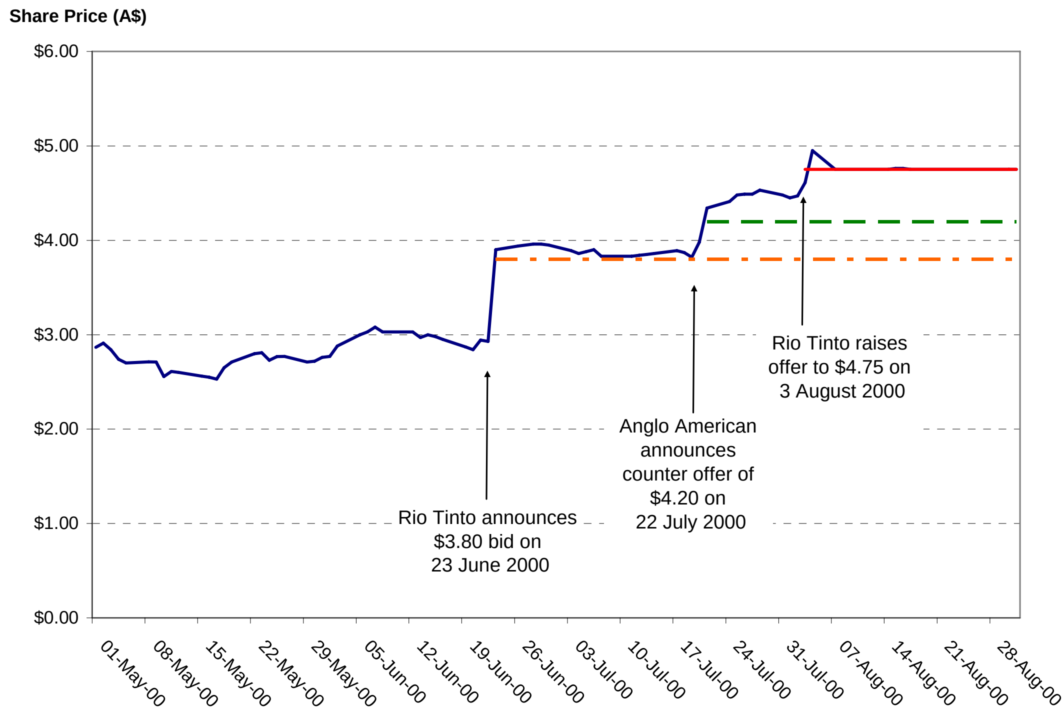
On 22 July 2000, Anglo American announced it would make a competing offer for Norths Limited with a cash bid of $4.20 per share which would be payable after Norths paid a 5 cent dividend. In response to the competing offer from Anglo American, RIO announced that it was lifting its bid to $4.75 and declared its offer unconditional on the 3rd August 2000 (Rio Tinto, 2000c).

The increased bid proved successful and RIO announced it had completed compulsory acquisition procedures on 10 October 2000 (Rio Tinto, 2000d)

This background is to highlight the underlying strategic reasons for RIO’s acquisition of Norths relating to the Pilbara iron ore synergies, the diversification opportunities but also the timing constraints. It was also known that Anglo American was interested in acquiring iron ore assets, and particularly in establishing an iron ore presence in Australia.

In the 2000 bidding war between RIO and Anglo-American for Norths, at each announcement the Norths’ share price over shot the most recent bid price on the expectation (probability) that a higher bid would later emerge (Figure 68).

Figure 68. Norths’ share price and bid levels. Note the successive over running by the share price at each announced bid price before trending towards that bid price.



Share price data sourced from Stock Resource, Norths, Rio Tinto & Anglo-American announcements.

With the market capitalisation size of the bidding companies and the presence of cash bids, it is difficult to envisage that there were other material influences on the Norths' share price apart from the probability-weighted value of successive new bids emerging.

Each share price driver (prospect of impending bid, bid announcement, prospect of overbidding, etc.) leads to a share price change corresponding to the earlier equation:

$$\Delta S = P(\Delta v)$$

This is evident in the subsequent share price premium to the revised bids outlined in Table 31. The higher premium after the Anglo American offer reflects a higher probability that RIO would overbid Anglo American's bid but that Anglo American was unlikely to overbid the second RIO bid.

Table 31. Temporary share price premiums following the initial and revised offers outlined in Figure 67.

Date	Bidder	Price	Peak share price premium to revised offer	Average 5 day premium following revised offer
23-Jun-00	Rio Tinto	$3.80	4.2%	3.7%
22-Jul-00	Anglo American	$4.20	7.9%	5.8%
3-Aug-00	Rio Tinto	$4.75	4.2%	0.8%

This method of ascribing a probability-weighted value leading to share price changes is logical and hence, is unlikely to be restricted to M&A activity. This thesis would argue that it is in fact evident throughout the market.

4.1.1.3 Case 3, Anchor Resources Limited

In the above case study with the three offers for Norths the share price exhibited a period of declining probability over time that each successive offer would be trumped by a new higher offer. This declining probability over time is evident elsewhere in the market including junior explorers although again it is difficult to identify non-confounding examples.

Anchor Resources Limited (ASX code: AHR) provides an interesting case study that meets the requirement of being largely non-confounding. The company listed on the ASX on the 4 July 2007 after raising approximately $3 million in cash on a portfolio of gold, uranium and tin exploration projects in eastern Australia. However, the company was relatively unique in that it was unable to materially advance its exploration projects for at least 12 months due to an inability to secure the services of drillers and rigs during the resources boom. Therefore, the performance of its share price reflected a declining perception of any short-term exploration success as the initial IPO investors became increasingly frustrated at the lack of progress and which was exacerbated with a backdrop of alternative investment opportunities. Hence, while the probability of exploration success on the company’s exploration tenements hadn’t declined, there were declining expectations that any potential value of this exploration could be realised within an acceptable timeframe. As in the North’s example above, the probability of an outcome is influenced by time – the market deems that the longer it takes to achieve an outcome, the less likely this outcome will occur.

This thesis makes the assumption that the share price for Anchor at any specific time largely reflected the summation of its ‘cash on hand’ per share as well as a probability -weighted value of the potential for a mineral discovery on its tenements within an acceptable time frame. While this is a reasonable assumption, it may not necessarily be the case given that with ongoing lack of progress or in other cases, exploration failure, the market may assume the remaining funds are ‘wasted’ without achieving the desired outcome or spent on existing futile projects. In these cases, the market may not value the share of a company at its full cash-backing value.

The broader market was increasing in value during the resources boom but its overall impact on the decline in the Anchor share price has been ignored.

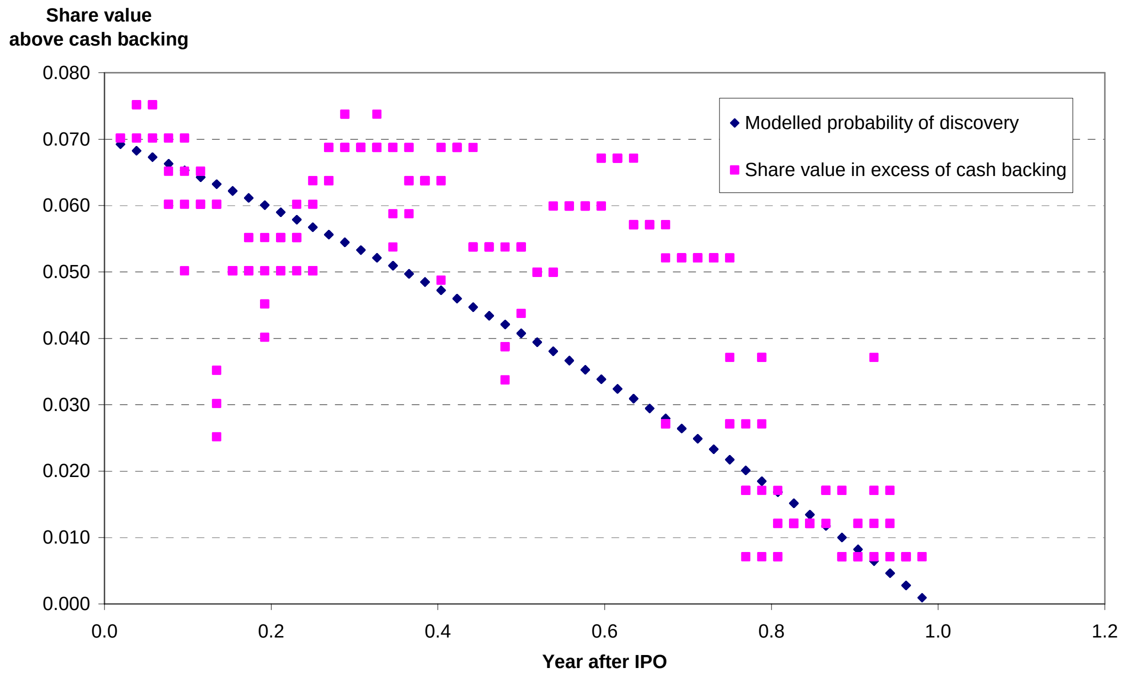
Figure 69 plots the value of the share price value above its net cash backing over the first year following the IPO. It is evident that over time the ‘probability of success within an acceptable timeframe’ diminishes and is virtually non-existent after 12 months. This type of waning is also observable in the market in other circumstances and reflects increasing investor dissatisfaction when investments are not put to their intended use and do not yield expected returns within an acceptable timeframe. This waning also reflects an increasing opportunity cost given the presence of alternative investments which increase in attractiveness over time in comparison to an existing non-performing investment.

Some readers may be tempted to think of this behaviour as reflecting some form of declining option value in the share price with an expiry date of 12 months but this argument is neither well supported (nor necessary) as:

- The shape of the wane or decline does not match a typical option profile that can be derived from a Black and Scholes model (see Chapter 2, Section 2.2.2).
- Applying an option valuation methodology with an expiry date in 12 months is relatively artificial as the exploration prospectivity has not changed within this timeframe.

Both these points can be addressed with a probability-weighted value model given the value of the exploration tenements has not changed over the timeframe, only the probability that the initial investors will reap a potential return within a desired timeframe. As time passes, the opportunity cost in comparison to other investments and accumulating losses in the current investment are likely to lead to further divestment, exacerbating the share price decline.

Figure 69. Anchor Resources share value in excess of cash backing and modelled probability decay.



Share price data sourced from Factiva.

Figure 69 plots the share value in excess of the cash backing versus the time after the IPO in proportions of one year. The blue diamonds represent modelling done by the author to replicate the declining probability level over the 12 month period. This is based on an approximate exponential continuous rate of compounding as follows:

$C = A\ e^{rt}$

Where

$C =$ The amount after compounding

$A =$ The initial amount

e^{rt} = Continuous compounding factor at an interest rate of *r* over time *t*.

The modelling in Figure 69 assumes that the market's expectations in the likelihood of Anchor achieving a discovery is equivalent to the excess value (XV_t) at time *t* above the net cash backing per share. The model assumes that XV_t is equal to XV at time zero ($XV_{t=0}$) less the excess continuously compounded value of XV over the time period (*t*) less $XV_{t=0}$ such that:

$$XV_t = XV_{t=0} - \left(XV_{t=0}e^{rt} - XV_{t=0}\right)$$

or

$$XV_t = 2XV_{t=0} - XV_{t=0}e^{rt}$$

Where

$XV_t =$ Excess Value at time *t*

$XV_{t=0} =$ Excess Value at the start (*t=0)*

e^{rt} = continuous compounding factor for an interest rate *r* over time *t*

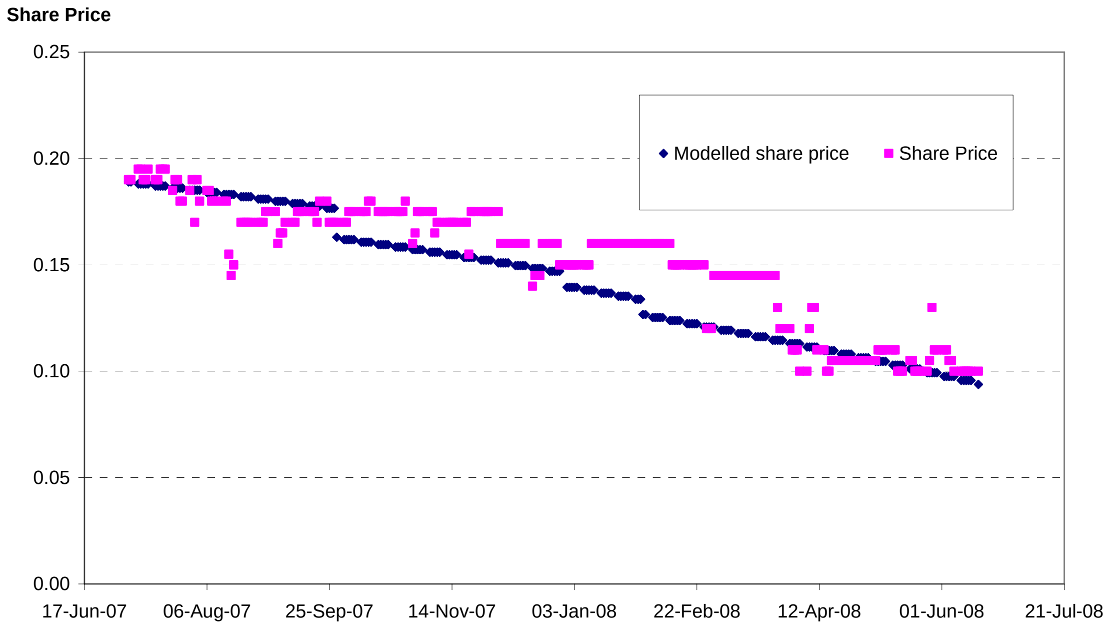
While the equation presents a broad fit (Pearson correlation coefficient = 0.88) and the only unconstrained variable is the interest rate, which, to achieve a 'best fit' in this model had to be placed at 70 per cent. This rate is not unreasonable given the high-risk nature of junior explorers and the fact that expected returns are normally in excess of 100 per cent.

Therefore:

$e^{rt} =$ the exponential of *r* =70% pa multiplied by *t* (which is the proportion of 1 year)

Using the model, it is possible to model the share price using the cash backing at any one time and the modelled premium above cash backing. This is compared to the actual share price in Figure 70 below.

Figure 70. The Anchor modelled and actual share price over the period under review.



Returning to the original equation:

$$\Delta S = P(\Delta v)$$

Where:

$\Delta S =$ The change in company value reflected in the company share price

$P(\Delta v) =$ The probability weighted change in value

In the case of Anchor, with no new share price drivers, the decline in the share price can be attributed to the declining expectation of imminent exploration success with the probability at time *t* derived from:

$$P_t = \frac{(2XV_{t=0} - XV_{t=0}e^{rt})}{XV_{t=0}}$$

And Δv is the potential for exploration success within an acceptable timeframe. Hence, it can be argued that at any point in time, the share price is:

$$SP_t = IV_t + \frac{(2XV_{t=0} - XV_{t=0}e^{rt})}{XV_{t=0}} \Delta \nu$$

Where:

$SP_t =$ Share Price at time *t*

$IV_t =$ Intrinsic Value of the company per share at time *t*. In the case of Anchor, this could be cash backing but in other companies, the share price prior to the emergence of the share price driver could be a reasonable approximation. In other situations it may be some other form of valuation, e.g. NPV valuation.

Adapting the earlier formula leads to the following derivation:

$$SP_t = IV_t + P(\Delta \nu)$$

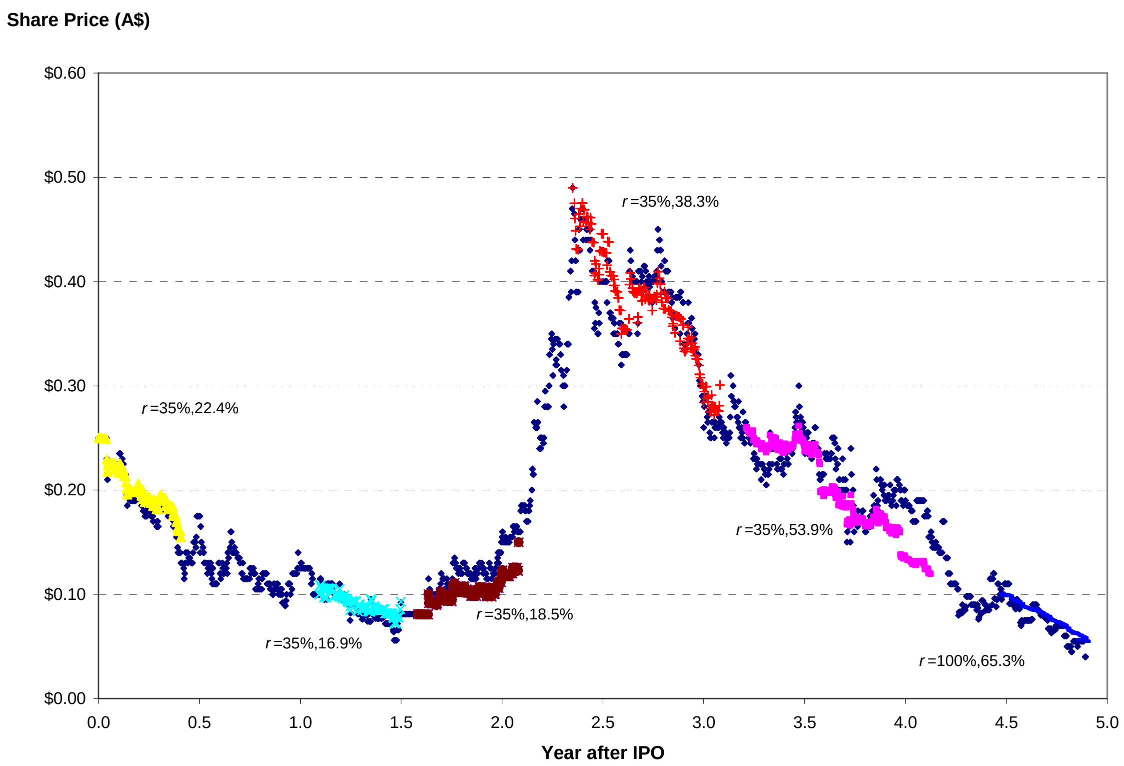
Where again:

$$P_t = \frac{(2XV_{t=0} - XV_{t=0}e^{rt})}{XV_{t=0}}$$

In most cases, given that share price drivers occur frequently, e.g. daily commodity price changes, the 'wane' or decline estimated in the equation above is small and can be ignored. However, this equation is important because it encompasses an expected return which itself includes a risk-free rate of interest. For example the 70 per cent return used in the Anchor modelling includes a risk-free rate which, in this case, may be assumed to be around 7 per cent. However, the return implicit in an assessed $P(\Delta \nu)$ will generally far exceed the risk free interest rate and therefore separate consideration of the risk-free rate is not warranted. In the case of most resource companies, if $P(\Delta \nu)$ is only expected to lead to a share price movement return at around the risk free rate then there is an expectation that it would not trigger a share price movement at all.

While the single Anchor case does not prove the declining expectation model, it is encouraging that it can be modelled by simply using continuous compounding prevalent in financial analysis. The decay shapes are also commonly observed in the short term share price patterns of other similar companies. This is highlighted in Figure 71 which models specific share price trends for Cougar Metals (ASX Code: CGM) in the five years from listing. The annotations include the return *r* used in the modelling and the average percentages that the declining expectation values represents of the total modelled share price. Unlike Anchor, Cougar has been active in its exploration activities, is more likely to be influenced by commodity price and resource market movements and the analysis is over a longer time period. Nevertheless, the decay modelling does appear to contribute to the share price trends presented in Figure 71.

Figure 71. The share price of Cougar Metals Limited (ASX Code: CGM) and modelled share prices based on the declining expectation model above. The annotations show the average percentage of the share price reflected by the declining expectation value, and the K constant and the expected return rate used in the modelling.



Share price data sourced from Stock Resource.

The market assessment of the rapidly declining expectation of achieving success within an acceptable timeframe has exacerbated the funding problems of junior explorers. As discussed later in Chapter 6 and 7, this in itself is likely to stem from the low probabilities of exploration success and high minimum costs to attain satisfactory degrees of certainty.

4.2 The Relevance of NPV Valuations

As discussed in Chapter 1 (Section 1.6.5) this thesis noted that the traditional measures of the value of companies are based on the following relative and/or absolute parameters:

- Prospective earnings (one or two-year horizon) as a function of share price (short-term price earnings ratio)
- Sustainable earnings levels as a function of share price (medium and long-term price earnings ratio)
- Prospective cash flows excluding capital items (one or two-year horizon) as a function of share price (a short-term price to cash flow ratio)
- Sustainable Cash flows excluding capital items as a function of share price (medium and long-term price to cash flow ratio)
- Prospective dividend yield as a function of share price
- Sustainable dividend yield as a function of share price
- Aggregate NPV valuations of company assets or total company cash flows
- Option valuations

Share price drivers described earlier generally reflect an event that impacts some or all of the above parameters e.g. a commodity price movement or an announced increase in dividend may stimulate a share price movement reflecting the probability-weighted value relating to the sustainability of the increase in earnings or of higher dividend yields. As noted in the preceding section, less tangible parameters such as expectations of exploration success may experience probability decay over time in relation to investors' expected returns and the initial probability level.

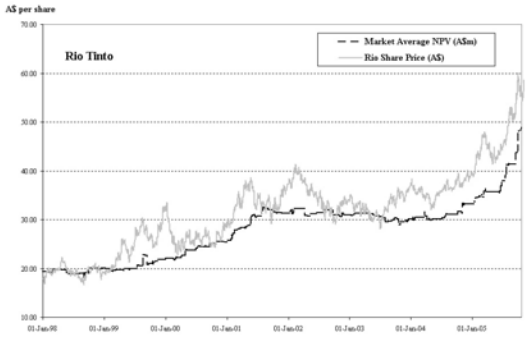
One of the key observations outlined in Chapter 1 is that a driver influencing a company's share price frequently changes and as highlighted in Chapter 3, is often daily movements in commodity prices. Bartrop and Guj (2006) hypothesise that, on trend over a full cycle, resource shares tend to ultimately trade around NPV values.

One may, however, argue that in fact NPV values often follow share prices given that they are responding to the same drivers.

An earlier interpretation states that the share price – NPV premium simply reflects the time lag required for updating of NPV valuations by the market. An example of this lag is when there is an upwards movement in commodity prices. This upward movement will not affect long-term commodity prices in NPV valuation models until investment bank commodity analysts consider the price changes are sustainable and reflect realistic long-term forecasts. Hence, as further price increases occur such as during the recent Resources Boom, analysts become more confident of upgrading long-term forecasts but remain behind current spot prices. Alternatively, a site visit to an operation by analysts may result in new production forecasts that are reported to the market at the time of the visit but are also later incorporated in valuation models with new results published to the market in general.

As mentioned in Chapter 1, Bartrop and Guj (2006) highlighted examples of BHP Billiton and Rio Tinto which suggested that companies with established and forecast cash flows tend to trade in a cyclical manner around the cumulative Net Present Value (NPV) valuation of their assets in line with changing short-term valuation parameters. This is reproduced in Figure 72.

Figure 72. BHP Billiton and Rio Tinto share prices and average broker NPV valuations.



From Bartrop and Guj (2006).

However, the following discussion supports the argument that the market strives for a quick assessment of the probability-weighted value imparted by say an overnight increase in a commodity price and while ideally this would involve an NPV recalculation, this is generally not practical. Instead the market assumes a relationship between the percentage change in share price and that of the corresponding commodity price movement, which is often one to one as discussed later.

Chapter 1 (Section 1.6.4) also briefly discussed bull markets where momentum investing can lead to ‘bubble’ situations with further discussion in Chapter 2 (Section 2.3.4) . In the resource sector this generally relates to commodity price runs. Chapter 1 highlighted uranium company share prices as an example where during 2007 average enterprise values were factoring in more than US$20/lb U3O8 for Australian uranium explorers with no producing mines despite the fact that their uranium resources were in many cases unlikely to ever be brought into production. The increase in uranium share prices was a direct response to the increasing uranium price and there was certainly no market data on the NPV value of the projects of various uranium juniors (Bartrop 2007).

A common difficulty in the analysis of share price movements is establishing a consistent information base across the market. Otherwise it can be validly argued that share price movements may simply reflect the influence of inhomogeneous information levels across market segments. Bartrop and Guj (2006) suggest that this may be partially overcome by utilising market consensus NPV valuations, but Sally Malay Mining (Sally Malay) offers a special case in its disclosure to the market.

- **Case 4, Sally Malay Mining Ltd.**

Sally Malay listed on the ASX in July 2001 after a conducting an IPO to fund the Bankable Feasibility Study of the Sally Malay nickel project in east Kimberley, Western Australia. In the company’s prospectus the Chairman states that the company has a simple philosophy and singular focus, this being to expeditiously take the Sally Malay Project through Bankable Feasibility Study and subject to a favourable study outcome, bring it into production as rapidly and cost-effectively as possible (page 3, Chairman’s Letter, Sally Malay Mining Prospectus 2001).

This thesis reviews the period between 22 July 2003 and 9 April 2004. During this time there were some significant announcements including feasibility study confirmation that the project was economic and reported on the 20 August 2002. Construction commenced from that time through to commissioning in August 2004. The company also conducted several placements with the most significant being a $5.85 million placement announced on the 27 June 2003 and a $10 million placement announced on the 12 November 2003. A $52 million Project Finance Facility was announced on the 13 March 2003 to fund most of the project development. The only other significant event during the period was the securing of additional debt as announced on the 14 October 2003. The references for these reports are summarised in Table 32.

In the period under review, Sally Malay management took the unusual step in reporting regular NPV valuations of the project to the market along with the basis for commodity price and exchange rate assumptions in the reports outlined in Table 32. The valuations provide a benchmark to compare the share price during this period of time, particularly given:

- The commodity price and exchange rate forecasts were in line with market expectations at that time.
- The company has the most reliable information on future operating parameters and hence should provide the market with the most reliable NPV valuations.
- The valuations were available to all market participants.
- The company's revenues and earnings would be dominated by nickel production and sales in the future and therefore the share price can also be compared with the nickel price during the period under review.

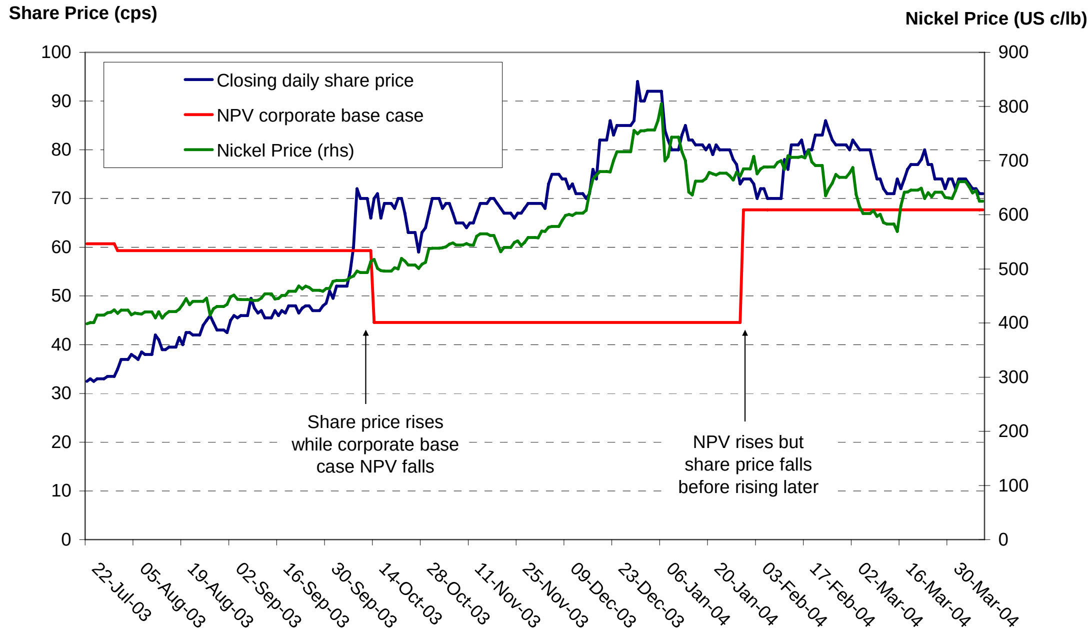
Table 32.The various reports outlining the NPV data reported by the company to the ASX.

Date	Company Report (ASX releases)
24-Jul-01	Prospectus
31-Jul-02	June 2002 Quarterly Report
20-Aug-02	Sally Malay Project - Bankable Feasibility Study Delivered
31-Oct-02	September 2002 Quarterly Report
31-Jan-03	December 2002 Quarterly Report
30-Apr-03	March 2003 Quarterly Report
31-Jul-03	June 2003 Quarterly Report
1-Aug-03	Construction of plant commenced
14-Oct-03	Sally Malay - Construction Advances, Additional Senior Debt Made Available & More Mineralised Nickel Sulphide Ground Acquired
31-Oct-03	September 2003 Quarterly Report
30-Jan-04	December 2003 Quarterly Report
1-Aug-04	Commissioning of plant

The NPV valuation data are presented on a per-share basis and include a corporate base case using the company's longer-term forecast commodity prices and exchange rates and a spot priced case based on spot commodity prices and exchange rates at the time of the valuation.

Figure 73 and 74 chart the Sally Malay NPV per share valuations with the corporate base case in the former and the NPV calculated using spot commodity prices and exchange rates in the latter. The LME spot nickel price is also charted in both figures.

Figure 73. Sally Malay share price, spot LME nickel price and NPV estimations by the company at long-term forecast metal prices and exchange rates at particular times.



Share price data sourced from Factiva, See Table 32 for references.

Observation of both Figure 73 and 74 highlight a correlation of the share price with the LME spot nickel price. This was expected given the leverage of the company's future earnings and cash flows as well as the value of its previously uneconomic resources to the nickel price. The Pearson product moment correlation coefficient between share price and nickel price is 0.92 but increases to 0.93 if the period from the 7 January 2004 is excluded (this period has a coefficient of 0.32).

Figure 74. Sally Malay share price, spot LME nickel price and NPV estimations by the company at spot metal prices and exchange rates at time of valuation.

Share price data sourced from Factiva, See Table 32 for references.

In both figures in the time period between 22 July 2003 and 9 April 2004 the Sally Malay share price is observed to have more or less tracked the nickel price higher to a peak in December 2003. After this peak the nickel price weakened and fluctuated along with the share price.

In terms of the corporate base case NPV valuation (Figure 73) it is noted that:

- The share price initially traded below the NPV, moved higher as the nickel price moved higher and then generally traded above the corporate base case NPV.
- In the 6 October - 9th October 2003 period the share price increased by 39 per cent to 72 cents and then range traded between 66 cents and 71 cents for the following 13 days while a flat trending NPV fell from 59 to 45 cents per share (24 per cent) less than a week later on the 13 October 2003.
- From the 29 to 31 January 2004 the NPV increased from 45 to 68 cents (51 per cent) while the share price continued to fall from its peak of 94 cents at the start of the month to a low of 70 cents (26 per cent) from 6 to 10 February 2004.

Figure 73 which charts the Sally Malay NPV using spot commodity prices and exchange rates at the time of each valuation by the company, and similarly, the following observations are made:

- The share price generally traded below the NPV throughout the period under review.
- Similarly on the 6 October to the 9th October 2003 the share price increased by 39 per cent to 72 cents and then range traded between 66 cents and 71 cents for the following 13 days while a flat trending NPV fell from 98 to 93 cents per share (5 per cent) less than a week later on the 13 October 2003.
- From the 29 to 31 January 2004 the spot based NPV increased from 92 to 104 cents (13 per cent) while the share price continued to fall from its peak of 94 cents at the start of the month to a low of 70 cents (26 per cent) from 6 to 10 February 2004.

While it can be argued Sally Malay represents one emerging nickel producer out of the Australian mining sector, the share price behaviour is similar to that experienced in BHP and Rio Tinto as outlined in Figure 72 where the share price moves with changing short-term valuation parameters. It also supports the concept of share price movements reflecting probability-weighted value changes driven by commodity price movements.

It can also be argued that while the corporate base case valuation provides a level of comfort for investors in relation to the share price, in reality it has provided minimal influence on the share price movements during this period. In contrast the valuation NPV estimations based on spot metal prices and exchange rates at time of valuation could provide an upper case if the commodity prices and exchange rates were considered sustainable at the time of the valuations.

Instead, it is evident that the share price tracks the nickel price higher, particularly where there are clear nickel price trends. This could reflect two interrelated factors:

- Firstly, a simple reflection of the expectation of increased short-term earnings and cash flows, albeit that earnings and cash flows would not be material until the 2H FY 05 – some 12 months after the nickel price peaked during the period.

- As the nickel price moves higher, there is increasing confidence of the reliability or sustainability of the NPV valuations that were calculated at previously lower spot nickel prices increases.

With the nickel price movements as the share price driver, it is logical that the increasing share price is reflecting a probability-weighted value increase attributable to both of the above, but most likely to higher sustainable earnings and cash flows. The probability level falls after the peaking nickel price in late December 2003 with the share price falling and exhibiting volatility in line with the nickel price.

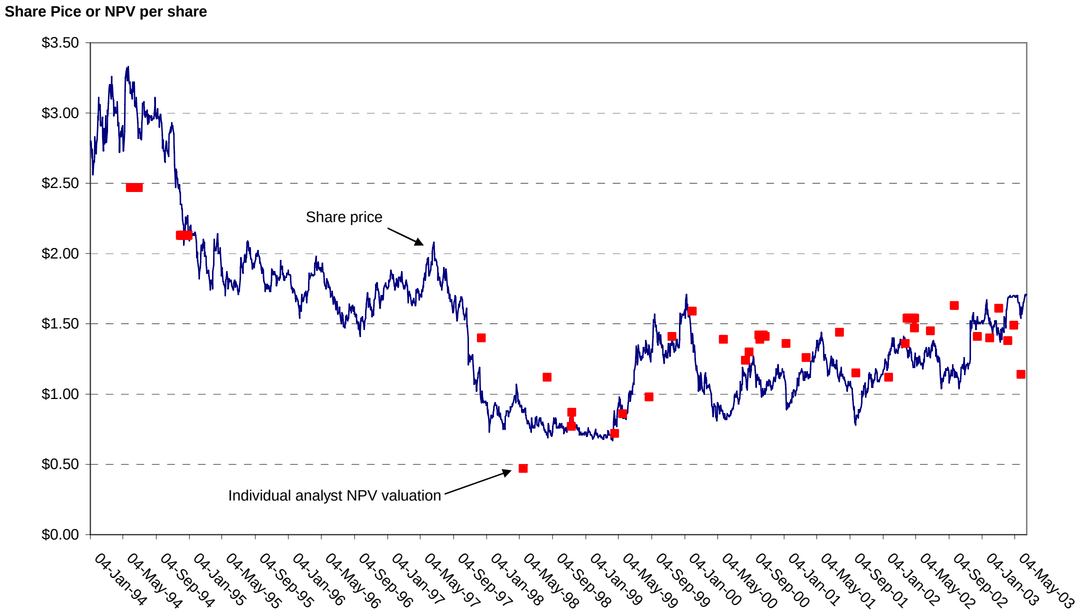
This will ultimately lead to an increase in the value of the company as a whole (earnings/cashflows, reserves, resources and exploration assets), which can be approximated with an updated NPV valuation.

4.2.2 Case 5, MIM (Holdings) Limited NPV Valuations

Continuing the analysis on the influence of NPV valuations, this section reiterates the minimal relevance of the long-term NPV valuations in short-term share price movements. This is irrespective of whether the valuations have the rigour and widespread dissemination in independent experts' reports or estimated and published by stockbroking analysts.

Figure 75 plots the MIM share price between 1994 and 2003 along with selected analysts' NPV valuations. The NPV valuations are taken from leading brokers and are likely to reflect the general market view of other analysts' valuations at these times – in the author's experience the range of market analyst NPV valuations at any one time is generally not that large as partly verified in Figure 75.

Figure 75. MIM share price between 1994 and 2003 along with a representative stockbroking analyst NPV valuations over this period.



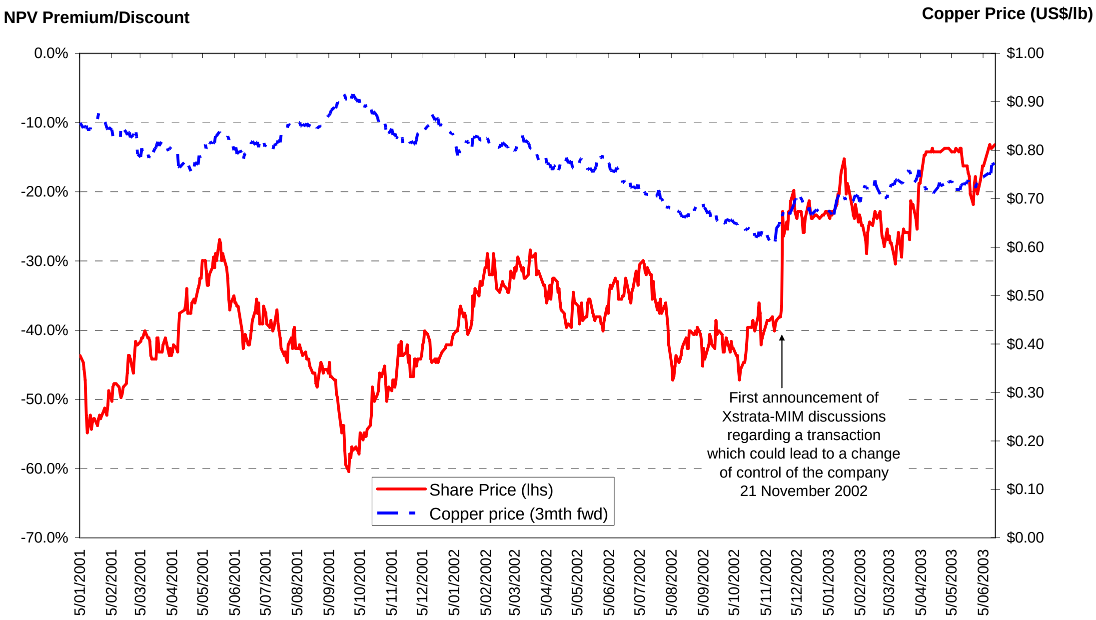
Data sourced from Factiva, Merrill Lynch, JP Morgan, Macquarie, UBS Warburg.

It is evident that the share price can trade well below broking analysts' NPV valuations which themselves are below the independent experts' valuations (low value of $1.72: MIM 2003) immediately prior to the Xstrata merger offer. This thesis would argue that this deems that the market is not utilising traditional option value in pricing the share price, say in addition to a static NPV value given that traditional option valuations cannot be negative. An alternative view is that an option value can be negative under real option theory if an option outcome is perhaps a less negative NPV such as in the case of the cost of mine closure in comparison to continuing to operate the mine incurring more substantial losses. However, during the period there was never any expectation that MIM would be closing significant mines – as discussed in Chapter 3 (Section 3.2.2 and 3.2.3), from the Asian crisis through to the tech boom including the 1998-2000 bull run. Other companies' share prices can trade at discounts to market or company sponsored valuations at particular times, e.g. BHP Billiton and to a lesser extent, Rio Tinto in Figure 72 and also most base metal companies during the Asian crisis and at other times.

This thesis argues that this 'lack of interest' period corresponds to the market assigning a low probability that commodity prices would materially increase in the short to medium term to stimulate share price movement. Hence, one could argue that irrespective of whether an investor was focussing on valuations based on sustainable earnings or cash flows or NPVs, etc. using long-term commodity price assumptions, the valuations are discounted because of a perceived low probability of an imminent recovery in commodity prices to meet the valuation assumptions. In the case of MIM, this probability starts to increase around the start of the Resources rally in 2002 where there are early signs of increasing Chinese commodity demand as well as a likely sector rotational shift out of tech stocks at the end of the Tech boom. However, in the case of MIM, the share price increase was also stimulated by the announcement of takeover discussions with Xstrata. Nevertheless, in an economic recovery it is likely that the probability will increase that a company will attain long term valuation measures and hence the combined probability weighted value of these measures will increase and lead to a higher share price.

Figure 76 plots the share price discount to the mid-point of the valuation range estimated by Grant Samuel for the MIM-Xstrata Scheme of Arrangement (NPV range, \$1.70 - \$2.24, mid point \$1.97 per share; MIM, 2003). The high and low valuation points were calculated using NPV valuations supported by market multiples and comparative transactions. The low point (\$1.70 per share) represents the base case while the high valuation reflects a number of more optimistic factors including a higher conversion of resources to reserves, metallurgical recovery enhancements, etc. While the MIM share price was trading in cycles, it was clearly trading below the base case valuation of \$1.72 for some years. Figure 76 also plots the 3-month forward copper price as MIM has often been considered a copper play in the Australian market. The copper price tended to drift sideways and lower over this period. Interestingly, Xstrata and MIM announced their discussions at the low point in the copper price.

Figure 76. MIM NPV Premium/Discount to the Independent Valuation Mid Point Valuation (\$1.97) and the 3-month forward copper price.

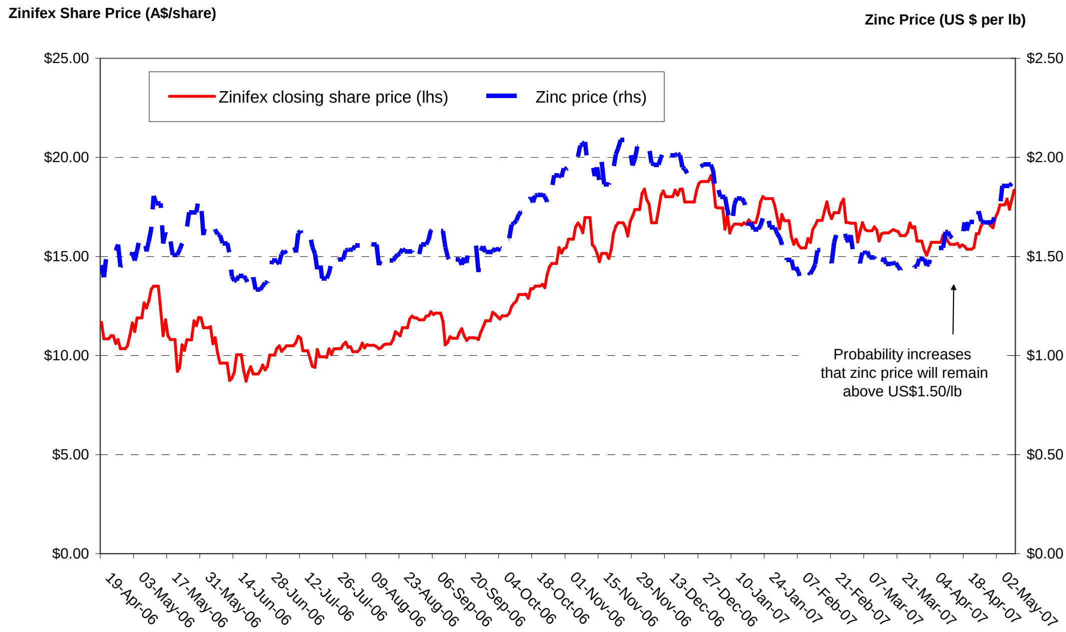


Data sourced from Stock Resource, LME

4.3 Commodity Price Movements and Resource Share Prices

The empirical relationship between commodity price movements and share price movements is well recognised in the market and typified by the Zinifex share price (offset by one day due to timing differences between LME metals closing prices and the ASX market) and the LME zinc price in Figure 77. The share price movements correspond quite accurately to the zinc price movements and although as annotated, there was a period in 2007 when the market was unsure whether the zinc price could sustain a US$1.50/lb support level. This lead to a softening Zinifex share price until the zinc price did in fact start to move higher.

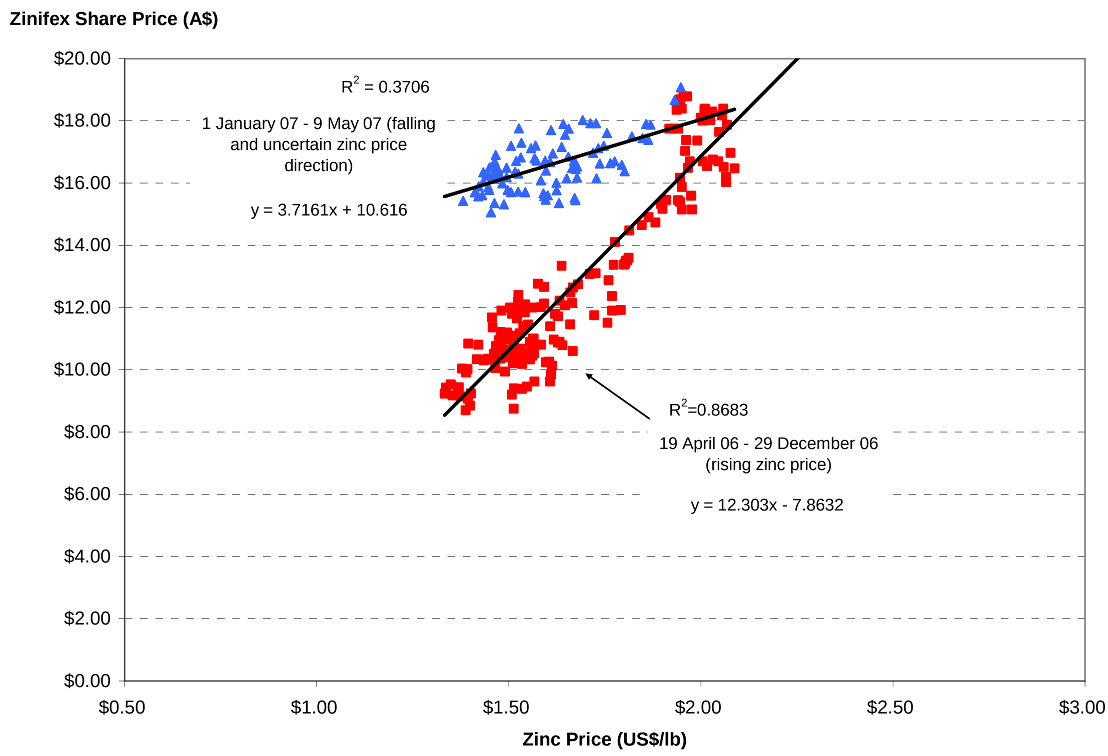
Figure 77. The Zinifex share price and the LME zinc price between April 2006 to May 2007 and prior to first US sub-prime mortgage crisis signs which emerged in August 2007. The share price is offset by one day to account for the timing difference between the LME zinc price close in London and the ASX market.



Data sourced from Factiva, LME

Figure 78 also plots the Zinifex share price and zinc price in two data series: one leading up to and around the zinc price peak ending on the 29 December 2006 (red squares) and a second following the peak and during a subsequent period of a falling, stabilising and later recovering, zinc price (see Figure 77). The evident strong correlation (R^2 =0.8683) in line with the generally rising zinc price supports the earlier contention by this thesis that the commodity price correlations are strongest where there are increasing or decreasing price trends.

Figure 78. Scatter plot of Zinifex share price and the LME Zinc Price. The two populations reflect the relationship price to around the peaking zinc price to 29 December 2006 (red squares) and the period following where the zinc price fall and stablised before later recovering (blue triangles).



Data sourced from Factiva, Stock Resource.

Using the probability-weighted value model:

$$\Delta S = P(\Delta v)$$

a cursory observation would be that the declining probability weighting (P) reflecting the uncertainty in the zinc price after 1 January 2007 has led to a less sensitive relationship (blue triangles) than prior to this date (red squares) when there was a stronger correlation between the zinc price and the Zinifex share price. In fact using the linear regression equations annotated on Figure 78, it is evident the share price sensitivity decreased by over three times after 1 January 2007. While the Δv per zinc price move is likely to have remained the same over both periods, clearly the uncertainty of the zinc price trend has lead to a significant lowering of P given the uncertainty of the sustainability of zinc price movements after 1 January 2007.

4.3.1 Case 6, Intec Limited. Share Price Relationship with Zinc

The relationship between commodity price and share price movements can vary and depends on factors such as the production credibility and imminence of commodity production. An example of this was presented by Intec Limited (Intec 2007) in its analysis of its share price movements relative to the zinc price.

The company owned the Hellyer zinc mine in Tasmania and was involved in two main projects: the retreating of the Hellyer tailings to produce a zinc concentrate (HZCP) and the development of a processing technology for the extraction of zinc and other metals from waste products (e.g. Electric Arc Furnace dusts from steel mills) and concentrates (Intec Process technology and Hellyer tailings reprocessing).

Figure 79 is derived from the Intec (2007) report and plots the zinc price and the Intec share price between December 2004 and May 2007. While the company was concerned at its collapsing share price from December 2006, its analysis provides an interesting review of the relationship of the zinc price to the company's activities.

Figure 79. Intec (ASX Code: INL) share price the following night LME zinc price close.

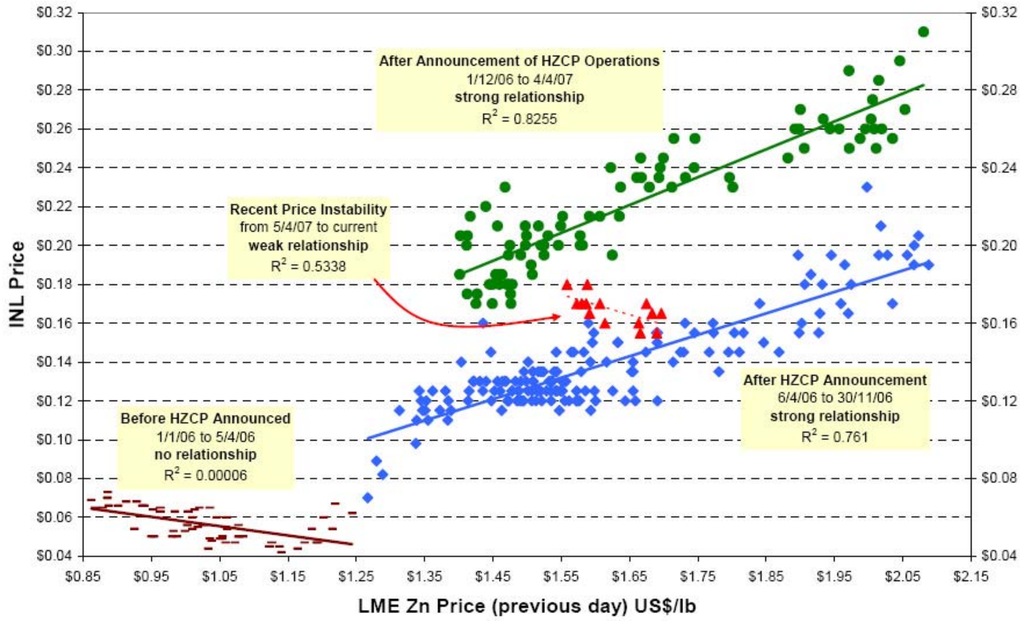
From Intec (2007).

The company also presented the correlation coefficients for its share price and zinc price movements over four separate time periods (see Figure 80).

The company reported that prior to its announcement on the 6 April 2006 of the HZCP, the Intec share price showed no relationship to the LME zinc price (R2=0.00006). This would suggest that while Intec held the tailings resources for some years, it was the proposed commercialisation with a credible partner (Polymetals Limited) that stimulated the market to ‘factor’ Intec’s leverage to the zinc price in its share price.

Following the announcement of the HZCP, the Intec share price responded to the previous day’s LME zinc price as evident in the blue line and diamond-shaped data points (R2=0.761). The company also reports that following the announcement on 1 December 2006 that the commissioning phase of the HZCP was complete and that production had commenced, the market responded with a step change in the Intec share price. It noted that while the relationship (i.e. the slope of the line) between the Intec share price and the LME zinc price remained almost the same, the Intec share price was revalued to a higher figure. Again, throughout the period from 1 December 2006 as the LME zinc price increased and then decreased and the Intec share price followed suit. This can be seen in the green line and round data points (R2=0.8255). This thesis would argue that this rerating reflects an increased probability of the company meeting its anticipated production cash flows and also a de-risking of the project. However, what is important is that the slope of the line did not appreciably change – after the share price ‘jump’. These key issues which are discussed later, are interpreted by this thesis to reflect the inability of the market to assess an accurate relationship between commodity price movements and a company’s earnings and cashflow (and valuation) leverage.

Figure 80. Correlation coefficients for the Intec share price and the zinc price for four periods.



From Intec (2007).

With respect to Intec, the company was particularly concerned that following the close of the March 2007 Quarter, the relationship between the Intec share price and the LME zinc price had broken down (R^2=0.5338; red line and triangular data points). While the reasons for this are outside the scope of this thesis, in the author's opinion this reflected a lack of confidence that the company could fund the development of the Intec Hellyer Residues Project (incorporating the Intec process).

4.3.2 The relationship between share price changes and commodity price changes

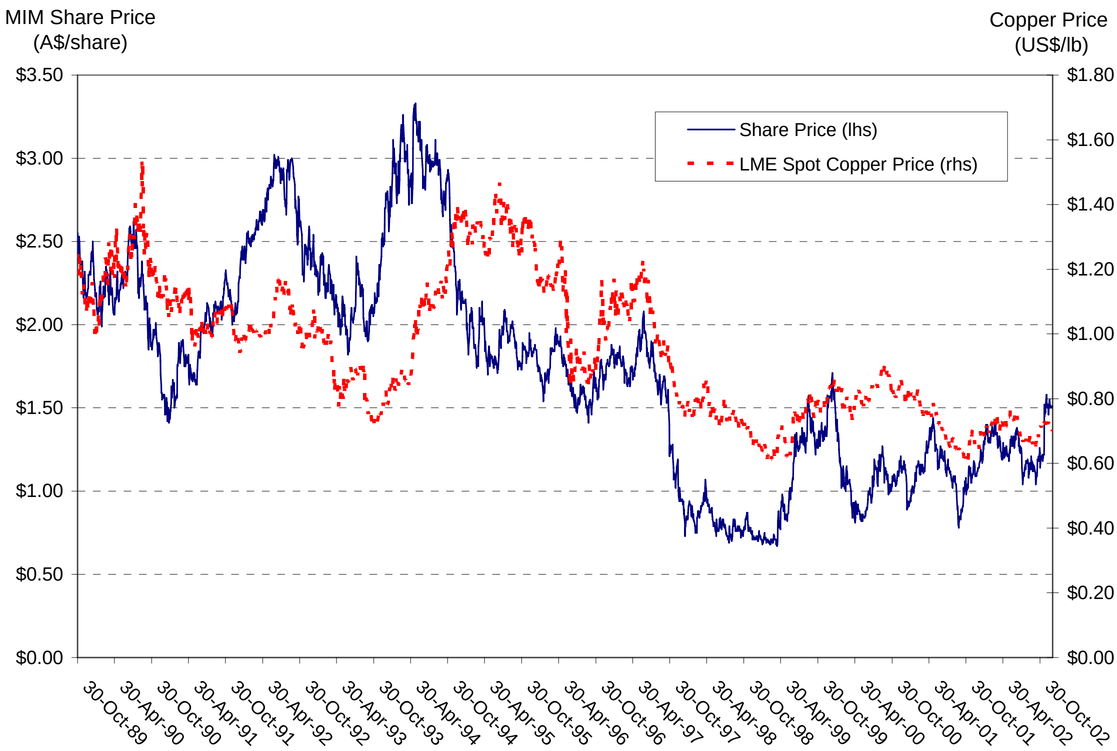
In the experience of the author, the relationship between commodity prices movements and share price movements has not been researched to any significant level (let alone recent research on the share price performance of resource companies) outside unpublished reports in the finance sector. Many resource companies regularly report their earnings sensitivity to changes in commodity prices and exchange rates (e.g. BHP Billiton, Rio Tinto, Oz Minerals, Alumina, etc.) and investors can assess the relationship for any forthcoming half year or even loosely track the earnings with commodity price changes as they occur.

In this section, this thesis seeks to highlight two observed phenomena; firstly that the correlation between share and commodity prices is stronger than the correlation of the returns on both parameters, and secondly, that the commodity price-share price movement relationship doesn't change as commodity prices increase in a given $P(\Delta \nu)$ relationship.

4.3.2.1 Case 7, MIM Ltd Share Price and Copper Price Relationship

Figure 81 plots the MIM share price and the LME spot copper price over the period from 30 October 1989 to the 31 December 2002 (recall that MIM was merged with Xstrata in mid 2003). Empirical observation of Figure 80 highlights the appearance of a strong correlation of the MIM share price and the LME spot copper price albeit the Pearson correlation coefficient is estimated at 0.61. However further observation of Figure 81 suggest that the pre-emption of the movement of the MIM share price of future copper price movements varies over time and in fact in the few years prior to 2003, it was almost contemporaneous.

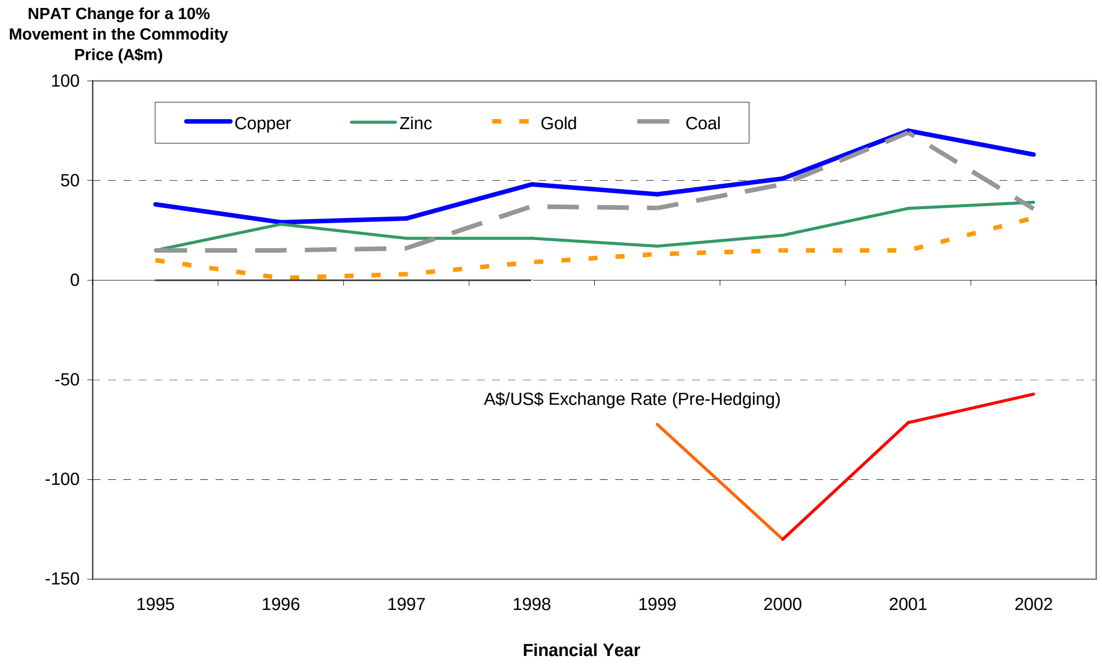
Figure 81. MIM daily share price and LME Spot Copper Price from 30 October 1989 to the 31 December 2002.



Data sourced from Stock Resource.

Overall, the ‘forecasting’ ability of the market is likely to vary over time and hence the response time of MIM’s share price movements is likely to vary over time in relation to copper price movements. Figure 82 plots the company’s reported earnings sensitivity to commodity prices and A$/US$ exchange rate movements. As evident, the company’s earnings are most sensitive to the copper price. Readers will also recall that significant earnings were also generated by coal sales and while company’s earnings are also sensitive to changes in the coal price, coal prices are generally negotiated yearly and do not impart the share price volatility evident with copper price movements. The company has also grouped its thermal and coking coal exposures under one category (coal) despite each coal market having different characteristics (steel making versus power generation).

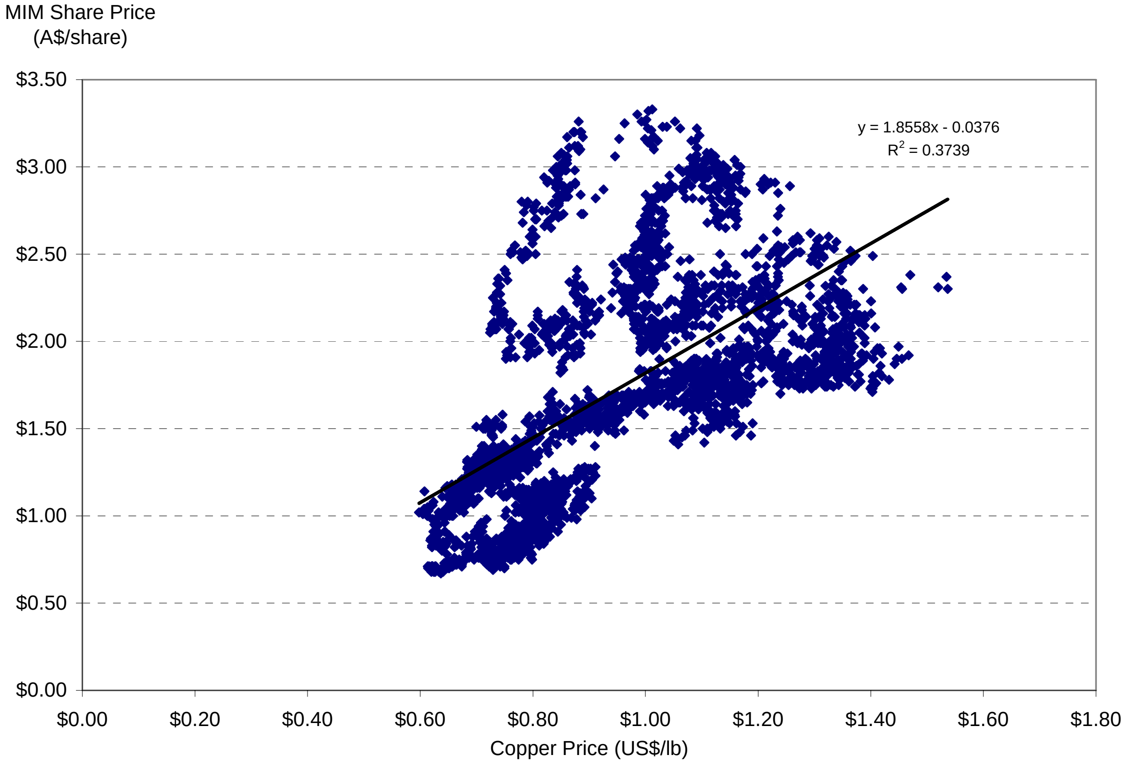
Figure 82. MIM’s reported earnings sensitivities from 1995 to 2002.



Based on data sourced from MIM fact books & results presentations for the years 1995, 1996,1997, 1998,1999, 2000, 2001, 2002

Figure 83 is a plot of the MIM daily share price versus the LME copper price for the period from the 30 October 1989 to the 31 December 2002 similar to the period in Figure 83 above. The copper price is offset by one day to match the overnight LME closing price impacting the share market activity in the following day in Australia due to the time difference. While the study period is longer than in the Zinifex example cited earlier (see Figure 78), it is argued that there are a number of point clusters which represent specific $P(\Delta v)$ relationships holding for limited time periods.

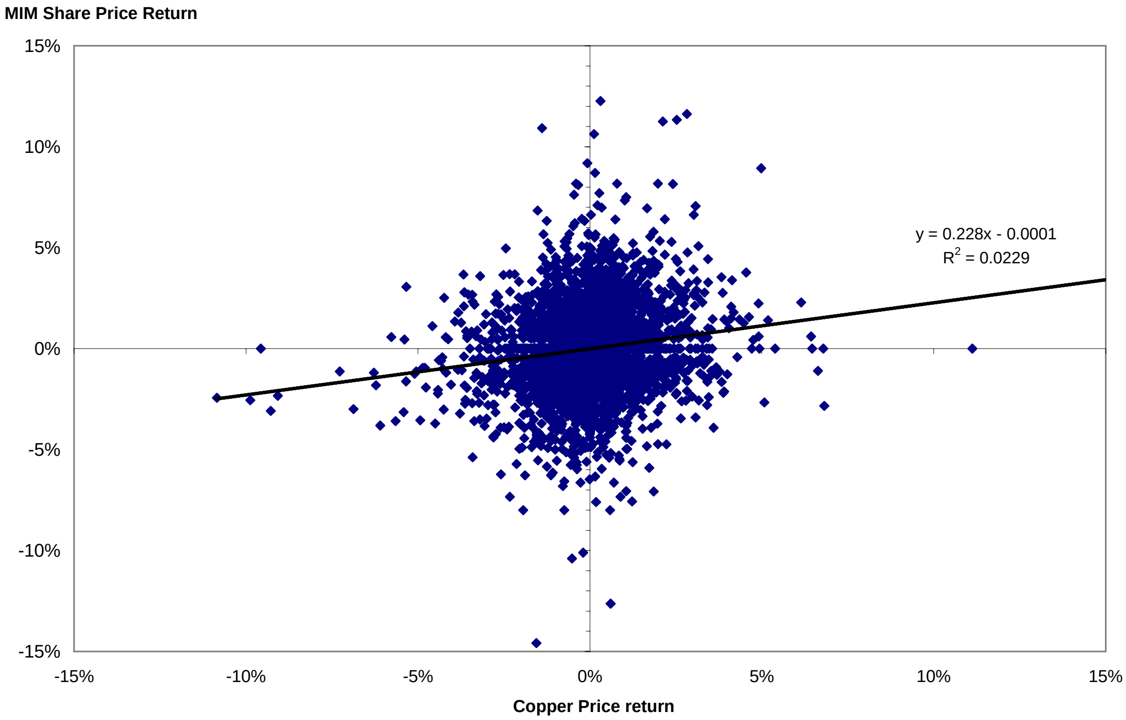
Figure 83. Scatter plot of the MIM share price versus the LME spot copper price.



Data sourced from Stock Resource.

Now if the daily MIM share price and copper price returns are plotted on a scatter plot, the overall relationships are not evident and the data have limited analytical value (see Figure 84). As event methodology (see Chapter 5) typically involves returns analysis, the dispersion evident in Figure 84 is likely to render analysis using returns of limited value.

Figure 84. Scatter plot of daily MIM share price returns and LME spot copper price returns (offset by one day).



Data sourced from Stock Resource.

Again, while this analysis of MIM represents one example, the author argues that this type of 'returns pattern' is typical for most resource companies and which has impeded event studies and other financial analysis in the past which have relied on analysis of share price returns.

4.3.3 Consistency of Share Price Relationships at Increasing Commodity Prices

Researchers and investors could logically assume that the share price reactions may diminish with successive increases in commodity prices. This could stem from perceived mean reversion in the commodity prices (although the author proposes that any reversion in commodity prices is more likely to be around the marginal cost of production) and hence at extreme commodity prices relative to historical trends, there is an increasing risk that the prices will retrace towards historical trends . This is likely to reflect expectations of supply increase as more marginal projects become viable with increasing prices and conversely with decreasing commodity prices, some projects will become unviable and placed on care and maintenance therefore reducing the overall commodity supply. There is also the consideration of the increasing A$/US$ exchange rate in line with increasing commodity prices which can undermine the increasing margins from the higher commodity rates as discussed in Chapter 3 (Section 3.7) and similarly mitigate falling margins in times of decreasing commodity prices.

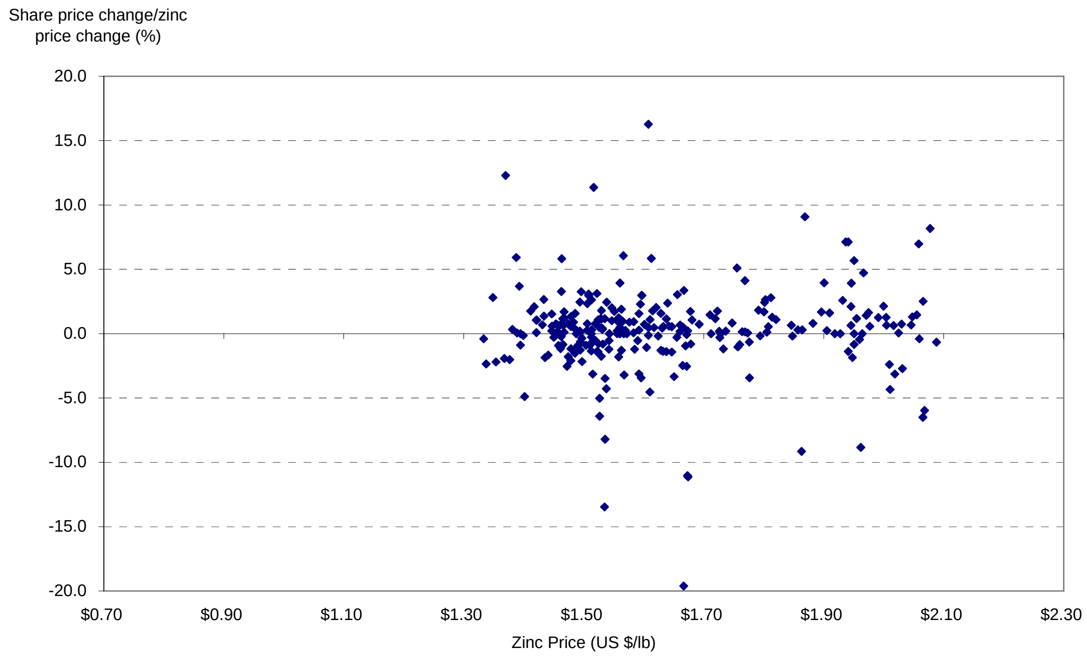
However, this may be offset by increases in valuations stemming from the fact that as commodity prices increase, companies may lower reserve cut-off grades or consider treating previously uneconomic ore stockpiles, with earnings and cash flows not moving incrementally at the same rate as the commodity price. There is also an increase in the gross value of the company's remaining resources.

An expectation is that the combined impact of these items would involve share price movements that increase with declining sensitivity to commodity prices moving higher (or lower) but potentially punctuated by step changes where marginal resources suddenly became viable or new expansions became economic, etc.

This thesis has assessed this expectation for several companies by plotting the daily share price change divided by the commodity price change versus the commodity price level (see Figures 85, 86 and 87). The expectation is that if there is a changing relationship, this will be reflected in a change in the distribution of data points at different commodity price levels.

Figure 85 uses the same data as in Figure 77 and plots the share price change for the preceding day over the LME zinc price change. While the distribution is broad, it suggests there is no relationship between the zinc price level and the response of the share price movement relative to the zinc price movement. This is also supported by the data points around the linear regression in Figure 78.

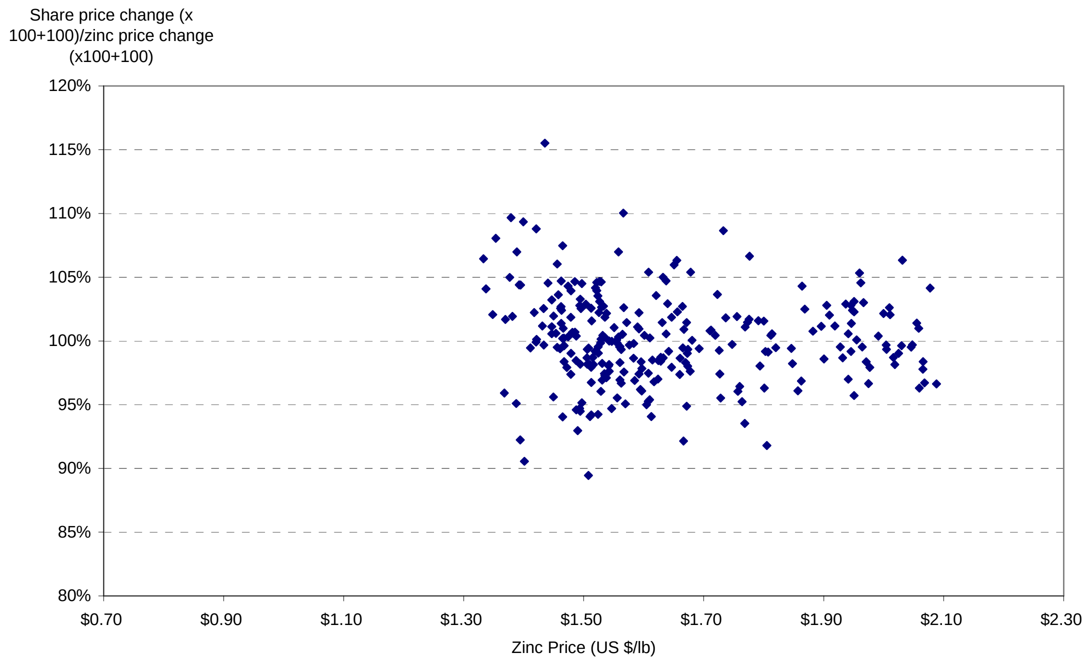
Figure 85. The daily percentage change in the Zinifex share price divided by the daily change in the preceding day's LME zinc price close versus the LME zinc price. The chart plots the data outlined previously in Figure 77.



Data sourced from Factiva, LME.

Unfortunately the data in Figure 85 can get distorted due to low percentage changes in one variable which creates large swings in the ratio, for example there are a number of share price movements which have been five times or greater than the zinc price movement. An alternative is presented in Figure 86 which indexes the previous day's share price or zinc price to 100 and applies the percentage change to 100 and then adds this to the previous day's index. For example a 5 per cent increase in the share price would result in an index of 105 (5% x 100 + 100) while a zinc price change of 10 per cent would result in an index of 110 (10% x 100 + 100) and a ratio of 105/110 or 95.5 per cent. This means that on that day the share price movement reflected 95.5 per cent of the zinc price movement overnight (London LME close).

Figure 86. The percentage change in the share price from the preceding day (offset by one day) multiplied by 100 and added to 100 to index the change. This is divided into the change in the LME zinc price calculated on the same basis to give a percentage change of the share price change over the zinc price change.

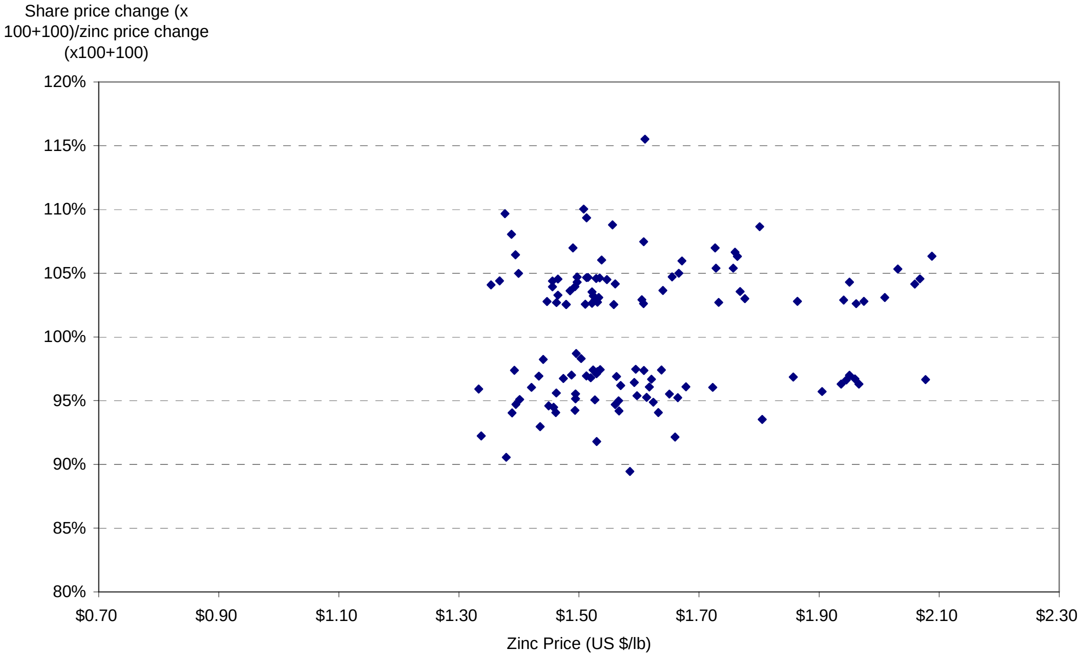


Data sourced from Factiva, LME.

In both Figures 85 and 86 it is evident that over the time period considered, there is no discernable change in sensitivity as the zinc price increases, albeit that there are less data at higher zinc prices, which reflects the limited number of instances in which zinc prices exceeded US$170/lb. It is also interesting that the relationship in Figure 86 using indexed data suggests a value of around one to one (or plus or minus 5 per cent) for a share price movement responding to a zinc price movement.

However, the indexing has an effect of creating a central tendency towards a one to one share price-zinc price relationship given many small movements or zero movements will lead to 100 divided by 100 or one. Figure 87 removes data which has a less than 3 per cent movement either side of one to exclude days where there are no or minimal movement in one or both variables (ignoring cases of large equal movements in both variables). As expected from the distributions in Figures 85 and 86, there is not a difference that would warrant a change of the average one to one relationship.

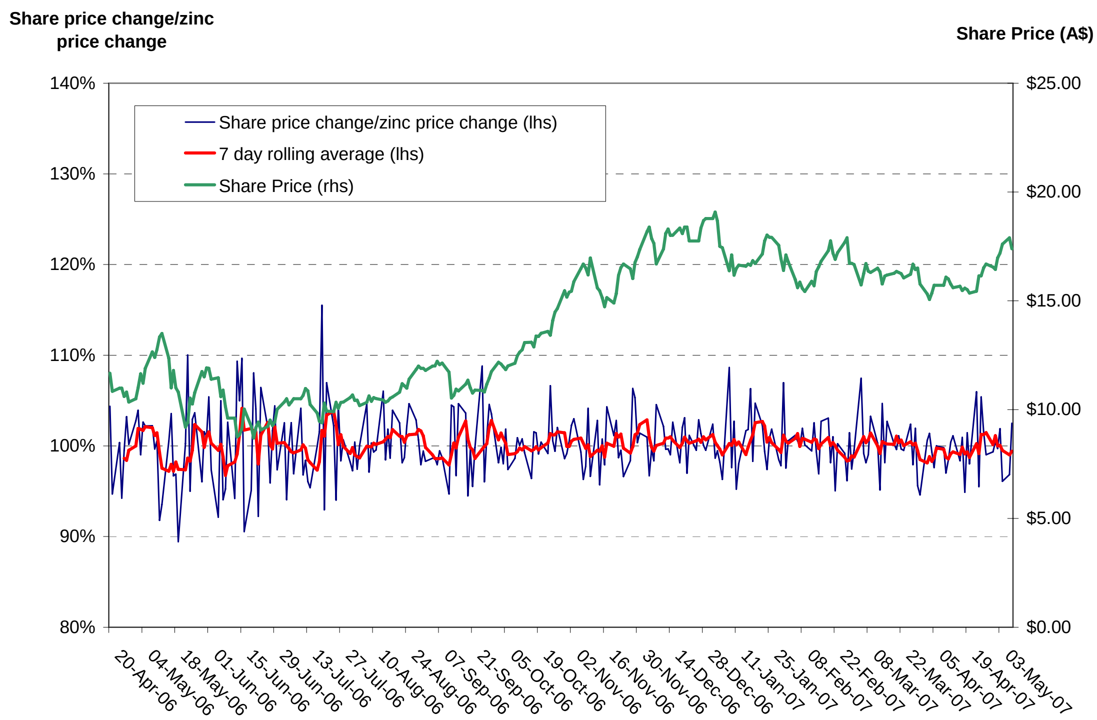
Figure 87. The effect of removing daily movements of the indexed share price movement divided by the indexed zinc price movement which are less than 3 percent.



Data sourced from Factiva, LME.

Lastly to test the reverse situation, Figure 88 plots the Zinifex share price change (indexed) over the zinc price change (indexed) along with a 7-day rolling average of this relationship. It also plots the Zinifex share price using the second Y axis. While there is increased volatility earlier in the time period, it is evident that as the Zinifex share price increases, on the whole there isn't a material change in the share price movement relative to the zinc price movement.

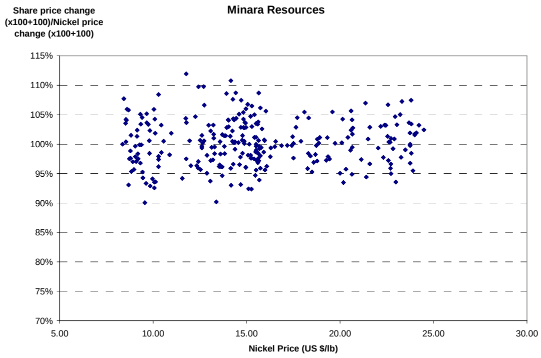
Figure 88. The Zinifex share price change (indexed) over the zinc price change (indexed) along with a 7-day rolling average of this relationship. The Zinifex share price is plotted using the second Y axis.

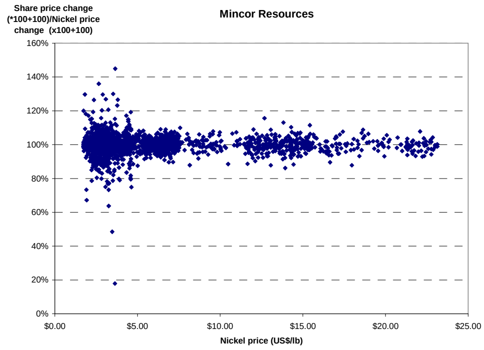


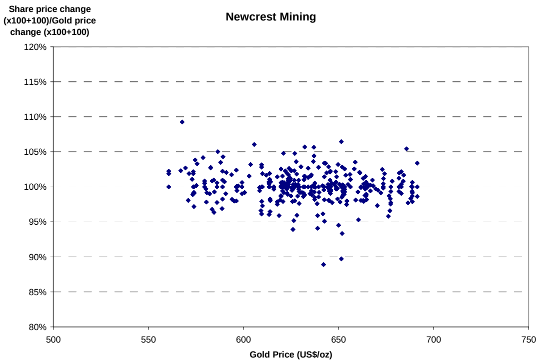
Data sourced for Factiva, LME.

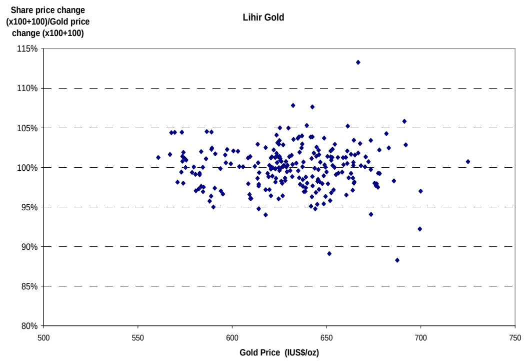
The charts shown in Figure 89 continue the same theme developed in Figure 86 and plots the share price change (indexed) over the commodity price change for a number of companies with varying commodity exposure. These are Minara Resources (nickel), Mincor Resources (nickel), Newcrest Mining (gold), Lihir Gold (gold), Alumina (alumina/aluminium) and CBH Resources (zinc). The thesis contends that in all these charts there is little evidence of declining share price sensitivity at high commodity prices. If this wasn't the case, and despite the central tendency with small or zero movements, significant movements would be apparent with congregations above or below the 1.0 line at greater commodity prices. However, all that is apparent is that there are fewer data points at higher commodity prices, which is expected given that many record commodity price highs were only achieved in the recent Resources Boom.

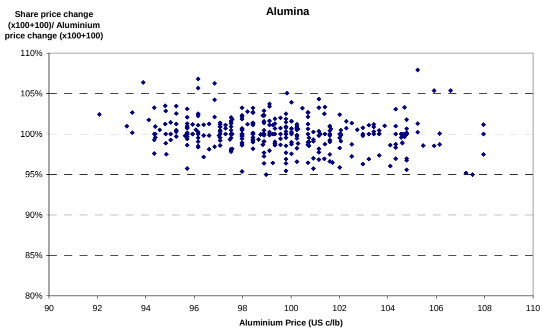
Figure 89. Charts of share price movements (indexed) divided by commodity price movements (indexed) for Minara Resources (19 April 2006-17 May 2007), Mincor Resources, (8 July 1997-20 December 2012), Newcrest Mining (15 May 2006-19 May 2007), Lihir Gold (19 April 2006-15 April 2007), Alumina (21 September 2006-10 February 2007) and CBH Resources (26 August 2005-8 June 2007).

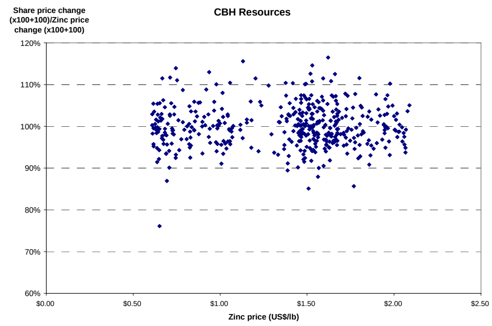












Data sourced from Factiva, LME.

This thesis proposes that under the general relationship:

$$\Delta S = P(\Delta v)$$

P and v remain relatively constant despite the opposing forces of mean reversion risk or more likely the increasing risk of over supply occurring (and to a lesser extent, A$/US$ appreciation/depreciation) versus increased company value with increasing commodity prices. This thesis would argue that the observed linear relationship simply reflects the market maintaining the same relationship that is evident at lower commodity prices. This relationship will change when a new share price driver emerges and could stem from a change in the trend of the commodity pricing itself.

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4.3.4 Commodity Price Influences and the Global Resource Indices

As outlined in Chapter 2, (Section 2.2.2) the application of a Wiener process is likely to have a limited application in tracking of resource prices except for short intervals of time or during periods where there are no clear commodity price trends (share price drifts as described in Chapter 3). However it is evident from above, that resource shares follow a Markov process otherwise the most likely observable relationship would be a declining share price sensitivity to further increases (or decreases) in commodity prices.

The question is then whether commodity prices follow a Markov process and can be modelled as geometric Brownian motion variables. This thesis considers that as evident through the movement of resource share prices, there is also a limited application of a Wiener process except for short intervals of time or during periods where there are no clear commodity price trends As noted in Chapter 3, commodity prices are influenced by their own supply/demand fundamentals as well as the general macro-economic outlook and the influence of speculators and these factors are likely to results in prices trending in a common direction most of the time.

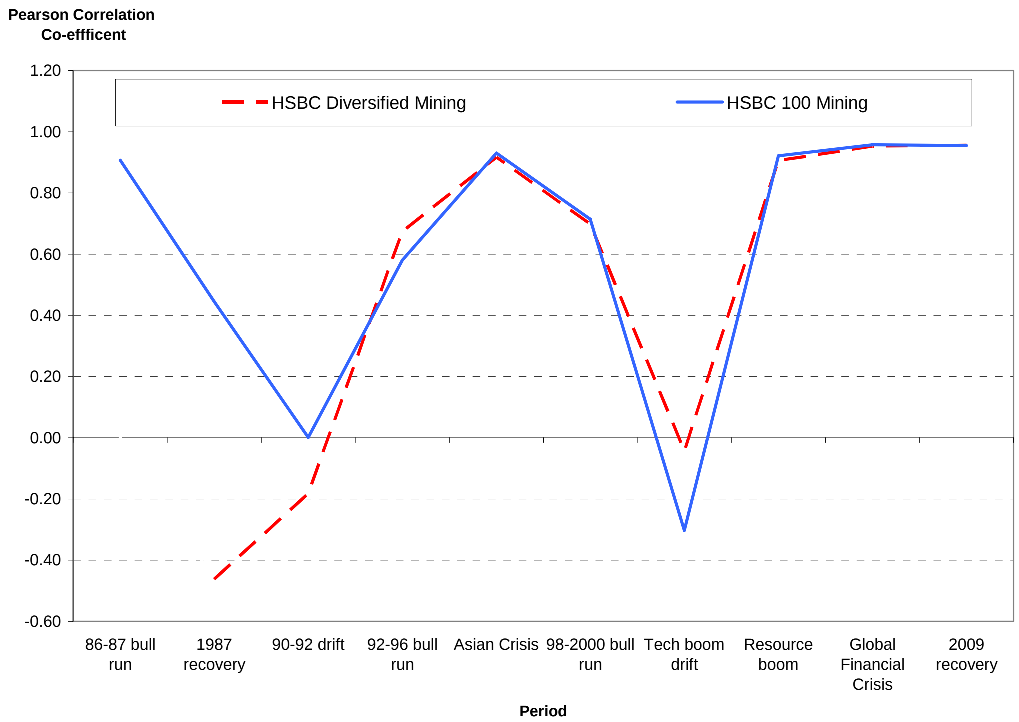
On a broad scale the correlation outlined in Chapter 3 between the base metal prices has also been applied to the global HSBC Diversified Mining and 100 Mining indices and the copper price as outlined in Table 33.

Table 33. Pearson product moment correlation coefficients for HSBC Diversified Mining and HSBC 100 Mining Indices with the 3 months forward copper price over the defined periods from Chapter 3, Table 21.

Period	Months	HSBC Diversified Mining Index	HSBC 100 Mining Index
86-87 bull run	14	na	0.91
1987 recovery	27	-0.46	0.44
90-92 drift	29	-0.18	0.00
92-96 bull run	42	0.67	0.58
Asian Crisis	14	0.92	0.93
98-2000 bull run	17	0.70	0.71
Tech boom drift	33	-0.04	-0.30
Resource boom	67	0.91	0.92
Global Financial Crisis	7	0.95	0.96
2009 recovery	9	0.96	0.95
For total period (1986-2009)	**259**	**0.93**	**0.93**

The daily data highlights a strong overall correlation between the global mining indices and the copper price although there are some individual periods exhibiting higher correlation coefficients than others. The series of coefficients are also plotted on Figure 90 and reiterate two key periods of low correlation, not surprisingly, during the Tech Boom drift and approximately a decade earlier in the 90-92 drift. Overall, it suggests that where there are clear trends (up or down), the correlation between the copper price and these international indices is higher compared to periods of share price drifts which reflect relatively directionless copper price movements.

Figure 90. Pearson product moment correlation coefficients for HSBC Diversified Mining and HSBC 100 Mining Indices with the 3 months forward copper price from Table 33.



Data sourced from Stock Resource.

As highlighted with Zinifex, MIM and Intec, the correlation of stock price movements to specific commodity price movements is well observed and often provides the basis for investing in some resources stocks depending on the supply/demand fundamentals of the commodities. Well known current and historical (over last 20 years) Australian resource 'leverage plays' are listed in Table 34 with associated key commodities.

Table 34. Australian resource 'commodity leverage plays'.

Company	ASX Code	Key Commodities
Aberfoyle	ABF	Cu, Zn
Acacia Resources	AAA	Au
Alumina	AWC	Al
Anaconda Nickel	ANL	Ni
Ashton Mining	ASH	Diamonds
Centaur Mining	CTN	Ni
Centennial Coal	CEN	Coal
Comalco	CMC	Al
Delta Gold	DGD	Au
ERA	ERA	U
Felix Resources	FLX	Coal
Fortescue Mining	FMG	Fe
Great Central Mines	GCM	Au
Iluku Resources	ILU	Mineral Sands
Macarthur Coal	MCC	Coal
MIM (Holdings)	MIM	Cu, Zn, Coal
Newcrest Mining	NCM	Au
Normandy Mining	NDY	Au
Norths	NBH	Fe
Oxiana	OXR	Au, Cu
Oz Minerals	OZL	Cu, Zn
Paladin Energy	PDN	U
Pasminco/Zinifex	PAS/ZFX	Zn
Plutonic Resources	PLU	Au
Portman Mining	PMM	Fe
Renison Goldfields	RGC	Mineral Sands
Savage Resources	SVR	Cu, Zn
Western Metals	WMT	Zn
WMC	WMC	Ni,Cu
WMC Resources	WMR	Cu

Many of the companies in Table 34 have been involved in takeovers and mergers and are analysed in Chapter 5.

4.4 Relationship with CAPM and APT

The proposed two factor model presents difficulties segregating valuation changes from probability weighting changes and in most cases there is a combination of both leading to a share price movement. Nevertheless, this segregation may not be important in many instances given their leverage to commodity prices which as a sector, is the major driver of returns. However, as discussed, the sector is varied, ranging from junior explorers to larger diversified resource companies such as BHP and RIO.

Junior explorers represent a high risk – high return end of the spectrum given the high risk associated with mineral discovery (See Chapter 6). However the changing probability weighting of discovery success over time is difficult to assess given the difficulty in separating the potential for a changing view of the company's prospects as new exploration results emerge out of the exploration program.

The diversity of junior exploration companies also creates an enormous challenge in analysis. This includes factors such as the perceived prospectivity of the project portfolio and advancement, variation in the fundamentals of the commodities sought, management experience and expertise, available and future funding, cash burn rate, the prospective of merger and acquisition activity and the timing of particular events relative to the overall market performance and sentiment.

Companies share prices become increasingly correlated to commodity prices as they move to producer status. As the production status diversifies then the correlation towards copper prices increases relative to other factors (the bellwether as discussed in Chapter 3) and globally (especially China or USA) relevant macro-economic variables.

The range of company status and size leads to varying correlation with the broader market. Table 35 lists the beta coefficients for fifteen producers and fifteen explorers derived from the Centre for Research in Finance at the Australian Graduate School of Management (AGSM) and available at Commsec (www.comsec.com.au) as well as from Bloomberg (2009).

Table 35. The market capitalisation, main commodity exposures and betas of 15 explorers and 15 producers.

Company	ASX Code	Market Capitalisation (A$m)	Main Commodity	Beta[1]	Beta[2]
Explorers					
Anchor Resources	AHR	$5	Sb	0.94	na
Icon Resources	III	$8	W	0.93	1.55
Pioneer Resources	PIO	$16	Au	0.92	1.13
Gunson Resources	GUN	$19	Ti, Zr	0.92	0.73
Signature Metals	SBL	$25	Au	0.95	1.33
Sipa Resources	SRI	$38	Au	0.95	1.04
Jindalee Resources	JRL	$38	U	0.91	1.32
Venturex Resources	VXR	$40	Cu	0.91	1.30
Western Desert Resources	WDR	$65	Fe	0.91	0.75
Gryphon Minerals	GRY	$88	Au	0.92	1.22
Energy Metals	EME	$109	U	0.91	0.92
Rex Minerals	RXM	$163	Cu	0.91	0.55
Perseus Mining	PRU	$467	Au	0.91	1.21
Cudeco	CDU	$770	Cu	0.92	1.26
Producers					
Terramin Australia	TZN	$114	Zn, Pb	1.07	1.47
Perilya	PEM	$190	Zn, Pb	1.11	1.82
Avoca Resources	AVO	$441	Au	0.96	0.80
Panoramic Resources	PAN	$455	Ni	1.01	1.46
Independence Group	IGO	$469	Ni, Au	0.98	1.45
Minara Resources	MRE	$975	Ni	1.16	2.27
Panaust	PNA	$1,334	Cu, Au	0.93	1.87
Equinox Minerals	EQN	$2,641	Cu	0.93	1.30
Oz Minerals	OZL	$3,558	Cu	0.95	1.26
Alumina	AWC	$3,965	Al	1.22	1.62
Lihir Gold	LGL	$7,509	Au	0.94	0.77
Fortescue Mining	FMG	$11,505	Fe	0.95	1.37
Newcrest Minerals	NCM	$16,146	Au	0.95	0.70
Rio Tinto	RIO	$38,115	Fe, Cu, Al	1.23	1.21
BHP Billiton	BHP	$123,302	Fe, Cu, Oil	1.03	1.30

Beta[1] Derived from Commsec, 2009 accessed 4 November 2009
Beta[2] Derived from Bloomberg, 2009 accessed 4 November 2009

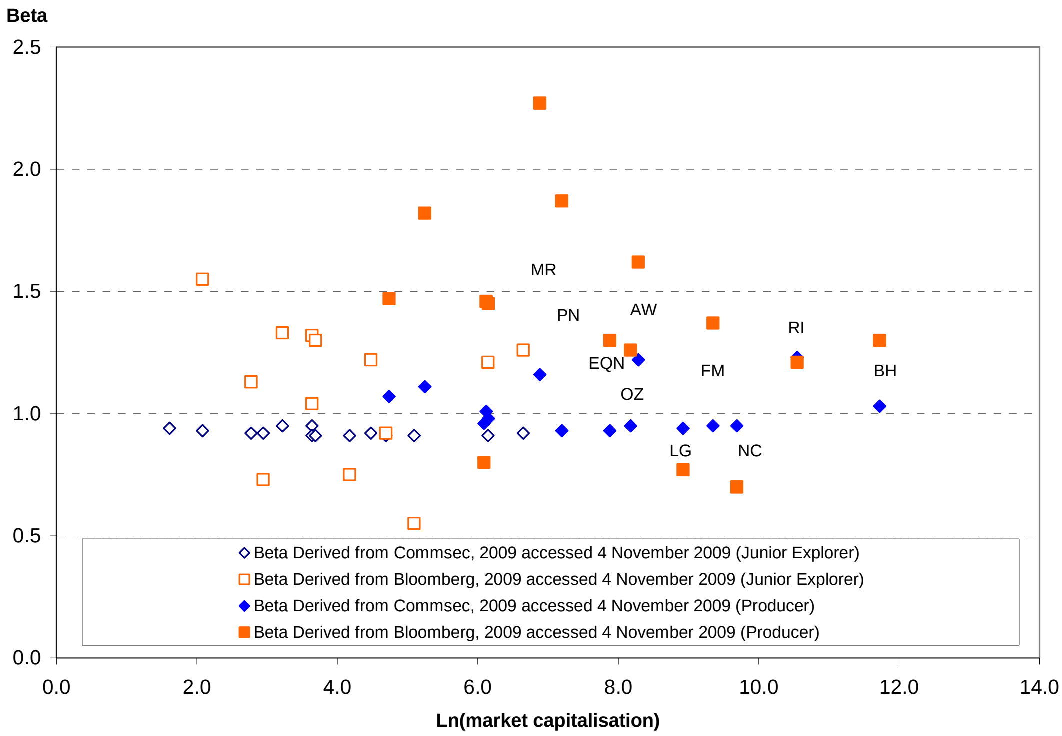
Empirical observation of the data does not impart confidence in terms of company attributes and this relationship to the broader market. The data derived from Commsec appears incorrect but is highlighted given that Commsec is the largest online retail broking house (over 200,000 accounts, J. Rickward, pers comm. 2006) and this thesis suggests that this data is not used at all by these account holders.

This thesis is not embarking on a discussion on the merits of the estimation methods used in these beta estimations nor the time frames involved, statistical dispersion, etc.

However it is noted that junior explorers can be regarded as venture capital investments and their betas are likely to reflect either their exploration success or perhaps declining cash backing and are independent to a large degree of the broader market trends. Hence the estimation of the beta for a junior explorer may simply reflect the market's movement relative to a static or declining share price and therefore the future applicability of this beta may be more dependent on the direction of the broader market than stock specific factors.

Elsewhere there is *a priori* expectation that larger companies will have a beta value approaching that of the broader market (i.e. 1) simply given their higher weightings in the broader market indices. Figure 91 charts the beta values presented in Table 35 against the natural logarithm of the market capitalisation of the companies. As evident, there are no discernable trends between the explorers and the producers while the AGSM data derived from Commsec (2009) doesn't appear convincing in suggesting most of the listed resource companies are market insensitive. Discrepancies have been noted elsewhere and there have been a number studies addressing the 'small-firm effect' in industrial companies with expectations from the CAPM (e.g Fama and French, 1995; in Australia, Halliwell et al, 1999, Beedles et al, 1988).

Figure 91. Beta estimations versus the natural logarithm of the company market capitalisation for 15 explorers and 15 producers on the ASX. Major companies are listed between the two data points in line with their market capitalisation.



As noted in Chapter 2 (Section 2.7.1), mining companies were excluded from most previous Australian takeover research because they are considered by researchers to have systematically different financial, operating and risk characteristics (Bugeja & Walter, 1995, da Silva Rosa et al, 2000). This thesis has calculated the Pearson product moment correlation coefficient between resource and industrial indices over the time periods (including the 1987 crash) outlined earlier.

The ASX All Resources and All Industrials indices have the longest data series but were discontinued from the 3rd July 2002. The S&P/ASX 100 Resources and Industrial indices data series commenced on 17th February 2002 while the S&P/ASX 200 Resources and Industrial indices data series commenced on the 3rd April 2000.

Table 36. Pearson product moment correlation coefficient between resource and industrial indices over the time periods defined in Table 21, Chapter 3.

Period	Number of data	All Resources versus All Industrials	S&P/ASX 100 Resources versus S&P/ASX 100 Industrials	S&P/ASX 200 Resources versus S&P/ASX 200 Industrials
86-87 bull run	316	0.92		
October 1987 crash	7	0.93		
1987 recovery	576	0.74		
90-92 drift	629	0.86		
92-96 bull run	906	0.83		
Asian Crisis	307	-0.38	-0.47	
98-2000 bull run	360	0.42	0.38	
Tech boom drift	721	*0.37*	0.40	
Resource boom	1461		0.90	0.90
Global Financial Crisis	140		0.86	0.87
2009 recovery	202		0.82	0.82
For period 1986-2009		0.69	0.77	0.68

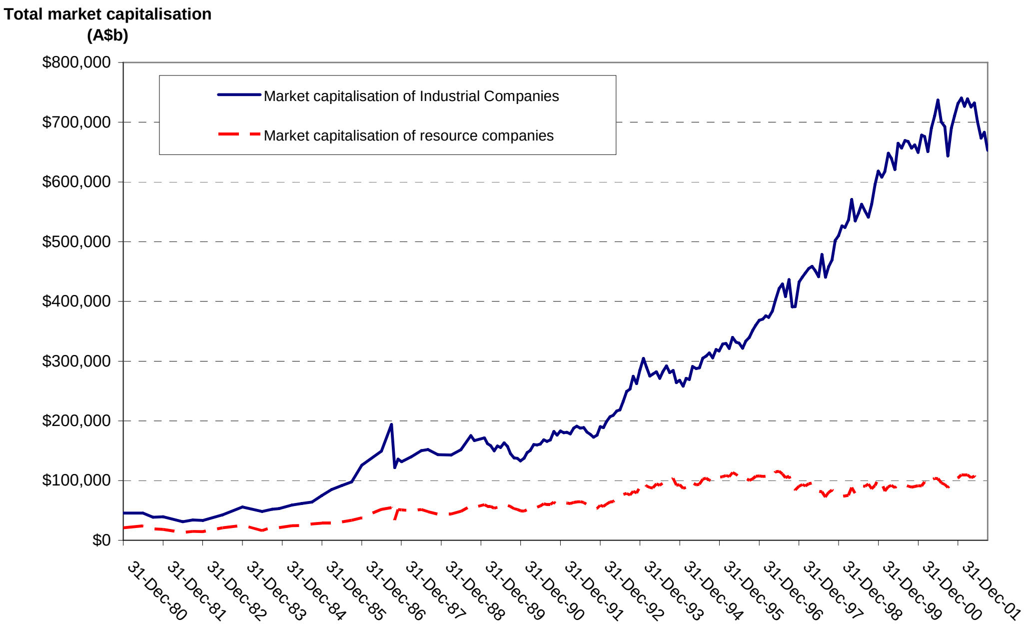
Italic means data for part of period only.

Data sourced from Stock Resource.

The correlation coefficents presented in Table 36 highlight a varying degree of correlation between the resource and industrial sectors of the ASX over the defined periods. It is evident that in strong bull resource bull runs, the correlation increases and may reflect a strong international attraction to the Australian market in general given the benefit of an appreciation A$/US$ during these periods as well as the implications of a strong resource sector for the broader economy (mining services, increased employment, etc.).

However it is also evident that the 1990s experienced a period of declining correlation of the resource sector to the industrial sector and therefore broader market and this reflected a period of declining relevance in the lead up to the Tech Boom (see Chapter 3, Section 3.2.3).This period corresponded with growth in the industrial sector with the listing of companies such as Commonwealth Bank, Telstra, and demutualization of AMP and NRMA as discussed in Chapter 1. To highlight the growth of the industrial sector relative to the resources sector, Figure 92 is reproduced from Figure 12 in Chapter 1 and charts the growth in market capitalisation of both indices.

Figure 92. The market capitalisation of the industrial and resource components of the ASX from 1980 to 2001.



Primary data sourced from ASX data feed.

Recalling from Chapter 1, at the end of 1990 the resource sector comprised 37.1 per cent of the All-Ordinaries index but by the end of 2000 it was a mere 14.1 per cent. At the end of the All-Resources data series discussed earlier, the All-Resources represented 14.5 per cent of the All-Ordinaries in early July 2002.

Recalling from Chapter 2 (Section 2.2.1) the CAPM uses a beta coefficient to ratio up the market risk less the risk free rate to account for the non-diversifiable sensitivity of a specific company to the market in general according to:

$$R_j = R_f + B_j(R_m - R_f)$$

Where:

R_j = expected return on stock *j*

R_f = risk free interest rate

R_m = expected return on a well-diversified portfolio of shares (such as the whole stock market)

B_j = 'Beta factor' or relative sensitivity of return on stock *j* compared to market average

While $B_j(R_m - R_f)$ adjusts the market risk premium above the risk free rate for the sensitivity of returns of the specific company being assessed, it is certainly questionable as to whether B_j is the right parameter to assess the non-diversifiable risk of resource stocks over the longer term. In fact Table 36 suggests that B_j may largely reflect the non-diversifiable risk of the entire resource sector during different periods, for example in strong resource bull markets the B_j will contract but expand in other periods such as in the Tech Boom.

In summary, the beta values outlined Table 35 and Figure 91 do not provide a significant degree of confidence in relation to the predictive non-diversifiable risk component of individual stocks given the lack of any relationships with company size or producer status and simply appear to be manifestations of events occurring at the time of the regression analysis. The varying correlations of resource and industrial indices over time are also likely to reduce confidence in the long-term effectiveness of beta values.

Finally, in terms of the relevance of the risk free interest rate (R_f), as discussed in Section 4.1.1.3, the probability-weighted value model $\Delta S = P(\Delta \nu)$, proposes that the probability weighted value $P(\Delta \nu)$ incorporates an expected return well in excess of the risk free rate otherwise investors would not be induced to invest. Hence it is not deemed relevant as a separate variable in the analysis in this thesis.

4.4.1 A Comment on Arbitrage Pricing Theory

In Chapter 2 (Section 2.2.3), this thesis discusses Arbitrage Pricing theory (APT) as a multi-factor model which contends that the expected return of an asset can be modelled as a linear function of a number of factors which are deemed to influence share price returns. Each factor has a specific beta-coefficient with the K factor model in the form as follows:

$$R_i = \alpha_i + \beta r_m + \gamma epsgrowth + \delta management + \xi oilprice + ...$$

Where

$R_i =$ return on asset *i* during a specified time period

α_i = a constant, specific to asset *i*

$\beta r_m =$ Expected returns based on the sensitivity of changes in the share price to changes in the market

The model as noted in Section 2.2.3 can be viewed as an extension or special case of the CAPM.

On first observation, there are similarities with the probability-weighted value model, however, there are two key areas of differentiation:

- Firstly, APT estimates the expected return from an asset R_i given the application of constants against various factors deemed to be of influence in deriving this return. However in the probability-weighted value model, the model share price is estimated and then a return is estimated from this model share price. As outlined earlier, regression analysis of parameters such as resource share prices versus commodity prices is far more meaningful than comparing the returns of these parameters.
- Secondly, an aspect of the probability-weighted value model is the fact that the probability weights are constantly changing as can the values. There are not a set of constants which can apply indefinitely and while there are commodity price correlations for many resource companies, a constant relationship may not be present for long. In a sense, APT may apply over specific time horizons with the constants reflecting probabilities applicable at a particular time to specific share price drivers.

Hence, a multifactor probability weighted value model would be:

$$SP_t = FV_{t-1} + P_1(\nu_1) + (P_2(\nu_2) + (P_3(\nu_3) + ...$$

Where:

SP_t = Share price at time t

FV_{t-1} = Fundamental value at time t (pre emerging driver share price, net cash backing, other valuation)

$P_1(v_1) + (P_2(v_2) + (P_3(v_3) + ... =$ Various value changing events and their associated probabilities reflecting the sustainability, deliverability or scope for further changes in relation to each value event.

However, as mentioned at the outset, there is normally only one dominant share price driver operating at one particular time although drivers can change rapidly.

In relatively stable circumstances probability weights (*P*) can wane through discounting according to a compound interest formula with the expected interest rates the key variable and according to the following equation:

$$P_t = \frac{(2XV_{t=0} - XV_{t=0}e^{rt})}{XV_{t=0}}$$

Where

P_t = probability value at time t

$XV_{t=0}e^{rt}$ = the excess value (*XV*) over a fundamental share price value multiplied by the exponential function of the time period and expected interest rate

This can be applied to derive a share price at time *t* as follows:

$$SP_t = IV_t + \frac{(2XV_{t=0} - XV_{t=0}e^{rt})}{XV_{t=0}} \Delta v$$

Where:

IV_t = Intrinsic Value of the company per share at time t

Hence an APT model could be developed with a series of waning constants multiplied by variables (values from specific share price drivers) but this appears to over-complicate the model and to reiterate, empirical market observations suggests that only one share price driver operates predominantly at one time.

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4.4.3 Rejection of the Market Application of Option Pricing Theory

This thesis discussed option valuation in Chapter 2 (Section 2.2.2). Some researchers could argue that the share price performance in both Cases 1 and 2 represent a function of option pricing. Recalling, the formula for the price of a call option (W) is as follows:

$$W = PN(d_1)-Ce^{-rT}N(d_2)$$

Where:

W = price of the call option

P = current share price

C = exercise price

N(d) is a cumulative standard normal density function with upper integral limit d and therefore $N(d_1)$ and $N(d_2)$ are probabilities with numbers between one and zero.

In continuous time e^{-rT} is an appropriate discount factor for the period T at a rate r. Therefore the term Ce^{-rT} is the present value of the exercise price (C).

Recalling that under these groupings the formula simply compares the present value of the exercise price with the current share price and probability weights both in accordance with the volatility of the share price.

While this thesis is arguing that the share price movements reflect the impact of probability weighted value stimulated by share price drivers, there is a logic that option pricing may account for some of the phenomena evident in the pricing of resource stocks, say in addition to a fundamental valuation such as an NPV valuation. However, this thesis argues that there are number of points (outlined below) that reduce this likelihood. These are:

- The complexity of option pricing calculations negates the pricing estimation by the majority of market participants and apart for small specialised investment bank teams involved in the pricing of exchange traded options, there is minimal overlap with the main market participants.

- The authors empirical observation of market participants such as fund managers and other investors indicates that they do not contemplate option valuations but rather partake in a process involving an assessment of the probability of attaining value from current or anticipated share price drivers.
- Periods when share prices can trade at a discount to NPV valuations (whether market consensus or derived from independent experts) would imply negative option values. This would have to reflect negative real option values such as the cost of closing mines and which do not fit the likely scenarios at the time of the share price trading at discount to NPV valuations.
- There are numerous incidents where the variables involved in option pricing struggle to explain these incidents. This chapter cites the overshooting of bid prices in the Norths takeover or the falling MIM share price during a period of potential bid failure as most easily explained by falling probabilities of expected outcomes.
- Lastly, all resources companies can experience resurgence in share prices in response to increasing commodity prices and this can be after an extended period of share price drifting. Again, a probability weighted value function offers a simpler explanation than option theory which may be deemed to reflect a sudden change in the time period to expiry!

In summary, this thesis argues that the complexity of option pricing is not necessary nor observable in the pricing of resource shares although of course it can be ‘made to fit’ by a change in parameters such as probability distributions, time to expiry, etc.

However, as discussed in Chapter 2, (Section 2.2.1.3) there is one area where option pricing may be of value although it is not apparent in market behaviour or in valuations that highlight the option value. This is the embedded option value that is evident between the low and high valuations presented by Independent Experts in takeover documents. Tables 37 and 38 present the independent expert valuations produced by Norths as defence for the RIO takeover (Norths 2000) and MIM’s valuation for its merger with Xstrata (MIM, 2003).

Table 37. Independent Expert's low and high valuation for Norths in defence of the takeover offer from RIO.

	Interest	Valuation Low US$	High US$	Valuation Low A$m	High A$m
Rober River Iron Associates	53%			1218	1419
Iron Ore Company of Canada	56.1%	450	510	750	850
Total iron ore assets				1968	2269
Minera Alumbrera	25%	120	140	200	233
Northparkes	80%	125	145	208	242
Zinkgruvan	100%	200	220	333	367
Lake Cowal gold project	100%			35	45
Yakabindie nickel project	100%			20	30
Regional exploration	100%			47	73
Total base metal assets				843	990
Energy Resources of Australia	68.40%			375	440
North Forest Products	100%			340	380
Hedge book				-15	-10
Corporate overheads				-85	-85
Total other businesses				615	735
Total enterprise value				3427	3994
Cash at 30 June 2000				97	97
Loans and amounts receivable (net)				116	116
External borrowings at 30 June 2000				-94	-94
US bonds		-200	-200	-333	-333
Net debt				-214	-214
Value of net assets				3213	3780
Shares on issue (millions)				737.2	737.2
Net value per share				4.56	5.13
Net value per share - diluted for options				4.34	5.09

From Norths, (2000).

Table 38. Independent Expert's low and high valuation for MIM for its proposed merger with Xstrata.

	Valuation (US$m)		Valuation (A$m)	
	Low	High	Low	High
Coal Operations			2,000.0	2,310.0
Mount Isa Mining Operations	1,425.0	1,750.0	2,375.0	2,920.0
Alumbrera - 50% interest	360.0	400.0	600.0	670.0
McArthur River - 75% interest	80.0	100.0	130.0	160.0
Ravenswood			40.0	50.0
Total value of operations			5,145.0	6,110.0
Exploration and Technology			130.0	185.0
Discontinued operations			-90.0	-80.0
Corporate overheads			-220.0	-200.0
Total enterprise value			4,965.0	6,015.0
Hedge Book			-260.0	-230.0
Dividend paid in March 2003			-25.0	-25.0
Net debt (excluding Alumbrera project net debt)			-1,277.0	-1,277.0
Value of net assets			3,403.0	4,483.0
Shares on issue (millions)			1,997.7	1,997.7
Net value per share			1.70	2.24

From MIM, (2003).

In both these valuations and which is typical for most independent expert valuations for resource companies, the experts present high and low valuations. The difference between the high and low valuations represents a combination of potential production increases, more optimistic resource to reserve conversion, a potential element of lower risk exploration success as well as modestly higher commodity prices (and corresponding higher A$/US$ exchange rate).

While not discussed by the Independent Experts or attributed by the market in the company share prices, there is clearly an option value that should be additional to the lower valuations. The high valuation levels represent a 17 per cent and 32 per cent increase in the low valuations for Norths and MIM respectively, and hence an option value would reflect a portion of this increase adjusted for perceived time to delivery of the parameters and higher commodity prices.

It is disappointing that this value is not recognised by the independent experts or the market in general and may reflect the complexity in its estimation. It also does not support a strong option valuation component in resources share prices. Nevertheless company management recognise this project ‘embedded option value’ as highlighted by Goodyear (2006) with the market ultimately assigning value when $P(\Delta v)$ is material within a short to medium term timeframe.

5.0 Resource M&A Analysis

Analysis of M&A activity based on the share price performance of the involved companies is often difficult due to the complexity of the stock market and the interaction of a multitude of factors that can affect the share prices at any particular time. While Chapters 2 and 3 discussed market valuations and recent market trends, as outlined in Chapter 4, it is often earnings and cash flow leverage to desirable commodities that leads to strong share price performance.

This thesis reviews the bulk of the major M&A activity over the past twenty years. It incorporates a review of 30 transactions which are deemed to be the more important in the evolution of the Australian resource sector over this period and includes the takeover and merger of household names such as Comalco, Norths, MIM, Normandy Mining, CRA, Plutonic Resources, etc.

One of the key findings outlined Chapter 3 is the fact that mining shares do well in certain periods but not in others, reflecting their leverage to world growth and levels of industrial production. As also noted in Chapter 3, the mining ‘non-performance’ periods in the Australian market have tended to correlate with either the emergence of new technology (the Tech Boom) or with periods when the competition for capital has been greatest with the privatisation of many Government-owned enterprises (e.g. Telstra, Commonwealth Bank) or the demutualisation of mutual or co-operatives companies (e.g. AMP, Pivot). Hence, this thesis would argue that an important factor in the success or otherwise of M&A activity in mining companies depends on the performance of the target company at the time of the transaction which itself may reflect market attitudes to the resource sector at that time.

Therefore, irrespective of the characteristics of the companies involved in M&A activity, it is important to review the timing of the transaction with respect to the commodity price cycle and the performance of the Australian and International resource markets in general. This aspect, which is discussed later in this Chapter, can significantly contribute to the success of M&A activity.

5.1 Transaction Analysis

To characterise M&A transactions, this thesis has identified or estimated a number of parameters described in this section. Individual transaction summaries are presented in Appendix 1 which provides an overview of the transaction, views of market sentiment at that time as well as brief review of the assets of the companies involved. It has become evident to the author that information on transactions becomes increasingly more difficult to source as time elapses and Appendix 1 can provide a useful record of these transactions for future research. An example is the RTZ – CRA merger creating a dual listing in 1995. Information on the actual transaction is no longer available on company websites, ASX releases only extend back for 10 years and there are very few media reports from around that time. In this case it was the accumulated research of the author that provided details of the bonus issue and capital structure of both companies at that time.

Another difficulty which is a limiting factor is the ability to source share price data for the relevant companies at the time of the transaction. This is particularly the case for companies where the ASX code has been reused for different companies (ASX codes can be reused after 7 years). The main source of data for analysis has been Bloomberg which collates data independently. However ASX share price data have been sold to third party suppliers and discussions with Premium Data Support (Author's personal email comm. 1 January 2010) indicates that these data are only available from around 1995.

The transaction analysis outlined in Appendix 1 can be separated into two broad categories of data estimation and collation utilising Microsoft Excel 2003.

The first investigates the offer and participants by collating four sets of data, namely:

- Transaction characteristics which include offer price, premium to a 30-day average price, composition of the offer, offer values, target director recommendations and takeover completion. If there are multiple bids, these are generally independently documented. Also the offer size is adjusted for material interests previously held by the bidder in the target.
- Final offer price relative to the mid point of an independent valuation if an independent valuation has been commissioned and the range of the high

valuation above the low valuation as a percentage of the low valuation (valuation spread).

- Company sizes relative to each other and the final offer size to bidder size. The company sizes are estimated using shares on issue for each company at that time and the closing share prices of each company prior to the first announcement event window. The size estimations exclude the value of issued options or net debt positions of each company. Foreign share prices are translated into A$ using prevailing spot exchange rates at that time.
- Primary and secondary commodity focus of the target and bidder. The primary commodity focus is based on the company's production or asset base, but can also include market perceptions at that time as noted by the author.

The second data estimation involves event analysis methodology outlined in the next section and involves estimation of abnormal returns and changes in t-statistics in regression analysis. This involves:

- Estimating cumulative abnormal returns for the target and the bidder at an event window at the time of the initial announcement and potentially, subsequent material announcements. This is translated into in an A$ value using the market capitalisation values outlined above.
- Estimating cumulative abnormal returns in a 252-day post-event period for the bidder and the value of these returns based on the initial market capitalisation of the bidder.
- A change in the observed t-statistic of key index and commodity price series in the regression analysis in the 252-day post-event period relative to the 252-day estimation period.

As a general comment, share price data series are adjusted over time for company issues, splits, etc. to provide a meaningful data series over time. In some cases the share prices from the data series are different at the times of the transactions from the share prices recorded with the offer details. In these cases, the actual share prices have been extracted from takeover documents and media reports (references are at the end of each transaction in Appendix 1). Nevertheless, the share price data series are valid for the event analysis conducted in Appendix 1.

Specific data from Appendix 1 have been extracted from the separate transaction workbooks for analysis outlined later in this in Chapter. These data and definitions are summarised in Table 39.

Table 39. Data collated in analysis in Appendix 1.

Parameter	Definition
Date	Initial annoucement of impending offer or transaction
Target	Target company
Primary commodity	Primary commodity that investors consider the basis for their investment in the Target
Bidder	Bidder company
Primary commodity	Primary commodity that investors consider the basis for their investment in the Bidder
Type of takeover	Takeover, Scheme of Arrangement or Dual Listing
Initial premium to 30 day average	Initial offer price premium to 30 day average share price prior to the annoucement (note: this is not a VWAP)
Final Premium to 30 day average	Final offer price premium to 30 day average share price prior to the annoucement (note: this is not a VWAP)
Final offer value (A$m)	Total shares of Target times the value of offer. Scrip offers based on share prices prior to initial bid.
Competitive	The transaction is competitive if there are more than one bidder.
Hostile	If the offer is rejected at the annoucement of the initial offer it is considered hostile.
Final bid to mid point on Independent valuation	Independent valuers typical provide a high valuation and a low valuation to present a range. This measures the ratio of the final offer price to the average of these valuations.
Valuation range from low value	This measures the different in the high valuation from the low valuation as a percentage of the low valuation.
Target size as percentage of Bidder	This is the estimated market capitalisation of the Target divided by the estimated market capitalisation of the Bidder. The Target size may be adjusted for material prior Bidder interests in the Target.
Target CAR at event (s)	This is the cumulative abnormal returns experienced by the Target at bid announcement(s).
Change in Target value due to CAR (A$m)	This is the cumulative abnormal returns estimated above by the estimated market capitalisation of the Target prior to the initial offer announcement.
Bidder CAR at event (s)	This is the cumulative abnormal returns experienced by the Bidder at bid announcement(s).
Change in Bidder value due to CAR at event (A$m)	This is the cumulative abnormal returns estimated above by the estimated market capitalisation of the Bidder prior to the initial offer announcement.
Bidder CAR in post event period	There may be specific factors which have influenced the M&A activity, and which may create a unique value proposition for the bidder.
Change in Bidder value due to CAR in post event period (A$m)	This is the cumulative abnormal returns estimated in a 252-day post event period normally commencing when the takeover is close to completion and there is a high degree of certainty.
Bidder changes in senstivity - Key Index	This is the change in observed t-statistic for the Bidder from the estimation period to the post event period. The index is selection based on relevance to the Bidder.
Key Index	This is the key index from above.
Bidder changes in senstivity - Key Commodity	This is the change in observed t-statistic for the Bidder from the estimation period to the post event period. The commodity is selection based on relevance to the Bidder.
Key commodity	This is the commodity index from above. In the case of gold, it may be expressed in US$ or local currency.
Value in Australia	This is value of the offer that is primarily retained in Australia. This would include an Australia ASX listed and domiciled company acquisition. While Newmont, Anglo Gold, Alcoa, etc. are ASX listed, they are not considered to be 'Australian' in this context. However BHP Billliton and Riot Tinto are considered 'Australian'.
Value offshore	This is where the company is predominantly by non-Australians and are traded on foreign exchanges but may have 'token' listings on the ASX, e.g Anglo Gold, Newmont, Xtrata, Homestake Mining Company, etc.
Scrip	The final value of the offer payment in Bidder scrip.
Scrip or cash	The final offer comprises an alternative between Bidder scrip and cash.
Cash	The cash value of the final offer.
Foreign scrip	The final offer comprises foreign scrip as defined in 'Value offshore' above.

5.1.1 Event Analysis and Application to Resource Companies

In Chapter 2, (Section 2.3.2) this thesis reviewed event study methodology which has the aim to determine whether an event or announcement caused an abnormal movement in the stock price of a company. The abnormal returns (AR) are calculated as the difference between the actual return and the expected return on a stock. The stock's expected return is typically measured using the market model and which relies only on movements in a relevant stock market index to estimate the expected returns for a particular company's share price if the event were not to occur. Reiterating from Chapter 2, the null hypothesis in event studies is that the event has no impact on the distribution of company share price returns.

The methodology utilised in this thesis adapts Benninga's (2008) prescriptive approach for a two factor model. However, a discussion of single factor market model is firstly warranted to provide the background to the model. An estimation window is used to estimate the deemed returns from a stock under 'normal' circumstances from the regression of the stock returns and the returns of the market index. Hence, for stock *i* the expected return can be expressed as:

$$r_{it} = \alpha_i + \beta_i r_{Mt}$$

Where r_{it} and r_{Mt} represent the stock and the market return on day *t* and the coefficients α_i and β_i are estimated by calculating an ordinary least-square regression over the estimation window.

Once the above is established, the impact of an event on the return on a stock in an event window can be defined as:

$$AR_{it} = r_{it} - (\alpha_i + \beta_i r_{Mt})$$

Where AR_{it} is the abnormal return representing the difference between the actual return r_{it} and the expected return predicted by the earlier formula at time *t*. Lastly the abnormal daily returns during the event window can by summed to establish a cumulative abnormal return (*CAR*) defined as:

$$CAR_t = \sum_{j=1}^{t} AR_{T1+j}$$

Benninga (2008) extends the single factor model to a two-factor model where it is assumed that the stock returns are for example, a function of both a market and an industry factor:

$$r_{it} = \alpha_i + \beta_{iMarket} r_{Mt} + \beta_{iIndustry} r_{Industry,t}$$

This thesis has generally used a two-factor model although this may be extended to three factors but in some cases a single factor model has been used in the estimation period for resource companies. This is logical because as outlined in Chapters 3 and 4, the share price movements of resource companies often correlate strongly to movements in relevant commodity prices as well as overall market movements. Hence, this thesis considers that an ideal estimation period involves regression of share price movements with a relevant index, e.g. Australian Gold Index, S&P/ASX 300 Resources Index etc. and the relevant commodity price movements such as the spot gold price.

However, as noted in Chapter 4, in the case of resource companies, the correlation of stock price returns and the returns from the movement of commodity prices exhibit a poor correlation. This is demonstrated in Table 40 which outlines regression analysis in a 252-day estimation period for Savage Resources prior to the takeover offer from Pasminco, while Table 41 presents a similar outline for Comalco Resources prior to Rio Tinto's takeover bid.

Table 40 compares the observed t-statistic for the returns and the actual data for the 3 month forward LME zinc price, the ASX Accumulation All Resources Index and ASX Other Metals Index against the stock price returns on a daily basis. With a critical t-value at 1.969 (5 percent level) it is evident that Savage Resources stock returns cannot be considered to be significantly correlated with the returns from the zinc price or the All Resources Index – a consideration that would not be shared with most market participants at that time (see Appendix 1 for company profile).

However, regression of the actual data provides significantly higher observed t-statistics where all parameters would be considered significant.

Table 40. Observed *t-statistic* in regression analysis of commodity price and index price returns and regression of price and index data in a 252-day estimation period from 30 October 1997, prior to the Pasminco offer for Savage Resources.

Parmeter	Using Daily Price Returns Observed t-statistic	Using Daily Prices Observed t-statistic
3mth forward LME zinc price	0.57	2.78
ASX Acumulation All Resources Index	-0.15	6.23
ASX Other Metals Index	7.76	14.35

A similar situation is evident with major aluminium producer, Comalco where there is a non significant relationship between the stock returns and the returns from the 3 month forward LME aluminium price. However, using the actual daily prices, there is a significant relationship (Table 41).

Table 41. Observed *t-statistic* in regression analysis of commodity price and index price returns and regression of actual price and index data in a 252-day estimation period from 9 March 1999, prior to the announcement of a Rio Tinto offer for Comalco Resources.

Parmeter	Using Daily Price Returns Observed t-statistic	Using Daily Prices Observed t-statistic
3mth forward LME aluminium price	0.45	4.65
ASX Accumulation All Resources Index	3.08	7.58
ASX Other Metals Index	2.61	16.97

As evident from the Chapter 4, and the discussion above, regression of returns in an estimation window with resource companies may not produce results which are consistent with market expectations. While Table 40 and 41 present data on only two resource companies, these data are consistent with the data observed with most resource companies.

In this research, the testing of the multi-factor market event analysis model for resource companies found that the model could be substantially improved by drawing on the analysis discussed in Chapter 4. Recalling, Section 4.3 identified that comparing the absolute level of share prices and commodity prices provided a better correlation than comparing share price and commodity price returns. Adapting this to the multi-factor model involves using the regression analysis in the estimation period to estimate the sensitivity of share price movements to a number of factors and then using these factor coefficients to estimate a ‘theoretical share price’ series. In most cases, the factors are derived from the regression of daily commodity prices and index levels with the daily share price of a resource company and are tested against a critical *t* value for significance.

The daily returns from the theoretical share price series can then be compared to the actual share price returns to determine abnormal returns. Importantly, these abnormal returns can be tested using a separate standard error measurement (Steyx used in Microsoft Excel) of a comparison of theoretical returns versus the actual returns and not the standard error derived in the original regression used to determine factors for estimating the theoretical share price.

While the procedure will become clearer in the next section on its practical application, essentially the developed methodology involves:

1. Using regression analysis in a 252-day estimation window to determine factors which are significant and their slope and intercept values.
2. Calculate a theoretical data price series based on the daily parameters and the slope values and intercept (if significant).
3. In the event window(s) compare the stock price returns with the returns calculated from the theoretical share price series.
4. Test these returns for significance by dividing by the standard error of the regression of the theoretical share price series returns and the actual share price returns and then compare this value to the *critical t value*.

The attraction of the methodology is that the theoretical share price is likely to be a more meaningful measure of the impact of movements of the significant factors whereas individual factors are prone to changing relationships. In Chapter 4, these were interpreted as changes in both probability weighted value changes where both probability and the value can independently change over time.

5.1.2 Methodology

Similar to Benninga's (2008) two-factor market model approach, this research utilises Microsoft Excel's LINEST array function for ordinary least-squares regression. LINEST produces an Excel block output of statistics outlined below.

- The slope of each parameter
- Standard error of the slope
- Intercept
- R^2 (a measure of how well the regression fits the observed data ranging from 0 to 1 for a perfect fit).
- Standard error of y values
- F statistic (observed F-value is a measure of the significance of the regression as a whole and can be compared against a *critical F-value*)
- Degrees of Freedom
- SS_{xy} which is the summed product of observations from the mean
- $SS_{residual}$ which is the residual sum of squares

Readers interested in a description of LINEST and the block output are referred to Benninga (2008), Microsoft Excel Help or Tushar-mehta (2009).
In determining significant coefficients, the coefficients are divided by their respective standard errors which yields an observed t-result, or

$$\text{Oberved t result} = \frac{\text{abs(coefficient value)}}{\text{corresponding standard error}}$$

The comparison of the absolute value (abs(coefficient value)) of this t-result with the corresponding critical t-value determines whether the coefficient should be treated as zero. The critical t-value is calculated with the formula =TINV(0.05, d.f.), where 0.05 corresponds to the 95 per cent confidence level and d.f. is the degrees-of-freedom for the regression (Tushar-mehta, 2009). With 252-day estimation windows, the degrees of freedom for the regressions are normally above 248 given the small number of factors.

If the coefficients and intercept are significant using this methodology then they are used to estimate a daily theoretical share price by multiplying the daily data by the significant coefficients and adding the intercept.

As mentioned earlier, the daily returns from the actual share price movements and theoretical price movements are then independently regressed to determine a standard error. This research has used the Excel STEYX function which estimates the standard error of the predicted y-value for each x in the regression.

Appendix 1 provides a summary of the regression statistics for each transaction as well as the STEYX values to provide readers with the data to assess the robustness of the regressions.

Finally, to determine whether abnormal returns are significant the actual returns less theoretical returns are divided by the standard error of the regression of the returns estimated using STEYX as outlined above. This value is then compared to a critical *t-value* estimated using the Excel TINV function described earlier. If the return divided by the standard error exceeds the critical *t-value* then it is considered significant, if not it is ignored.

Lastly, a regression using the same parameters in the estimation period is conducted in the post-event period to determine changes in the observed *t-results* to provide an estimate of any changes in the sensitivity of movements in the company share price to movements in the various parameters after the transaction.

5.1.3 Event Windows and Parameters

The event studies use the following windows or periods:

- Estimation window: 252 days (i.e. a full year in trading days terms) prior to Event window
- Event window: 3 days – one day prior to event, event day and one day post the event day, although sometimes this window is extended by a day or two to capture share price movements related to the event
- Post-event window: 252 days which generally commences at the time there is a high level of market certainty that the transaction will proceed.

This thesis has explored factors of significance to share prices using multiple regression analysis on factors including relevant commodity prices and selected Australian and International indices depending on the characteristics of the companies involved in the transaction.

The indices used in this study also depend on the timing of the transaction. As outlined in Chapter 1 (Section 1.10.1) the ASX in conjunction with Standard and Poors introduced the S&P/ASX 100, 200 and 300 series of indices which generally replaced the earlier indices. The now defunct ASX Other Metals index was particularly relevant to companies that were considered 'pure metal plays,' while the ASX Gold index was important to the significant gold sector during the 1980s and 1990s, but both ceased being recorded in mid 2002. The ASX All Resources Index also ceased being recorded at the same time, so their values are only available prior to 2002.

The recent S&P/ASX resource indices are mostly dominated by BHP Billiton and Rio Tinto apart from the S&P/ASX Mid Cap Resources and S&P/ASX Small Cap Resources indices. The last two indices are not ideal with the former comprising only a few companies (it was less than 6 in early 2009, but its current breakdown is not freely available) and the latter is distorted by a large component of oil and gas companies.

The international indices utilised in the present research include the MSCI Metals and Mining Index, HSBC Global Mining Index, the FTSE 350 Mining Index, the Philadelphia Gold and Silver Index, the JST Gold Mining Total Returns Index (Johannesburg) and the S&P/TSX Global Gold Index. The choice of index has been in accordance with the profile of the companies involved in the transaction. These indices also display different longevities with the FTSE 350 Mining Index, HSBC Global Mining Index and the Philadelphia Gold and Silver Index having data extending well back into the early 1990s.

The most common regression has involved the copper price given its status as a bellwether of the metals because of its relatively large market size and liquidity (see

Chapter 3, Section 3.6). Like the other base metals, there has been frequent testing of the differences in the significance between the 3-month forward price and the spot price and, similarly to gold, is priced in both US$ or in the domestic currency. The results of this analysis are presented later in this chapter.

An area of difficulty is dealing with commodities involved in annual benchmark price negotiations such as iron ore and coal. Typically iron ore companies are more sensitive to movements in the copper price (as a bellwether reflecting global economic activity) than say spot iron ore prices out of India, etc. As an example, the regression of Norths against the ASX All Resources Index and the three month forward LME copper price indicated a greater sensitivity to both than to the Indian spot iron ore price despite the company's high exposure to iron ore. A similar situation applies to spot coal prices and part of the reason is likely to involve the difficulties most market participants have in obtaining spot iron ore and coal price data.

Overall, the broadest factors which are least influenced by the transaction and the share price performance of the participants are selected for estimating a theoretical share price series. In some cases, a series of regressions are used to test a variety of factors and ideally the final selection includes at least one commodity price series and one share price index series.

5.2 Transaction Summaries

The following table lists the transactions investigated in this thesis with individual transaction details and data summaries presented in Appendix 1. Each transaction summary includes a reference list which largely comprises company announcements and media reports at the time of the transaction.

This thesis has focused on 30 transactions and while these represent the majority of the more significant transactions over the last 20 years in the Australian resource sector, there are more that have not been analysed as a consequence of data availability and time constraints. Nevertheless the selection of the 30 transactions attempts to provide representative coverage of issues considered important in the analysis. These include:

- Mopping up minority interests in subsidiaries
- Foreign takeovers of Australian subsidiaries
- Competitive takeovers
- Dual listing and mergers.
- Mid and small cap Australian takeovers

It is also important that the transactions are not subject to complicating factors which confound the analysis or are difficult for the market to interpret (e.g. unduly complicated bids) or reflect short-term market fads such as the two-year uranium boom ending in 1997.

Table 42. Transactions analysed and presented in Appendix 1.

Date of announcement	Target	Bidder	Type
19-Mar-01	Billiton plc	BHP	Dual Listing
09-Oct-95	CRA	RTZ	Dual Listing
05-Jul-06	Excel Coal	Peabody Energy	Merger
14-Nov-95	Gold Mines of Kalgoorlie	Normandy Mining	Merger
07-Apr-03	MIM	Xstrata	Merger
14-Nov-95	Northern Flinders Mines	Normandy Mining	Merger
14-Nov-95	PosGold	Normandy Mining	Merger
18-Jun-97	QNI	Billiton plc	Merger
24-Jul-98	RGC	Westralian Sands	Merger
03-Mar-08	Zinifex	Oxiana	Merger
28-Apr-98	Aberfoyle	Western Metals	Takeover
03-Sep-99	Acacia Resources	Anglo Gold	Takeover
27-May-02	AurionGold	Placer Dome	Takeover
23-Feb-05	Austral Coal	Centennial Coal	Takeover
24-Jul-06	Aztec Resources	Mt Gibson Iron	Takeover
25-Feb-00	Comalco	Rio Tinto	Takeover
23-Feb-07	Consolidated Minerals	Palmary Enterprises	Takeover
17-Jan-96	Gascoyne	Sons of Gwalia	Takeover
11-Dec-01	Hill 50	Harmony Gold Mining	Takeover
14-Aug-95	Homestake Gold Australia	Homestake Mining Compa	Takeover
29-Oct-07	Jubilee Mines	Xstrata	Takeover
05-Sep-01	Normandy Mining	Newmont	Takeover
23-Jun-00	Norths	Rio Tinto	Takeover
28-Nov-96	Placer Pacific	Placer Dome	Takeover
23-Dec-97	Plutonic Resources	Homestake Mining Compa	Takeover
28-Aug-00	QCT Resources	BHP	Takeover
09-Nov-07	Rio Tinto	BHP Billiton	Takeover
07-Apr-03	Savage Resources	Pasminco	Takeover
21-Aug-97	Wiluna Mines	Great Central Mines	Takeover
28-Oct-04	WMC Resources	BHP Billiton	Takeover

The total value of these transactions is A$240 billion although this figure is dominated by the 1997 BHP Billiton bid for Rio Tinto. If this attempted takeover is excluded from the list then the total value of the transactions analysed is A$60 billion.

To extend the analysis in several areas, this thesis has listed a further 22 transactions as outlined in Table 43 which contribute a further A$8.2 billion of transactions. The author believes that combined with the 30 analysed transactions, the total would cover more than 90 per cent of transactions and more than 95 per cent of the value of resource transactions over the last 20 years.

Table 43. Additional transactions not analysed in Appendix 1.

Date	Target	Main Commodity Exposure	Bidder	Main Commodity Exposure	Value (A$m)
16-Jan-91	Carr Boyd	Au	Ashton Mining	Diamonds	50
16-Apr-92	ACM	Au, Ni, Zn	WMC & Normandy	Au, Ni, Cu, Al	260
07-Apr-94	Aztec Mining	Zn, Au	PosGold	Au	287
10-Apr-96	Golden Shamrock	Au	Ashanti	Au	372
22-Nov-96	Ashton Mining	Diamonds	ADEX	Diamonds	14
09-Dec-97	Eagle Mining	Au	Great Central Mines	Au	229
12-Jan-99	Great Central Mines	Au	Normandy Mining/Yandal Gold	Au	463
25-Feb-99	Abednego Nickel	Ni	ANL & Glencore	Ni	64
31-Jul-00	Ashton Mining	Diamonds	Rio Tinto	Diamonds	522
19-Dec-00	Newhampton Goldfields	Au	Harmony Gold Mining	Au	54
26-Feb-03	Abelle	Au	Harmony Gold Mining	Au	155
03-Jun-03	Darymple Resources	Au, Ni	LionOre (now Xstrata)	Ni	162
12-Jan-05	Portman	Fe	Cliffs (US based)	Fe	605
09-Oct-06	Leviathan Resources	Au	Perseverance Mining	Au	46
18-Oct-06	Ballarat Goldfields	Au	Lihir Gold	Au	350
27-Feb-07	Summit Resources	U	Paladin	U	1,160
19-Jul-07	Kimberley Diamonds	Diamonds	Gems Diamonds (UK)	Diamonds	300
26-Sep-07	Resource Pacific Holdings	Coal	Xstrata	Coal	960
28-Oct-07	Perseverance	Au	Northgate Minerals	Au	282
17-Dec-07	Allegiance Mining	Ni	Zinifex	Zn	775
19-Mar-08	Equigold	Au	Lihir Gold	Au	1,100
02-Dec-08	Fusion Energy	U	Paladin	U	18

The following sections present and discuss the findings of the data analysis.

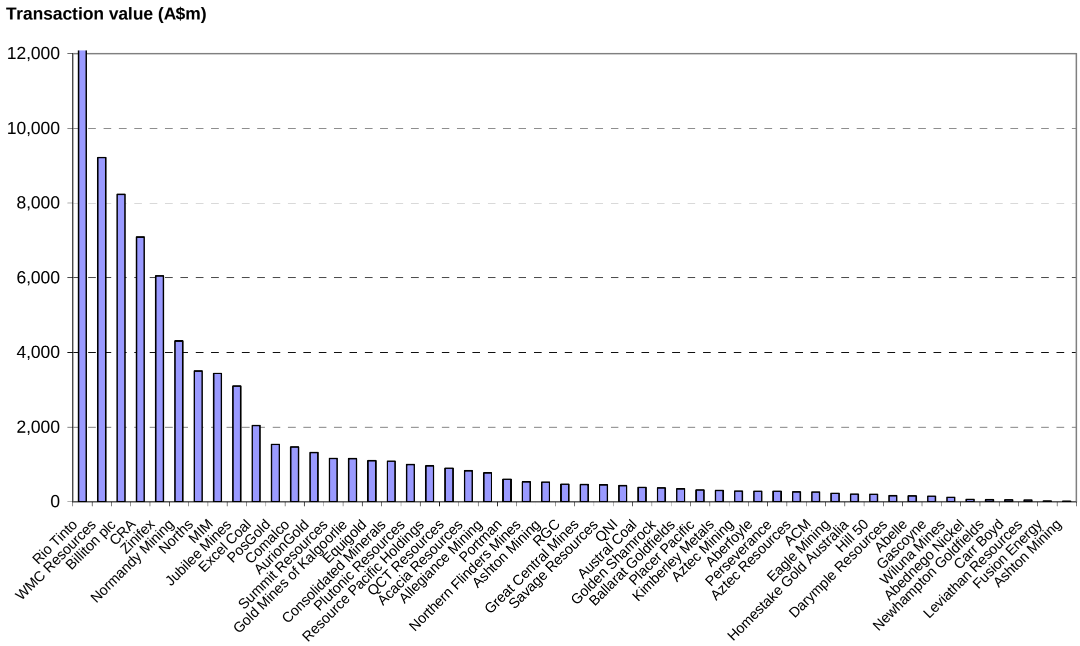
5.2.1 Transaction Values

The 52 transactions plotted in order of decreasing value are presented in Figure 93. The overshadowing impact of the potential BHP Billiton bid for Rio Tinto (A$181.5 billion) is evident in the chart even though the Y axis has a maximum value of $12 billion. This is the only transaction study that was not completed because BHP withdrew its offer on the 25 November 2008 and is therefore used in some analysis and not in others.

The average transaction values are:

- $1,340 million (51 transactions and excluding the 2007 BHP Billiton bid for Rio Tinto)
- $4,804 million including the 2007 BHP Billiton offer for Rio Tinto (52 transactions)

Figure 93. The 52 transactions in descending order of transaction value.



Categorising the transactions into value ranges highlights that the most common transaction size range was from $250 million to $500 million representing more than 27 per cent of all transactions and more than half (51.9 per cent) of the transactions were less than $500 million in value (Figure 94). This is in line with expectations given the size distribution of companies in the sector and tendency for companies to acquire smaller companies than themselves (see later in the Chapter).

Figure 94. Frequency distribution of transaction values in value ranges for the 52 transactions.

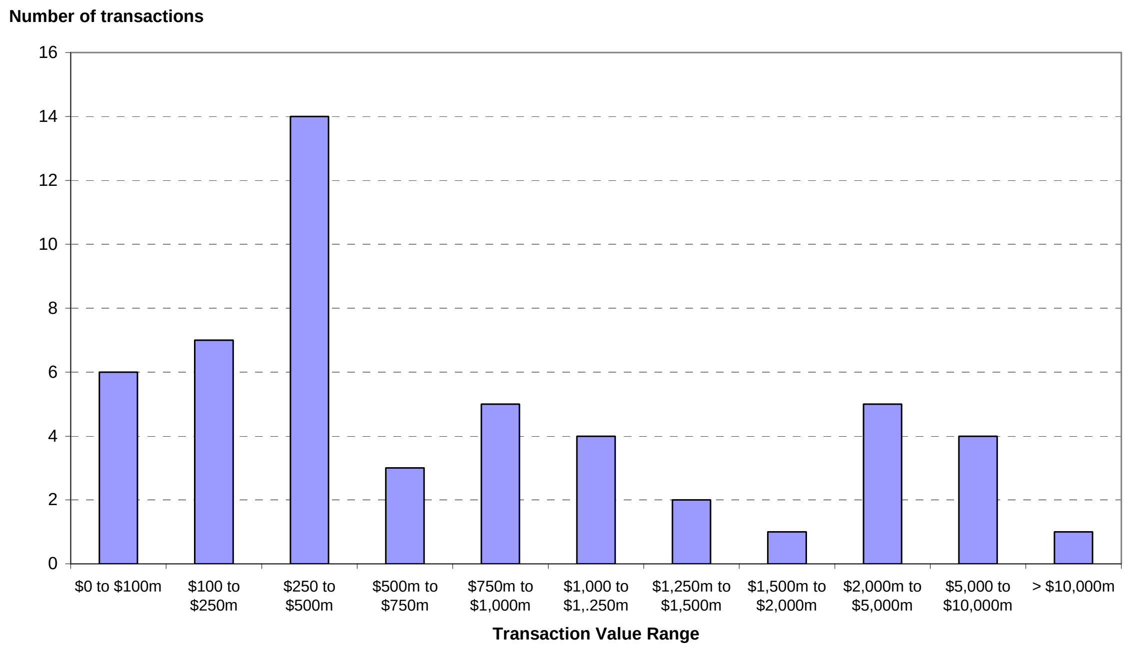
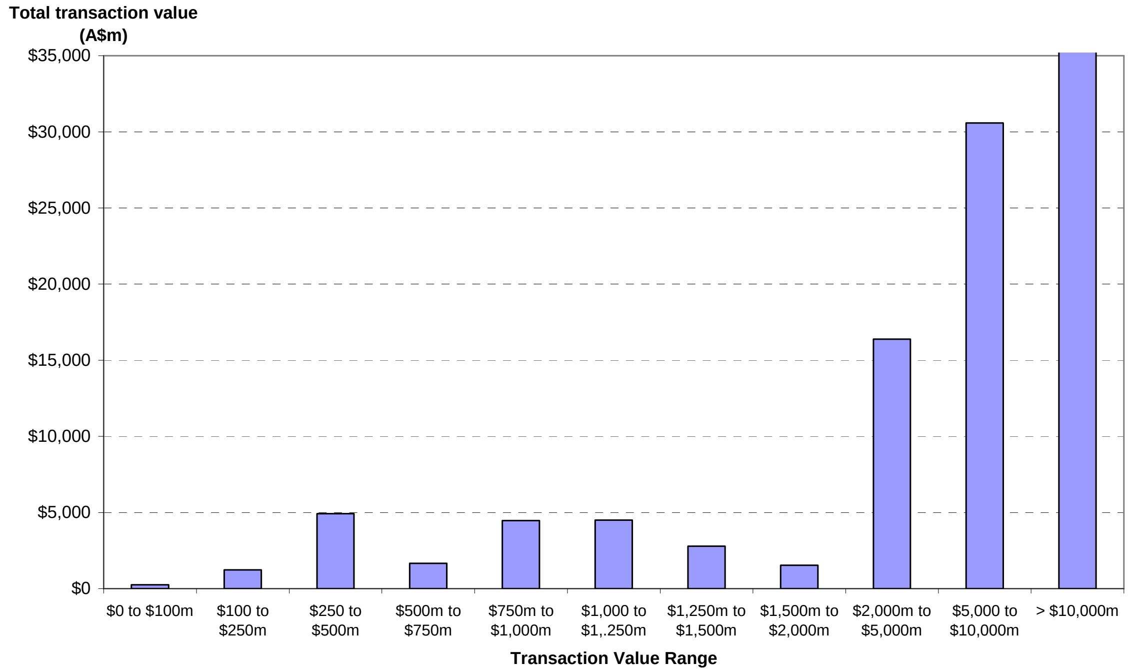


Figure 95 charts the total value of the transactions in the value ranges presented in Figure 94. In combination with Figure 94, it is evident that a few high-value transactions dominate the total value of the 52 transactions.

Figure 95. Total transaction values for each value range for the 52 transactions



5.2.1.1 Transaction values in commodity sectors.

This thesis has grouped company commodity exposure into seven commodity groups, viz:

- Uranium
- Mineral sands
- Gold
- Diversified/iron ore
- Diamonds
- Coal
- Base metals

In this categorisation, iron ore producers are grouped with diversified miners because historically most diversified miners have large iron ore production bases in their commodity mix. This has changed in recent years where increasing iron ore prices have encouraged the establishment of pure iron ore producers (e.g. Portman Mining, Mt Gibson, Aztec Resources, etc.). An alternative is to group these companies in a bulk commodity category, but this would not separate coal transactions which have also become more prevalent in recent years. Hence, the diversified category is a broader group which involves iron ore and associated commodities and including companies ranging from BHP Billiton, Rio Tinto and Norths through to Mt Gibson Iron and Consolidated Minerals.

Figure 96 plots the number of transactions in each of the target commodity categories outlined above. Not surprisingly, the gold sector has experienced the greatest level of rationalisation on a number of transactions basis and is followed by the base metals sector. This also largely reflects the number of companies operating in these sectors.

Figure 96. Number of transactions in each commodity category.

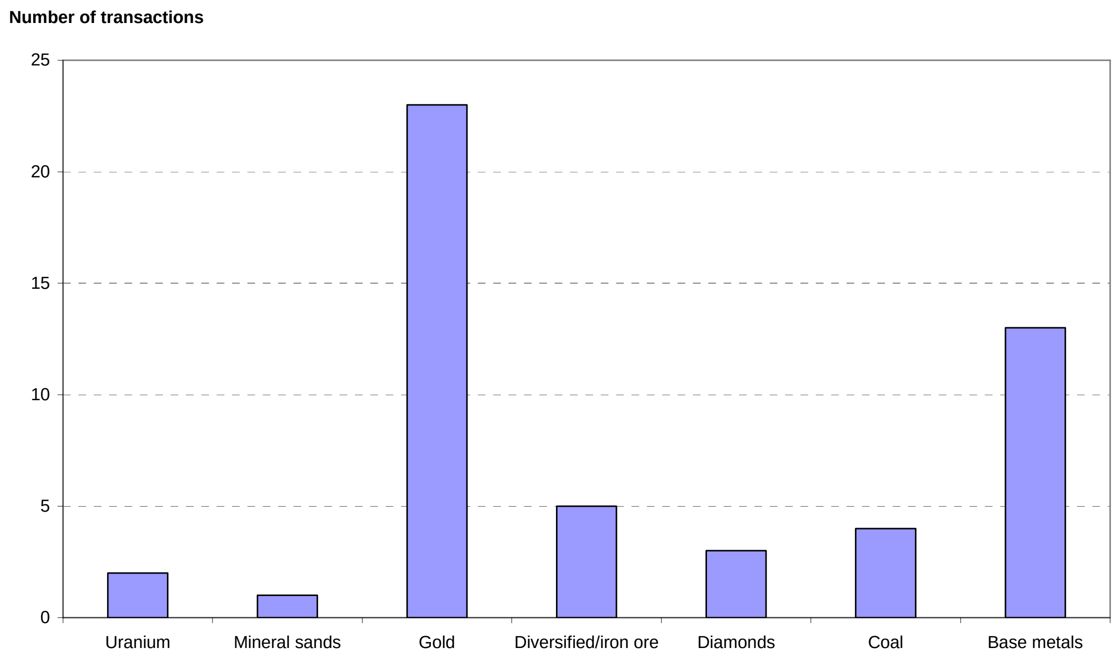
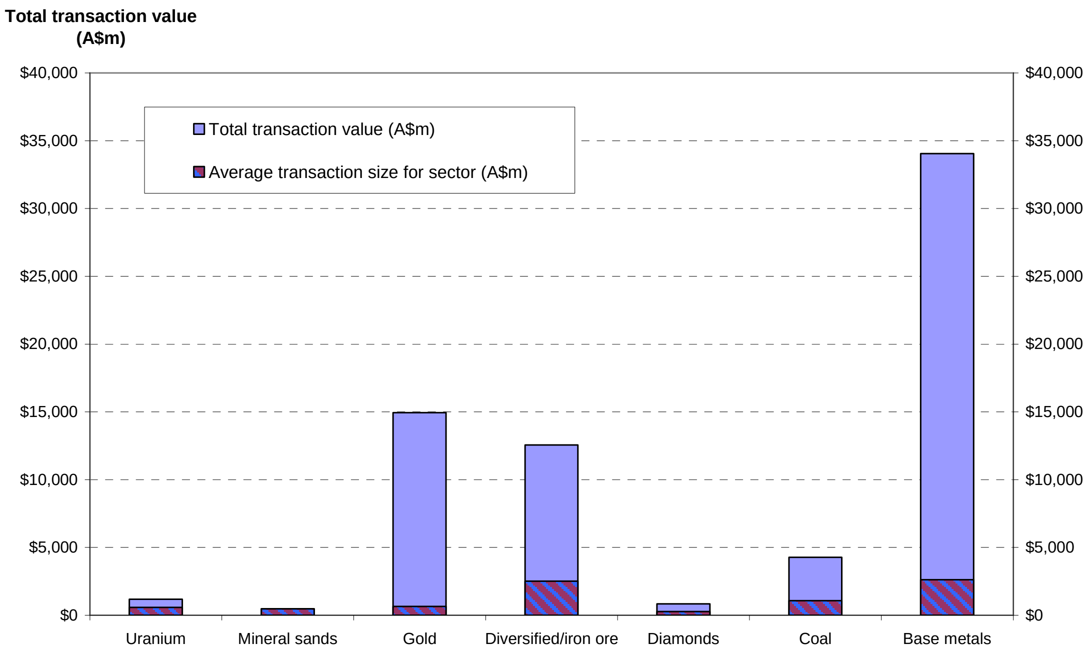


Figure 97 charts the total transaction value for each commodity group along with the average transaction size for the group excluding the 1997 BHP Billiton bid for Rio Tinto. These data are also outlined in Table 44.

Figure 97. Total and average transaction values for each commodity group.



A review of the uranium data shows that transaction values are skewed by the 2007 Paladin takeover of Summit Resources which is likely to reflect the euphoria with the uranium boom. Interestingly Summit's main projects are in Queensland where uranium mining remains banned. The only mineral sands transaction is the 1998 merger of RGC and Westralian Sands which has been included for later merger analysis.

Overall, the diversified and base metal average transaction sizes are similar while the average gold transaction has a lower value of $650 million. This reflects the typical company sizes in these commodities and as discussed in Chapter 3 (Section 3.3) there are commodity market size constraints which can limit the size of companies operating within each sector. The evolution of these commodity sectors over time is discussed later.

Table 44. Total and average transaction values for each commodity group.

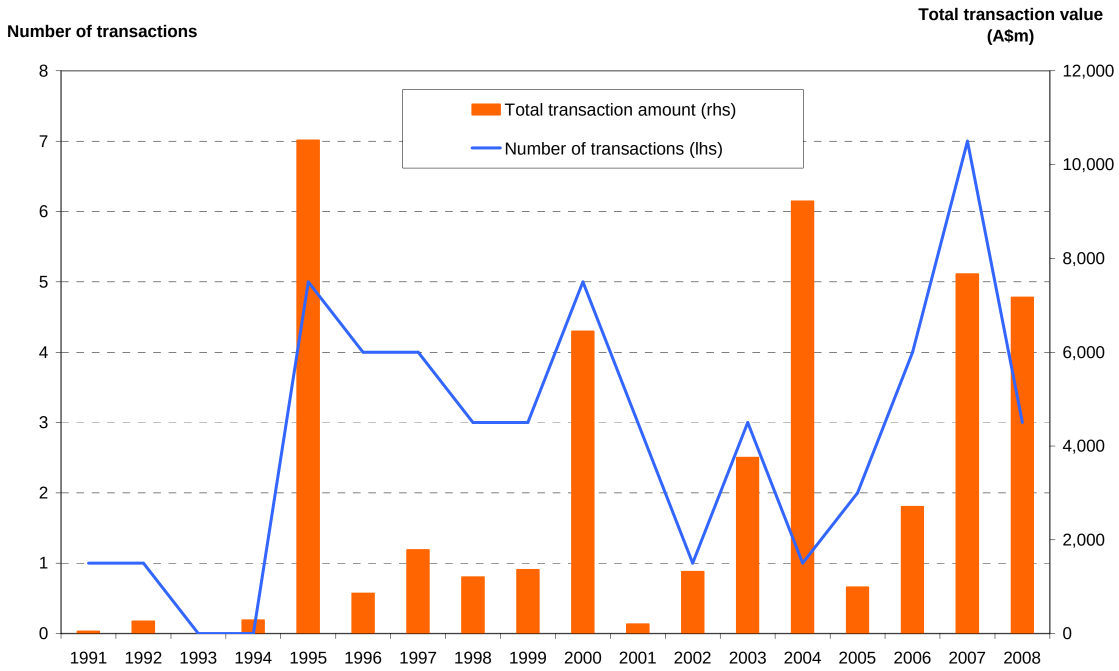
Commodity group	Number of transactions	Total transaction value (A$m)	Average transaction size for sector (A$m)
Uranium	2	$1,178	$589
Mineral sands	1	$470	$470
Gold	23	$14,944	$650
Diversified/iron ore	5	$12,551	$2,510
Diamonds	3	$836	$279
Coal	4	$4,283	$1,071
Base metals	13	$34,061	$2,620

In comparing target commodity exposure with bidder commodity exposure, it was not surprising that 90 per cent, including all the gold companies had a similar exposure. Companies with differing exposures tended to involve a larger bidder (e.g. Xstrata/MIM or Ashton Mining/Carr Boyd) seeking diversification into new specific commodities.

5.2.1.2 Trends in Australian M&A activity

M&A activity in Australian since 1990 can be broadly separated into three significant phases: a first period between 1995 and 2000, a second period between 2002 and 2004 which occurred at the early stages of the 2002-2008 resource boom and a thirdly, a more recent period from 2006 to 2008 which occurred towards the end of the resources boom. This is evident in Figure 98 which plots the number of transactions and total value of the transactions on a calendar year basis since 1991.

Figure 98. Number of transactions and total value per calendar year since 1991.



To recap on the defined periods in Chapter 3, Table 21 has been reproduced here as Table 45 as the market sentiment at these times is important in understanding the rationale for a significant portion of the M&A activity.

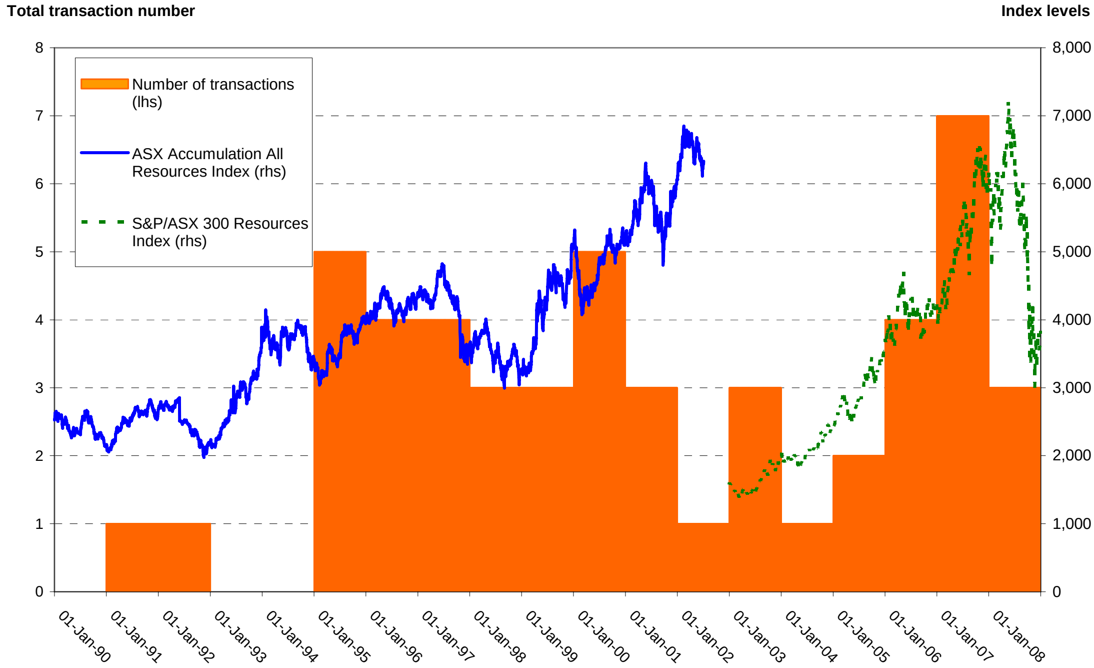
Table 45. Defined periods over the last 23 years.

Period	Start	End	Months
86-87 bull run	4 August 1986	19 October 1987	14
1987 recovery	29 October 1987	11 January 1990	27
90-92 drift	12 January 1990	10 June 1992	29
92-96 bull run	18 November 1992	8 May 1996	42
Asian Crisis	25 June 1997	27 August 1998	14
98-2000 bull run	28 August 1998	13 January 2000	17
Tech boom drift	14 January 2000	18 October 2002	33
Resource boom	21 October 2002	19 May 2008	67
Global Financial Crisis	27 May 2008	5 December 2008	7
2009 recovery	8 December 2008	24 September 2009	9

To compare the frequency of transactions against the Australian resource indices, Figure 99 charts the ASX Accumulation All Resources Index (ending on 5 July 2002) and the S&P/ASX 300 Resources Index (commencing on 1 January 2003) along with the year transaction numbers presented in Figure 98.

It is evident that the peaking number of transactions appears to correlate with lower, albeit temporary, points in the Australian indices apart from the period in the latter part of the 2002-2008 Resources Boom.

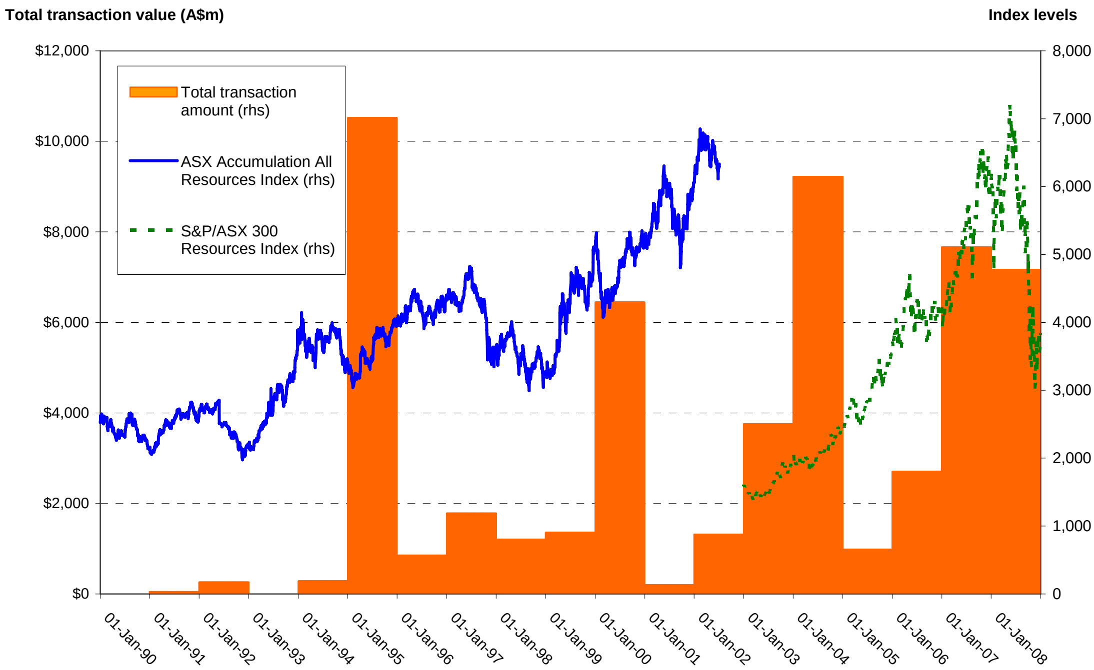
Figure 99. Total transaction value per year and Australian Resource Indices.



Index data sourced from Stock Resource.

This tends to be supported in Figure 100 which charts total transaction value per year and the two Australian resource indices.

Figure 100. Total transaction value per year and Australian Resource Indices.



Index data sourced from Stock Resource.

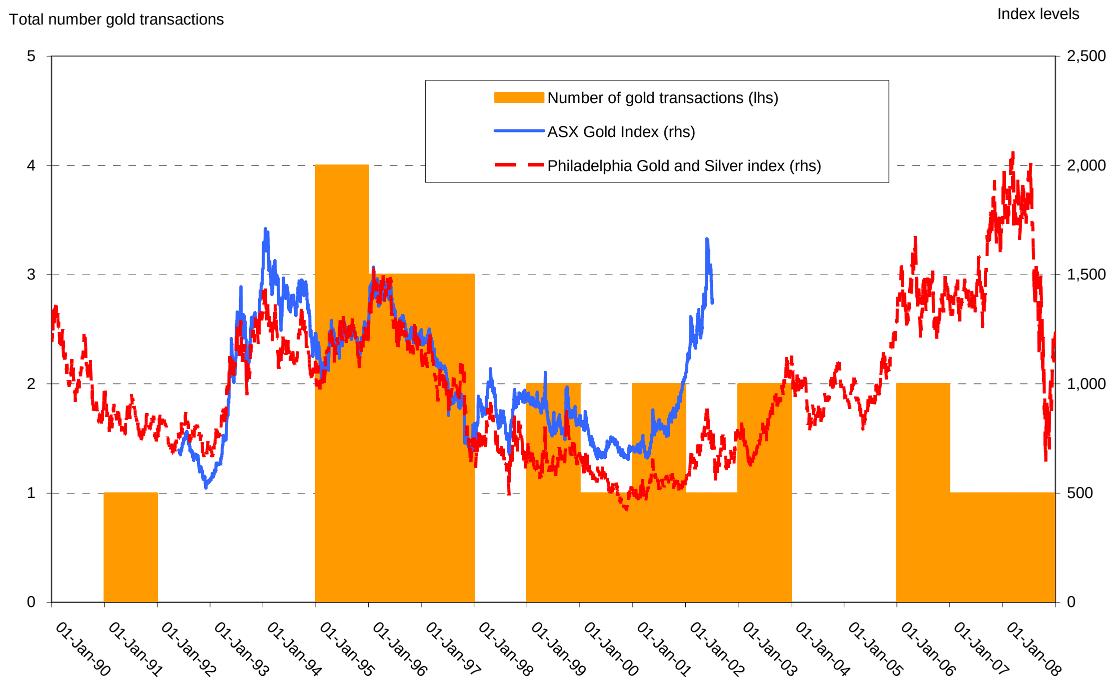
The next sections discuss the various commodity groups outlined earlier.

5.2.1.2.1 Trends in Australian gold takeovers

The number gold transactions each year are plotted on Figure 101 along with the ASX Gold Index and the Philadelphia Gold and Silver Index multiplied by 10. The Philadelphia Gold and Silver Index has been used due to the incompleteness of the ASX Gold Index over this period and is multiplied by 10 times to increase the value of the index so that trends are more comparable with the ASX Gold Index.

Figure 101 displays a high number of transactions in the mid 1990s after the gold indices peaked in 1994 and declined in 1995 before peaking again in 1996 and then declining into the Asian Crisis. Between 1990 and 2004 there was a period of activity albeit at reduced number levels which resumed again from 2006.

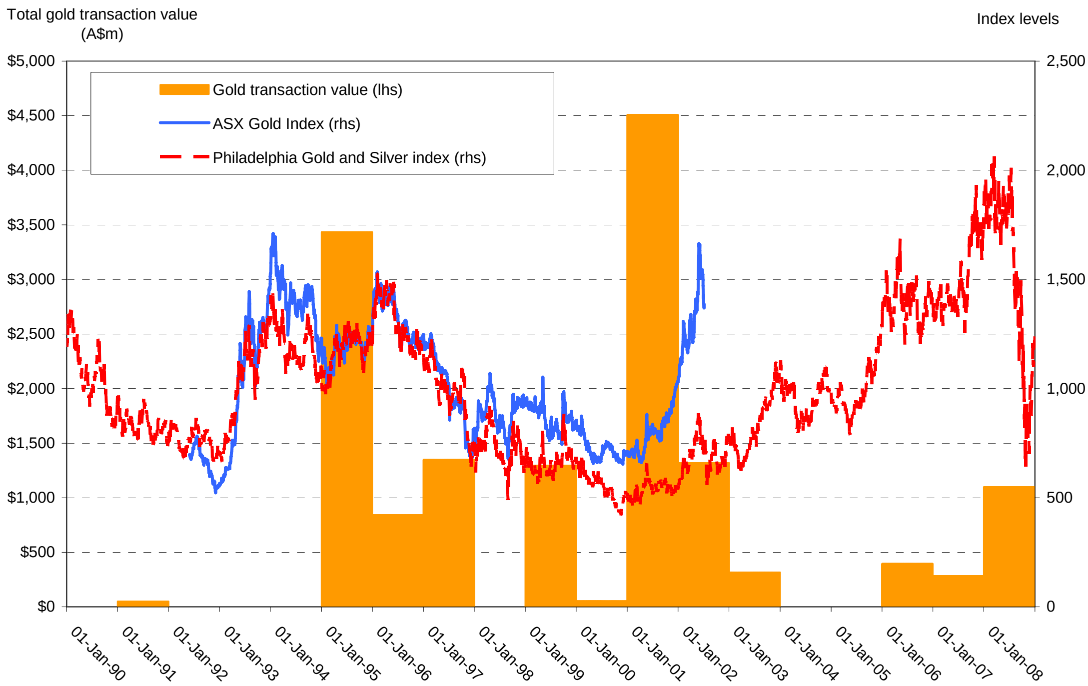
Figure 101. Number of annual gold transactions, ASX Gold Index and Philadephia Gold and Silver Index multiplied by 10.



Index data sourced from Stock Resource.

Figure 102 below illustrates that 2001 was the peak year in transaction value at $4.5 billion and included the Newmont takeover of Normandy Mining. The transaction number peak in 1996 evident in Figure 101 also coincides with a significant transaction value of almost $3.5 billion with the Normandy Mining merger (see Appendix 1). In other years the activity was below $1.5 billion.

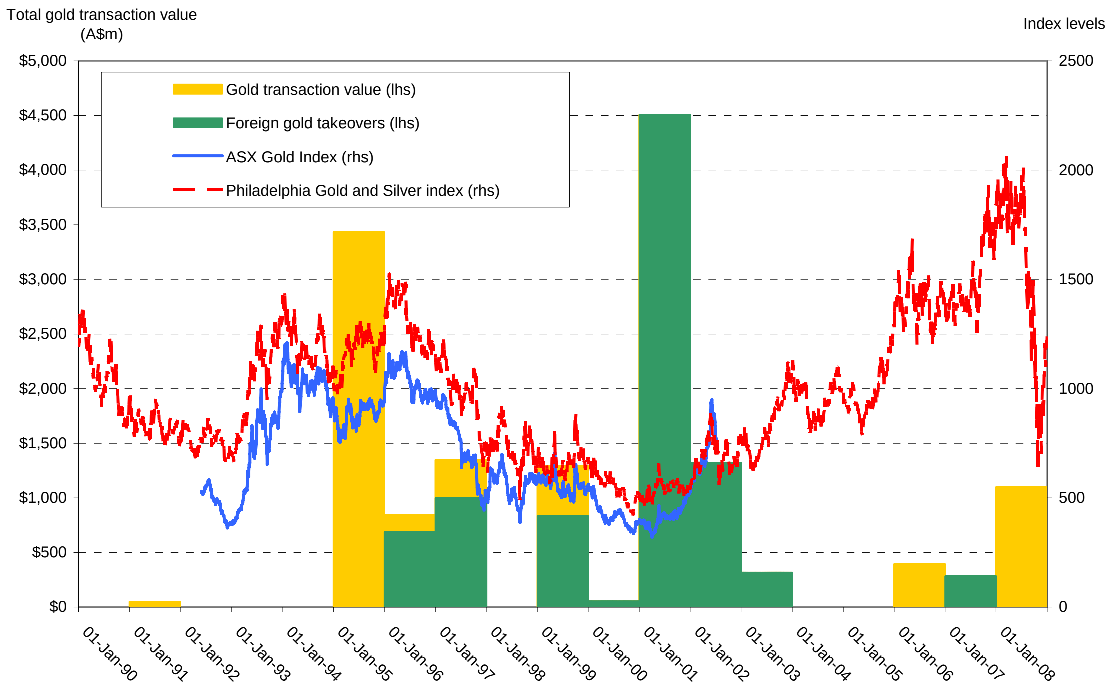
Figure 102. Value of annual gold transactions,ASX Gold Index and Philadephia Gold and Silver Index multiplied by 10.



Index data sourced from Stock Resource.

In both Figures 101 and 102 the ASX Gold Index appears to increase from 2000 relative to the Philadelphia Gold and Silver Index (multiplied by 10). Figure 103 plots the ASX Gold Index converted to US$ to highlight the effect of the declining A$/US$ exchange rate during this period. Figure 103 also overlays the value of foreign transactions on the total transactions on a year by year basis.

Figure 103. Value of annual gold transactions including transactions involving a foreign bidder highlighted in green. The ASX Gold Index has been converted to a US$ basis using daily spot exchange rates while the Philadelphia Gold and Silver Index has been multiplied by 10 for comparison.



Index data sourced from Stock Resource.

Figure 103 is interesting for two reasons. Firstly, contrary to some market opinions, during the Tech Boom Australian gold shares were, after adjusting for the exchange rate, generally priced in accordance with their global peers. At that time it was considered that share prices had fully compensated for a higher Australian dollar gold price due the overall lack of market interest in Australian resource shares. Essentially Figure 103 highlights that it is likely that all global gold shares were at a nadir in 2001.

Secondly, Figure 103 outlines the dramatic increase in foreign takeovers of the Australian gold sector from the mid-1990s through to the end of 2003. In fact all the takeovers in the late 1999 to end 2003 period were carried out by foreign bidders at a time the gold indices were at low levels. Hence while these six transactions (AngloGold – Acacia; Harmony – New Hampton Gold Fields, Hill 50 and Abelle; Newmont – Normandy, and Placer Dome – AurionGold) accounted for only 26 per cent of the total number of gold transactions, they accounted for 60 per cent of the $15 billion in M&A transactions or $9 billion of takeovers of the Australian gold sector. With this surge of foreign activity in the late 1990s through to the end of 2003, it is little wonder that the ASX abandoned the ASX Gold Index series.

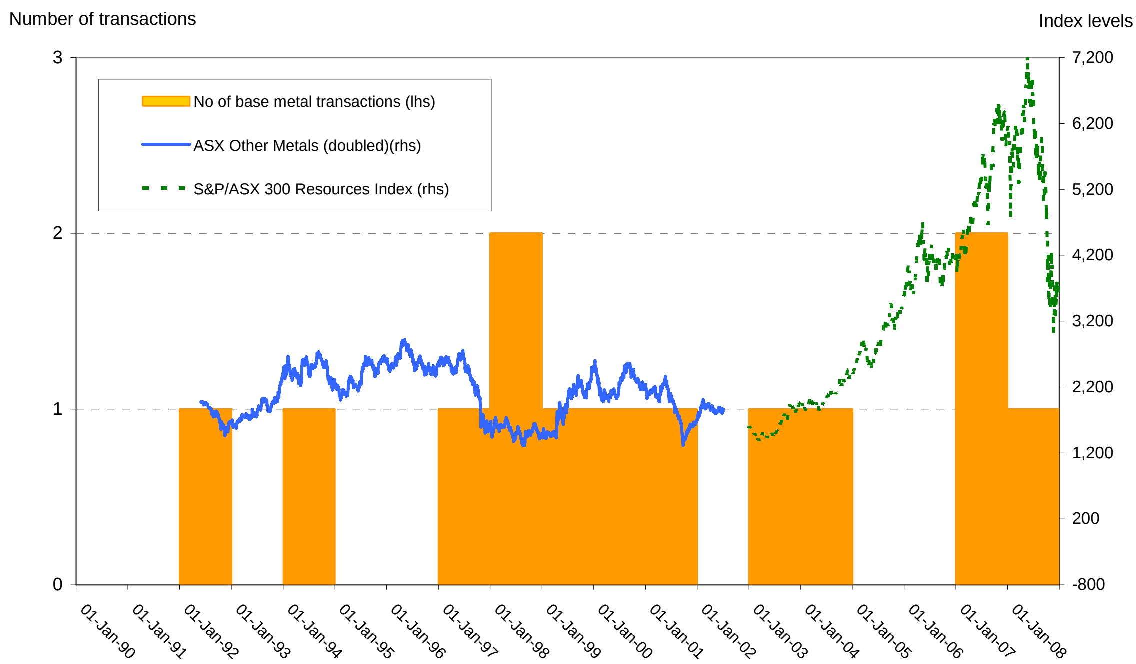
Interestingly most of the gold transactions by value involved payment by scrip (e.g, Newmont – Normandy, Placer Dome – AurionGold; AngloGold – Acacia) which meant that the bidders didn't fully capture the lower equity values at that time with cash bids. The only exception was Harmony Gold in its spate of takeovers involving Hill 50, Abelle and New Hampton Gold Fields.

It can also be argued that the Australian gold sector experienced a significant period of consolidation in 1996 and beyond which eventually ended up in foreign ownership with few exceptions, although the most notable exception is Sons of Gwalia which went into administration in 2004.

5.2.1.2.2 Trends in Australian base metals sector

Trends in base metals M&A are different from gold described above and are dominated by fewer but generally larger transactions. Figure 104 plots the ASX Other Metals Index doubled to provide an easier comparison to the S&P/ASX 300 Resources Index from 2003. Transactions numbers are low and are generally only one per year, if occurring at all, except for two transactions occurring in 1998 and 2007.

Figure 104. Number of annual base metals transactions,ASX Other Metals Index (doubled) and the S&P/ASX 300 Resources Index.

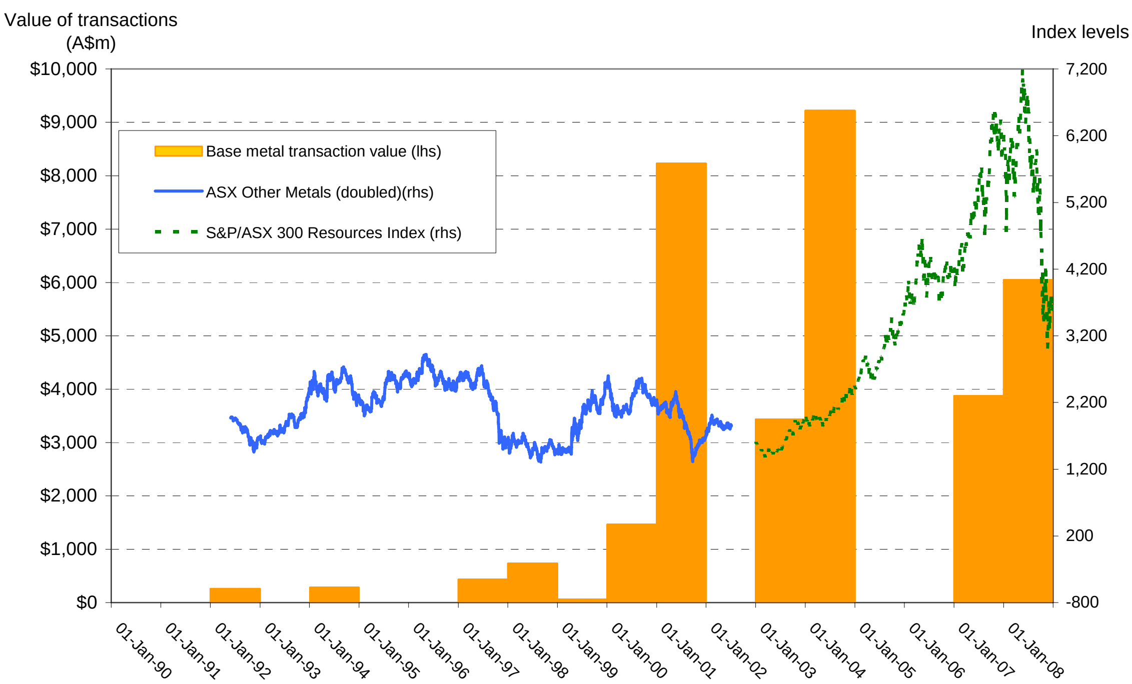


Indexed sourced from Stock Resource.

When compared to Figure 105, the five dominant transactions are evident and all occur later than 2000. In 2001 BHP conducted its merger with Billiton plc, in 2003 Xstrata took over MIM, in 2004 BHP Billiton took over WMC Resources in a bid prompted by Xstrata and in 2007 Xstrata took over Jubilee Mines. Lastly Oxiana and Zinifex merged in 2008. Three of the five dominant takeovers stemmed from the acquisitive nature of Xstrata plc.

Apart from Rio Tinto successfully buying out the minority interests in Comalco with its cash or a less popular alternative scrip offer in 2000, most of the Australian takeovers have met with mixed success. The Pasminco takeover of Savage Resources and the Western Metals takeover of Aberfoyle appear to reflect opportunistic cash bids in 1998 following the Asian crisis while the more recent Zinifex takeover of Allegiance in 2007 was timed at the top of the market.

Figure 105. Value of annual base metals transactions,ASX Other Metals Index (doubled) and the S&P/ASX 300 Resources Index.



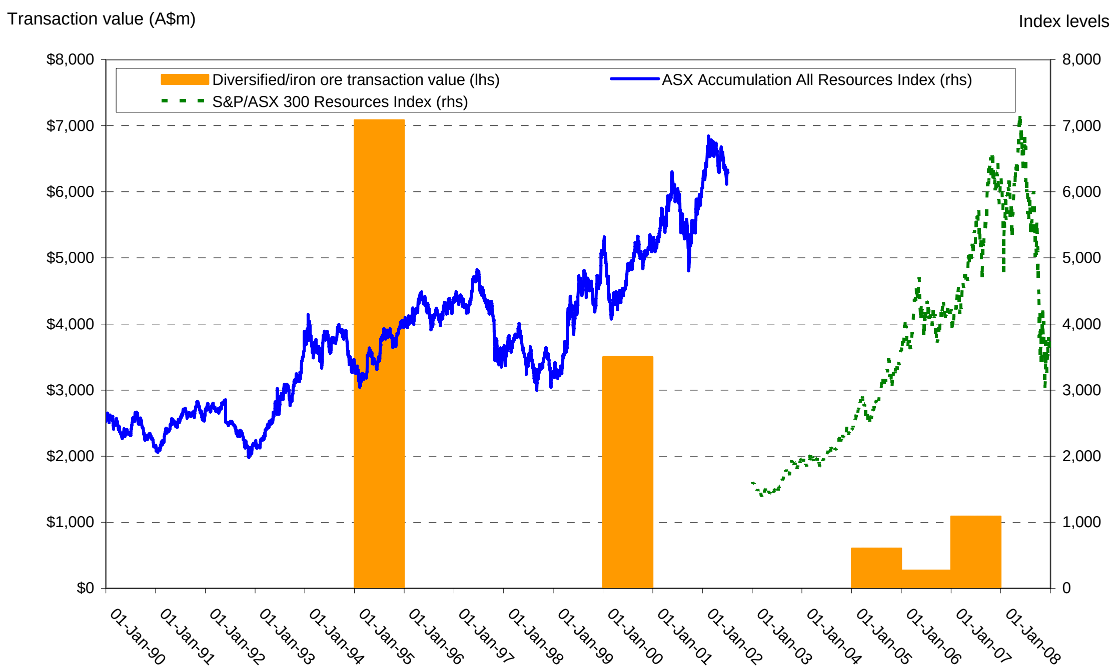
Indexed sourced from Stock Resource.

5.2.1.2.3 Trends in Australian diversified/iron ore sector

The trends in M&A activity in the diversified and/or iron ore companies appears relatively straightforward. Figure 106 outlines five transactions with the dominant being the 1995 dual listing of RTZ and CRA. As discussed in Appendix 1, this deal involved a bonus share issue to CRA shareholders and hence timing was not critical. The 2000 takeover of Norths by Rio Tinto appears a time of moderating lower share prices but as also outlined in Appendix 1, involved strategic factors in the consolidation of the Pilbara iron ore projects.

More recent M&A activity has involved consolidation in the iron ore sector (e.g. 2006 Mt Gibson takeover of Aztec Resources) and foreign companies investing in the sector (2005 Cliffs partial takeover of Portman Mining, and 1997 Palmary takeover of Consolidated Minerals). Increased foreign investment in and growth in the iron ore sector has been in direct response to perceived growth in iron ore demand from the industrialisation of China and other emerging economies as discussed in Chapter 3.

Figure 106. Value of annual transactions for diversified/iron ore companies with the ASX Accumulation All Resources Index and the S&P/ASX 300 Resources Index.

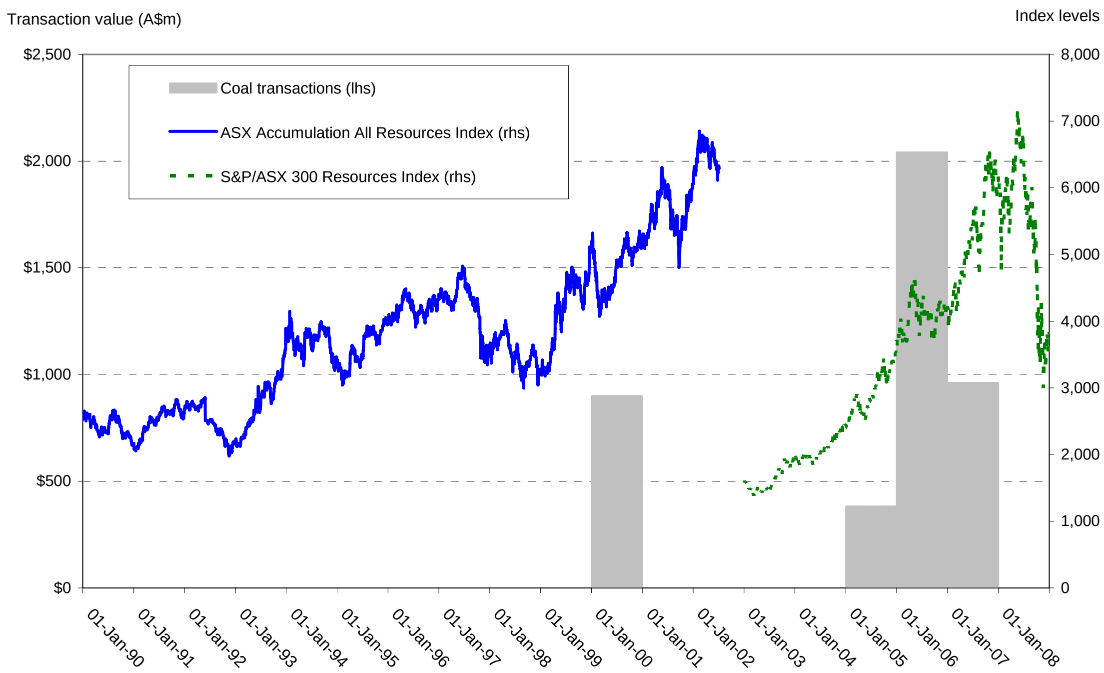


Indexed sourced from Stock Resource.

5.2.1.2.4 Trends in Australian other commodity sectors

In the remaining commodity sectors, there are few and generally sporadic transactions. Figure 107 plots the coal transactions and, from the 2000 takeover of QCT Resources by BHP and Mitsubishi, most coal transactions reflect foreign acquisitions of domestic coal producers. These include the 2006 Peabody Energy takeover of Excel coal and the 2007 Xstrata takeover of Resource Pacific Holdings. An exception is the 2005 takeover of Austral Coal by Centennial Coal, although this was later sold to Xstrata.

Figure 107. Value of annual coal transactions with the ASX Accumulation All Resources Index and the S&P/ASX 300 Resources Index.



Indexed sourced from Stock Resource.

As mentioned earlier the uranium sector has experienced significant consolidation during the 2006 – 2007 uranium boom, particularly by Canadian company Mega Uranium. In Table 42 this thesis notes the 2007 $1.2 billion takeover of Summit Resources by Paladin as well as the small 2008 takeover of Fusion Energy.

There were three diamond takeovers during the period of this analysis, namely: the 1996 takeover of ADEX by Ashton Mining, the 2000 Rio Tinto takeover of Ashton Mining itself and the 2007 takeover of Kimberly Diamonds by UK Gem Diamonds. Ashton’s takeover of ADEX was opportunistic given its knowledge of the Argyle

Diamond mine, while Rio Tinto potentially had its hand "forced" when DeBeers announced a hostile takeover of Ashton Mining in 2000. Kimberly Diamonds was facing financial difficulties and negotiated a friendly deal with Gem Diamonds.

The only mineral sands deal analysed is the 1998 merger of RGC with Westralian Sands which reflected rationalisation in a subdued resource market after the Asian Crisis and before the 1998-2000 Bull Run had commenced.

5.2.1.2 Takeover style trends in Australian M&A activity

The research in Appendix 1 covers the analysis of 30 transactions that provides the data that has been summarised here to highlight trends within broader M&A activity.. The transactions have been categorised into dual listings (RTZ – CRA and BHP – Billiton), mergers involving scheme of arrangements (8 transactions) and traditional takeovers (20 transactions).

Figure 108 plots the average final offer premium over the previous 30-day average share price for the target for the three categories. In the case of dual listings and mergers, the target is regarded as the company whose shareholders receive new scrip or cash.

As expected, the friendly transactions offer target shareholders a lower premium (dual listing – 17.8 per cent, mergers – 12.9 per cent) compared to traditional takeovers which average 48.7 per cent. While the number of mergers is only eight and reflects their prevalence in M&A activity, they are co-operative approaches to merging and hence shareholders have lower premium expectations.

Figure 108. Average premium to 30-day average share prices prior to announcement for dual listing, mergers and takeovers.

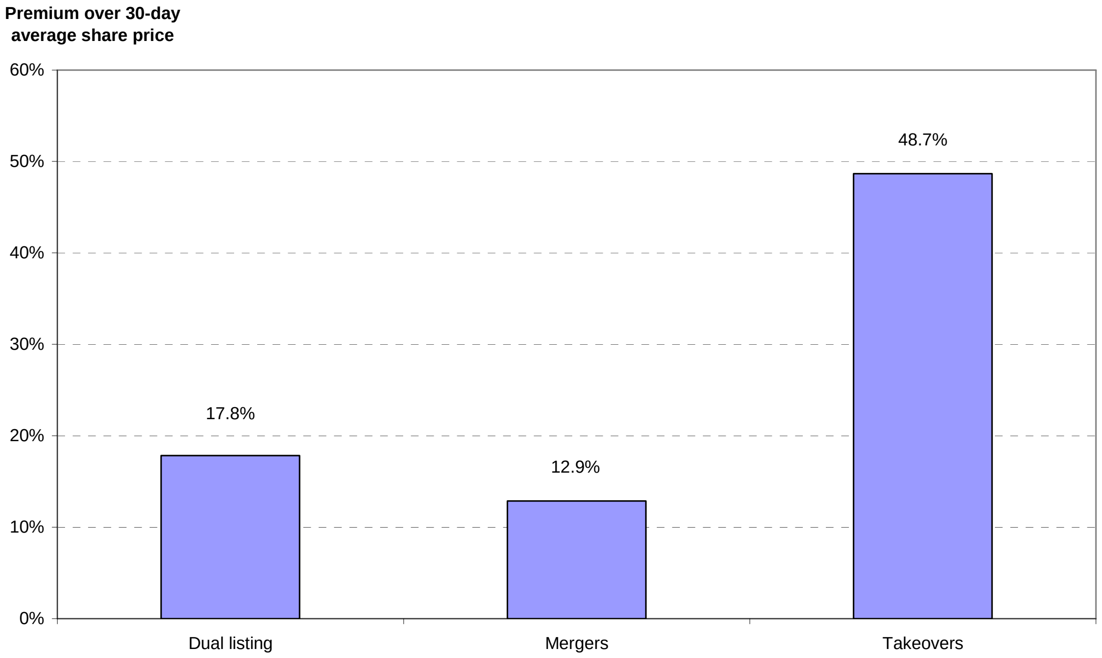


Figure 109 plots the final premia over the 30-day average share prices for non-competitive and competitive takeover bids. Competitive bids are defined as where there is more than one bidder during the course of the takeover. As expected, the takeover premium is almost 70 per cent higher with an average premium of 66.1 per cent compared to non-competitive bids with an average premium of 39.3 per cent.

Figure 109. Premia over 30-day average target share price prior to bid announcement for competitive and non-competitive bids.

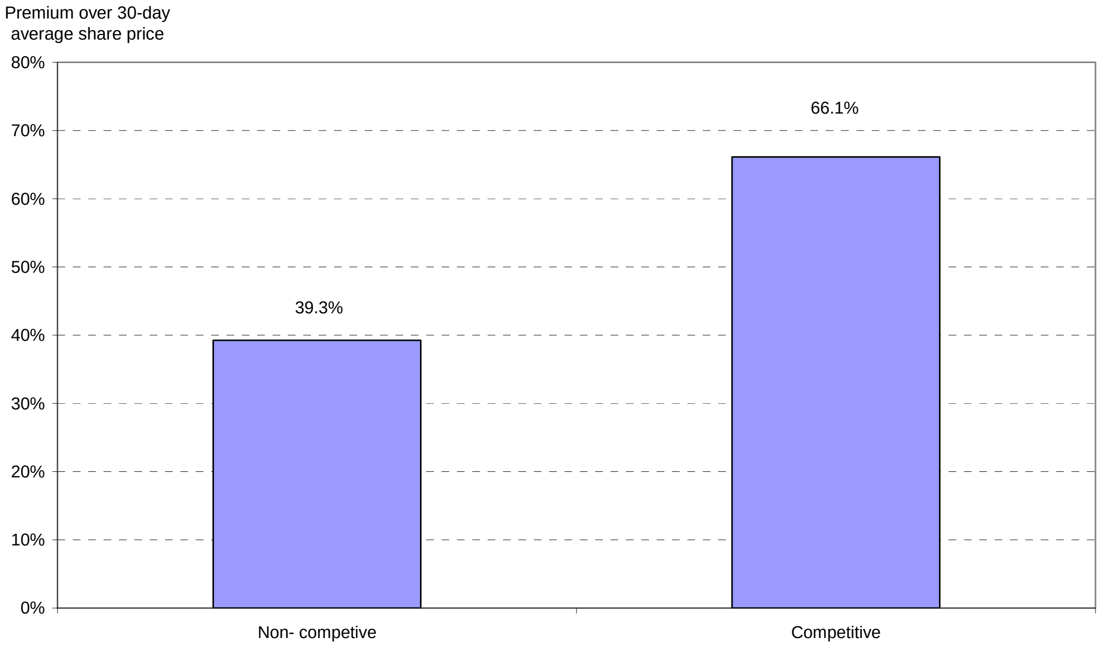
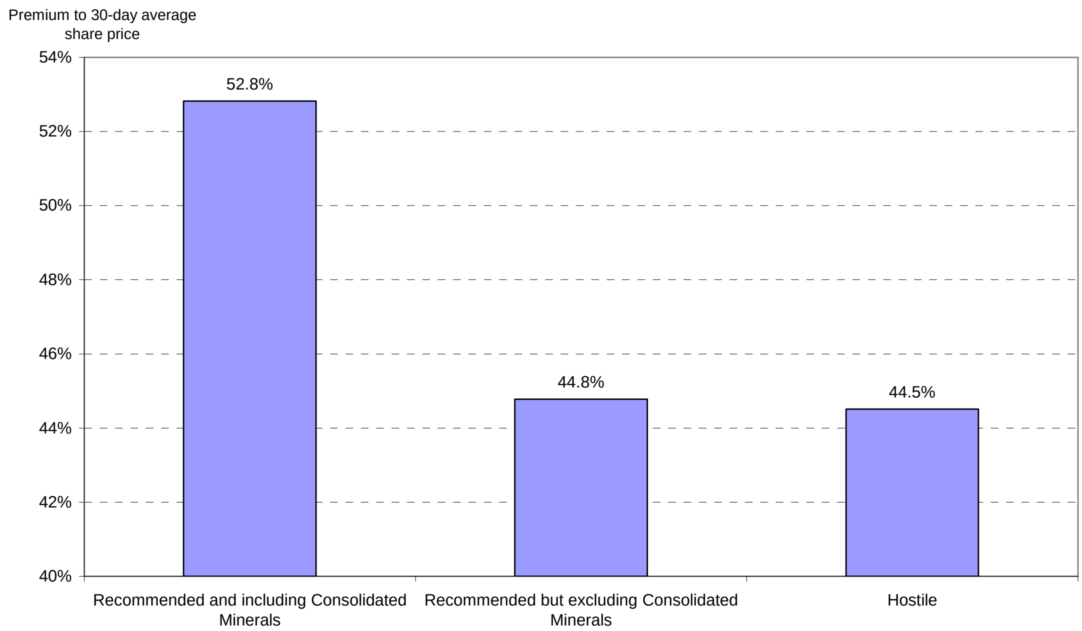


Figure 110 plots the final takeover premia to the 30-day average target share price for hostile and non-hostile (recommended) takeovers. A takeover is regarded hostile if the target Board rejects the initial takeover bid and is designed to establish whether there was a degree of co-operation between the companies with regard to the takeover offer. The data for recommended bids are highly skewed by the recent competitive bidding for Consolidated Minerals (final 125.2 per cent premium to the 30-day average share price) as the initial approach was a recommended offer (see Appendix 1). Figure 112 presents average recommended takeover premia with and without the Consolidated Minerals takeover offer.

Figure 110. Takeover premia over the 30-day average target share price prior to announcement for recommended (with and without the Consolidated Minerals transaction) and hostile takeovers.



Interestingly, excluding the Consolidated Minerals transaction which is considered an outlier, the final premia over the 30-day average target share price is similar for both hostile and recommended offers. Recalling Figure 109, this thesis highlights that it is the competitive nature of takeovers which can increase final bid premium and not whether the takeover is hostile or recommended.

This is reaffirmed in Figure 111 which plots the final average takeover premium over the initial 30-day average target share price less the initial average takeover premium over the same 30-day target average price. There are two clear outliers in this data, firstly the non-competitive Placer Dome bid for AurionGold was during a falling market where the difference was a 67 per cent fall in the final offer premium and reflected the falling scrip offer. The second was the Palmary takeover offer for Consolidated Minerals discussed earlier which culminated in a 122.5 per cent difference in premia between initial and final offers.

Figure 111 plots the difference between final and initial offer premia with and without these outliers. Excluding these outliers it is evident that a competitive bid can lead to an average 20 to 25 per cent increase in the initial offer premium.

Figure 111. Difference between initial premia to the 30-day average target share price prior to bid announcement and the final offer premia.

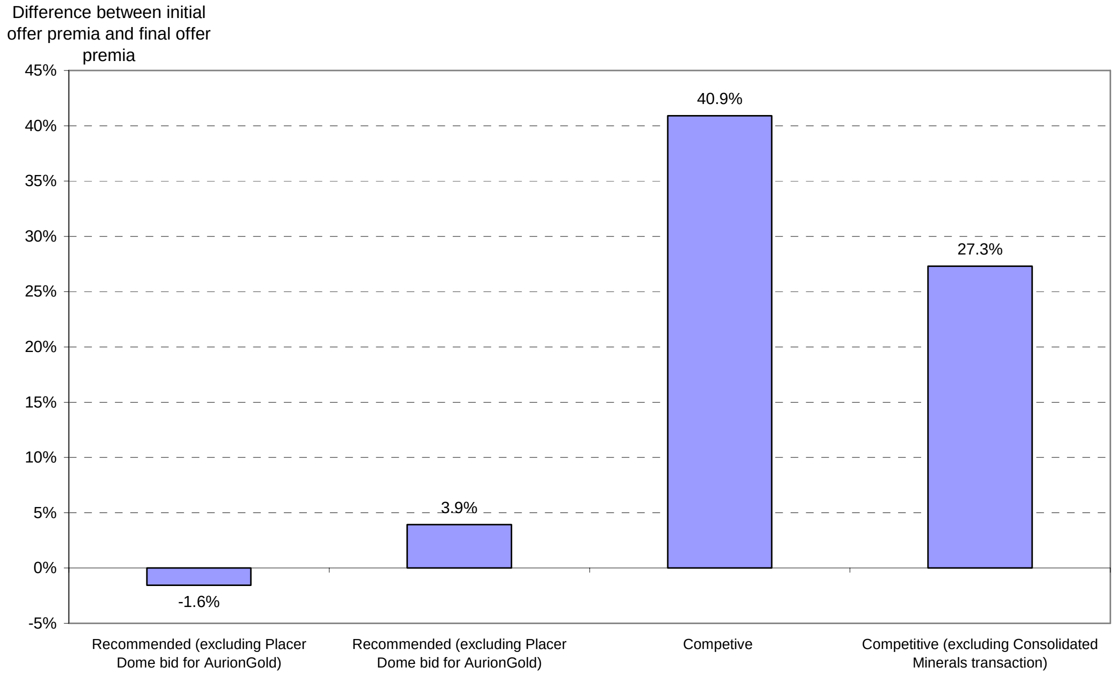
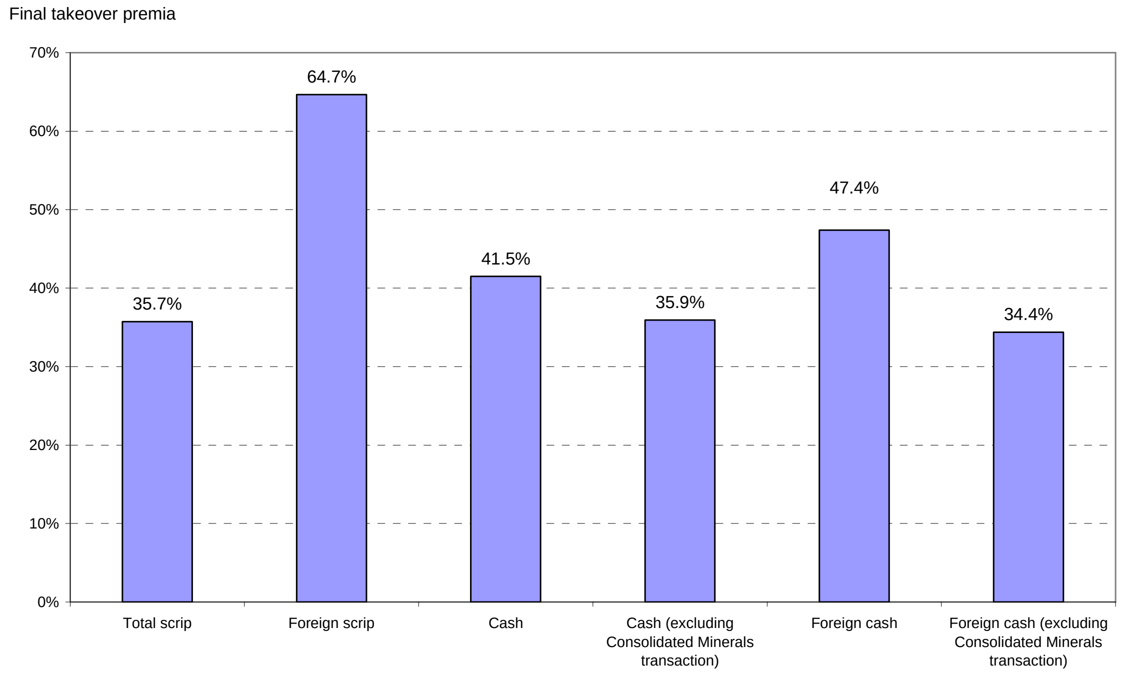


Figure 112 compares the final offer premium to the 30-day average target share price for scrip and cash bids. Scrip bids are separated into two categories: all bids and foreign only offers. Figure 112 also plots the final offer premium for all cash bids, foreign only cash bids and a variation on both which excludes the Consolidated Minerals cash bidding war outlier.

The author notes that interestingly, if the Consolidated Minerals outlier is removed from the data set, there is no significant premium difference between all scrip offers and cash offers and whether the cash is from a foreign company. This contrasts with a traditional market view that cash is worth more than scrip, hence scrip offers should provide a greater premium. This includes merger schemes but then merger schemes can be in effect a takeover, e.g. Xstrata's 2003 merger with MIM offering MIM shareholders cash. Hence as outlined in Figure 108 it is the capacity of the bidding company to effect a merger that may influence the size of the premium.

The standout feature of Figure 112 is the different in premia between foreign scrip and total scrip offers which is expected to stem from the 'encouragement' required for Australian shareholders to receive foreign scrip, even though the company may be listed on the ASX. This average premium at 64.7 per cent is approximately 30 per cent higher than the total scrip offer average premium at 35.7 per cent.

Figure 112. Average premia for scrip and cash offers.



In reviewing payment type through time, Figure 113 appears to support the old adage that bids in high markets tend to be with scrip while bids in market lows are with cash. One exception is the dual listing of RTZ and CRA in 1995 and as discussed earlier, the nature of the deal meant that it wasn’t share price sensitive.

Figure 113. Payment type for transactions each year 1995-2008.

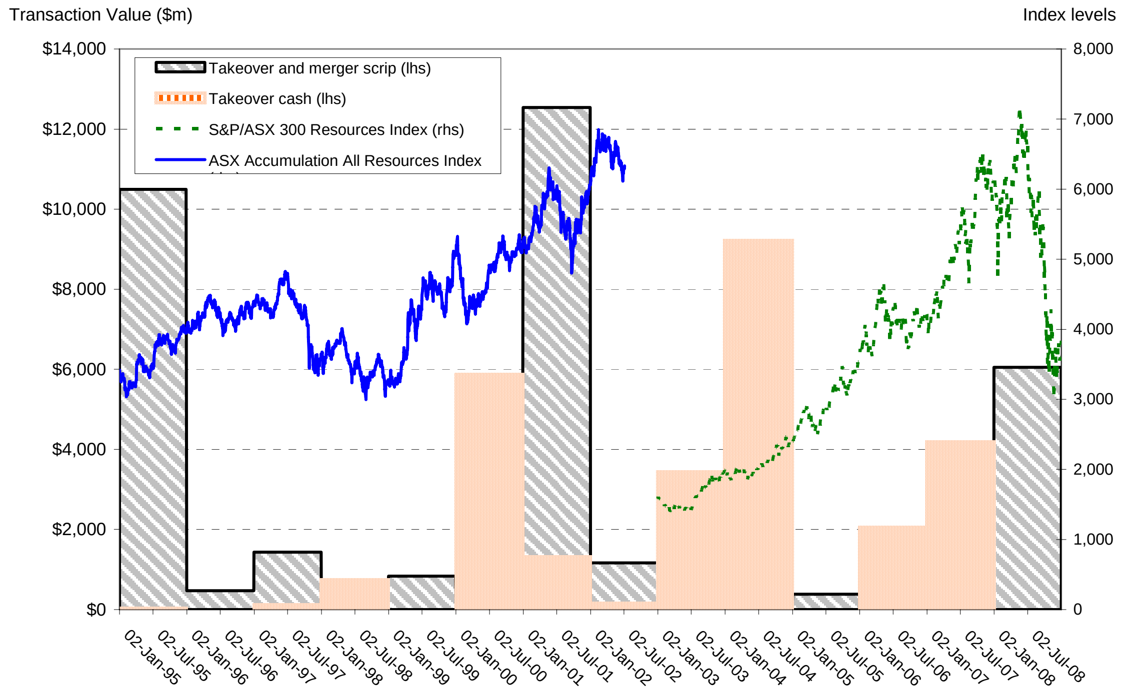
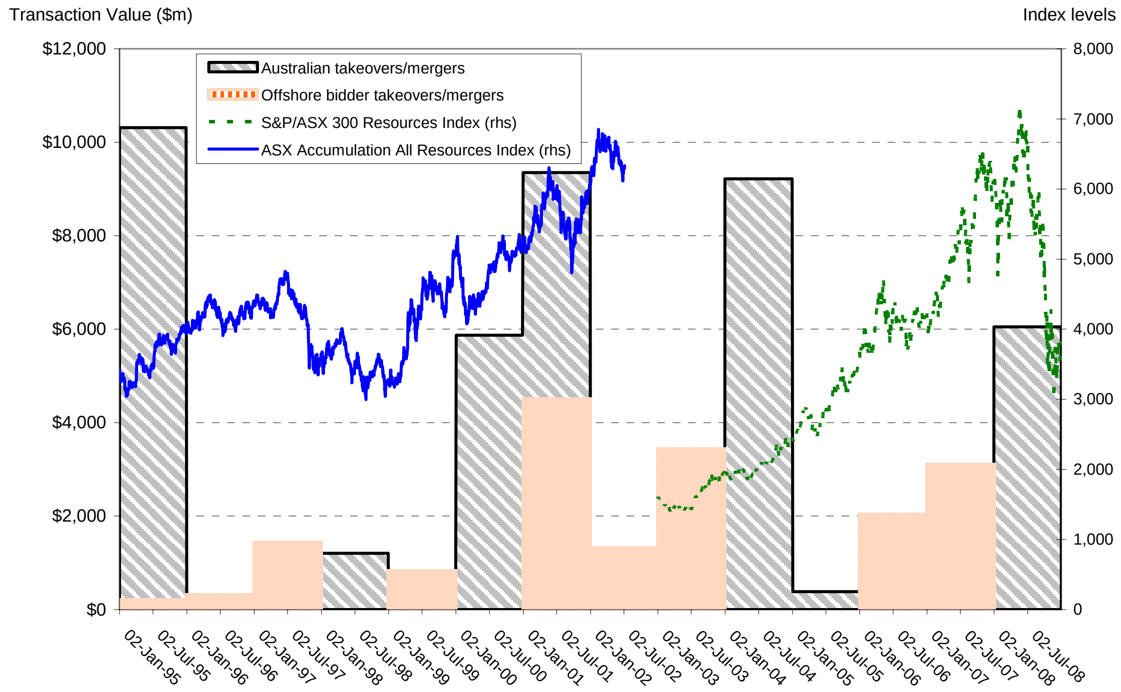


Figure 114 plots Australian M&A activity versus transactions involving a foreign acquirer. Overall there is a broad trend of foreign bidders acquiring Australian companies in weaker markets. This author believes that, at the end of the Tech Boom, there was more recognition of a potential turnaround in resource markets in North America and Europe than in Australia and that may have stimulated a spate of foreign bidders including Rio Tinto, although Rio Tinto has been regarded as an Australian company.

Figure 114. Australian takeover/mergers and offshore bidder takeover/mergers from 1995-2008.



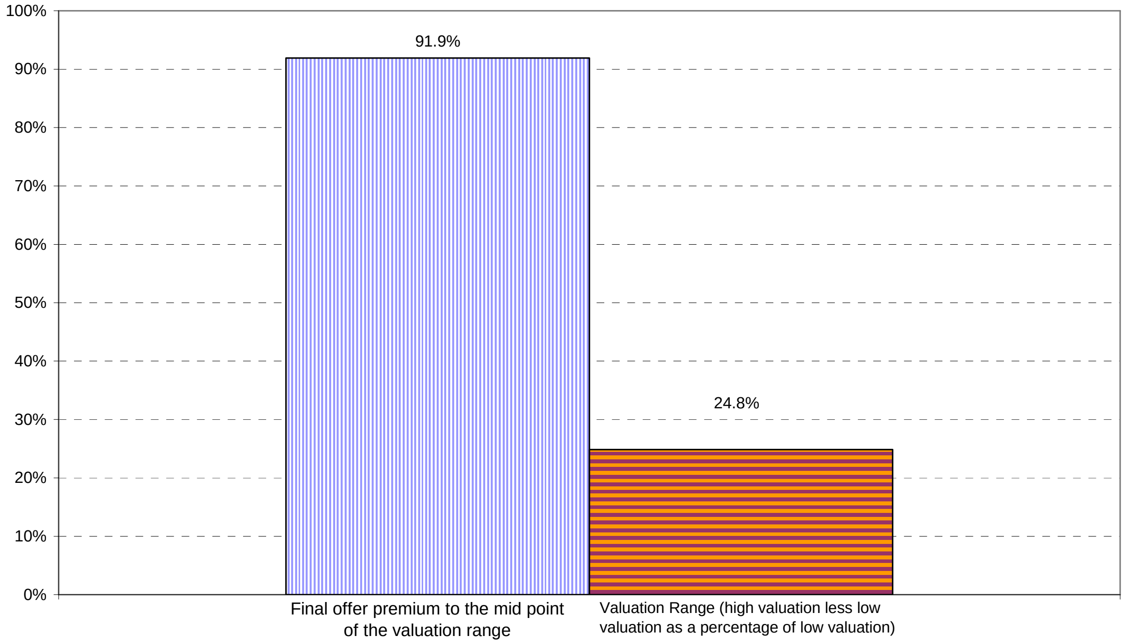
Index data sourced from Stock Resource.

5.2.1.3 Independent Expert's Reports and takeover premia

In the 30 transactions analysed, 15 of the target companies had commissioned valuations from independent experts to assist their shareholders in their decisions. All the independent experts provided both high and low values of the target to provide a valuation range.

Figure 115 plots firstly the final offer price as a percentage of the mid point of the target valuation range. The chart highlights that on average, the final bid price was close to 92 per cent of the mid point of the valuation range. Figure 115 also plots a measure of the valuation range by displaying the difference between the high and low values divided by the lower value. It shows that on average, the high value is around 25 per cent higher than the low value and hence a final offer price offer which averages 92 per cent of the mid point of the valuation range means that most final offers tended to fall within the lower part of the valuation range. This is expected to some degree given the fiduciary duty of directors making it difficult for them not to recommend an offer which is within the valuation range, particularly when they have commissioned the valuation.

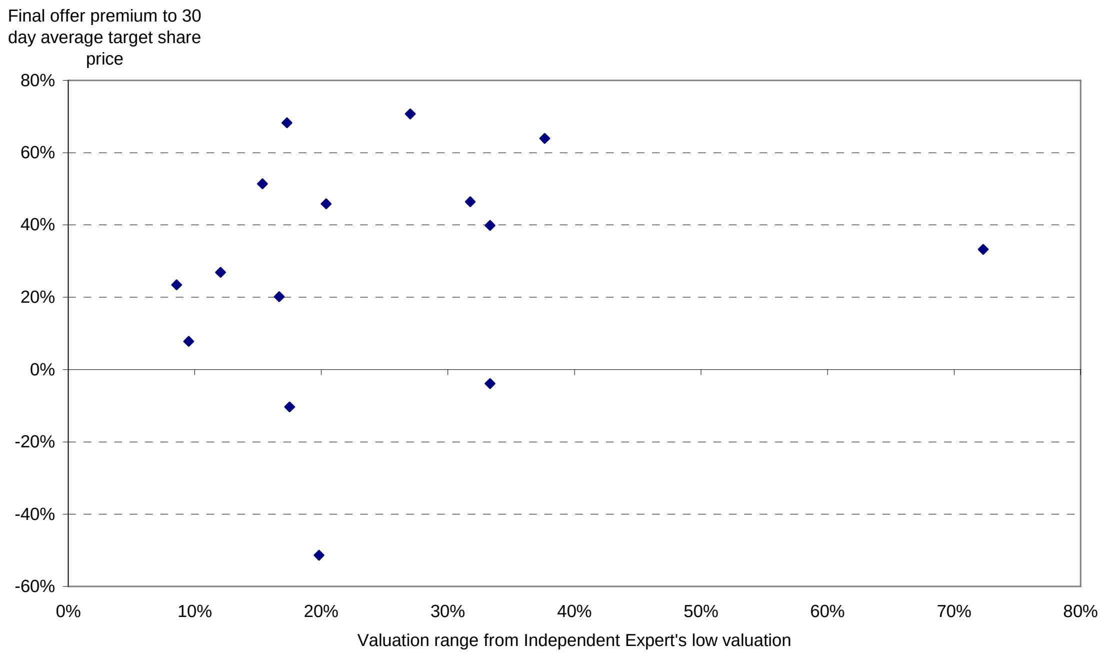
Figure 115. Average final offer price as a percentage of the mid point of the independent expert's valuation range and average valuation range as a percentage of the low valuation.



Valuation ranges potentially offer an insight into a company's asset base as a large range would suggest that there is a scope for an acquirer to extract greater value from a target company's asset base. This could reflect undeveloped resources, exploration potential, expansion opportunities, etc. which have the potential to be developed under certain circumstances such as higher commodity prices or after additional exploration or development work has been carried out.

Figure 116 plots the final bid premium against the valuation range in a scatter plot. Overall there is a broad trend supporting the proposition that on average, a greater valuations range attracts a greater offer premium..

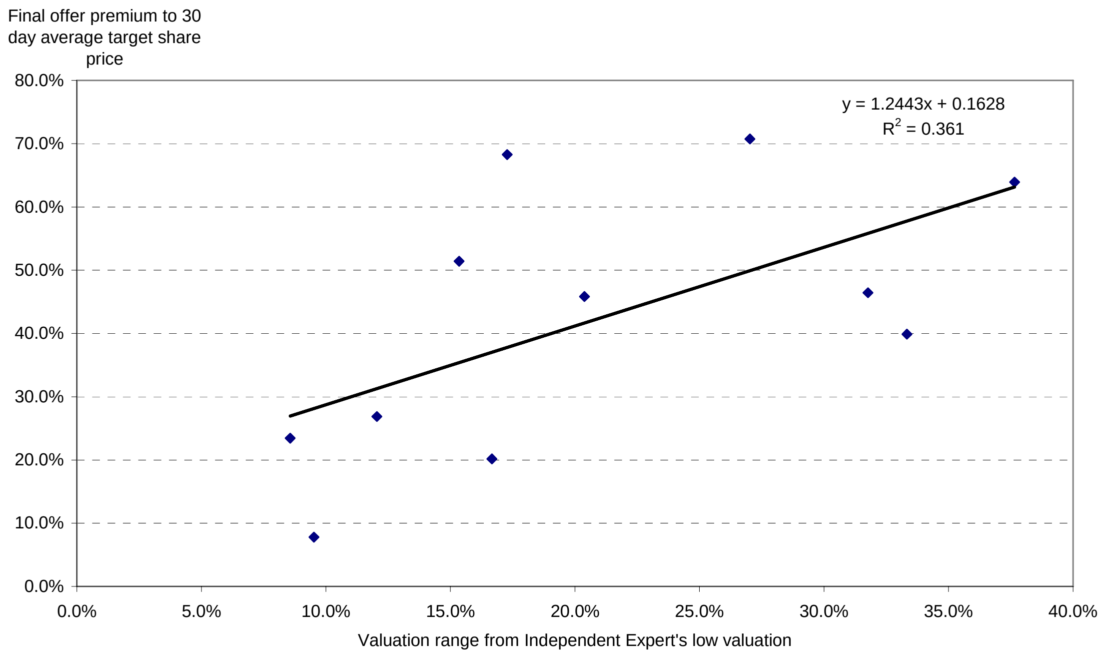
Figure 116. Average final offer premium versus average independent expert valuation ranges.



The outliers reflect unusual circumstances where the bid price has fallen during the takeover process and this reflects falling markets and hence negative final offer premia. The other outlier is the Aberfoyle valuation range which at 72.3 per cent appears unrealistic and probably unhelpful to Aberfoyle shareholders!

In Figue 117 these outliers have been removed and a trend line (R^2 = .361) included.

Figure 117. Average final offer premium versus average independent expert valuation ranges after the removal of outliers and applying linear regression.



5.2.1.4 Takeover target and bidder abnormal returns

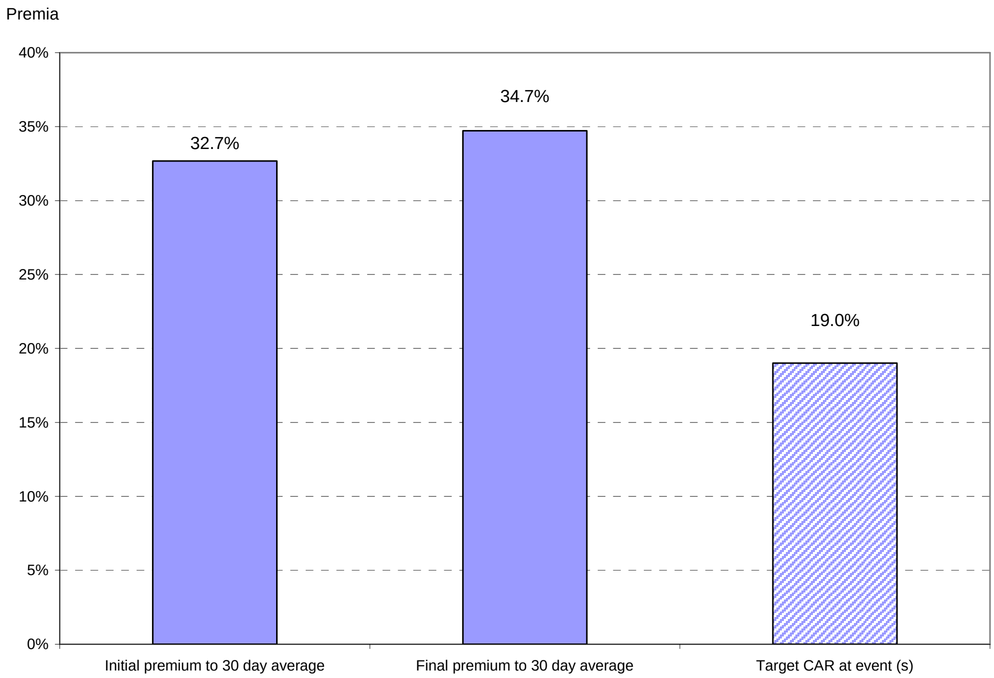
The data in Appendix 1 list the estimated cumulative abnormal returns for both the target companies and bidders based on the difference between actual returns and the returns based on a theoretical share price series calculated using significant regression coefficients as described earlier in Section 5.1.2.

The research estimated the cumulative abnormal returns (CAR) normally in a 3-day at the times of the announcement but with mergers and competitive bidding this may be extended through to the completion of the transaction. The intent of the research is to estimate the CAR stemming from the transaction, which is normally only evident at the time of the initial announcement. However in protracted takeovers with competitive bidding anticipated by the market there is a risk that enhanced returns received by target shareholders are not recorded as abnormal returns due to their incremental nature.

Figure 118 plots the initial and final offer premia to the 30-day average target share price as well as the target CAR at the time(s) of the announcement(s). On average the CAR is 42 per cent and 45 percent lower than the initial and final offer premia to the 30-day average target share price. This is likely to reflect a combination of:

- The value of the overall market sector increasing in response to the announcement of a potential transaction
- Potential uncertainty associated with the likely success of the transaction
- The potential changing value of scrip offers
- A required arbitrage return, e.g. selling Homestake Mining US shares to purchase Homestake Gold Australia shares to generate the funds necessary to then accept the Homestake Mining offer.

Figure 118. The initial and final offer premia to the 30-day average target share price as well as the target CAR at the time(s) of the announcement(s).



This impact of scrip bids on CAR is evident in Figure 119 where the CAR can be 60 per cent less than the final bid premia over the average 30-day target share price. It is interesting that the final premium to the average 30-day target share price remains similar to both cash and scrip transactions, whereas some scrip offers include friendly mergers. As a general comment this thesis reports that the data indicate that the final premia over average 30-day target share price on average are independent of transaction types and as highlighted earlier, also of whether the transaction is hostile or recommended. The premium is dependent on whether it is a competitive transaction while the CAR are influenced by whether the payment is in cash or scrip

Figure 119. The initial and final offer premia to the 30-day average target share price as well as the target CAR at the time(s) of the announcement(s) for scrip bids only.

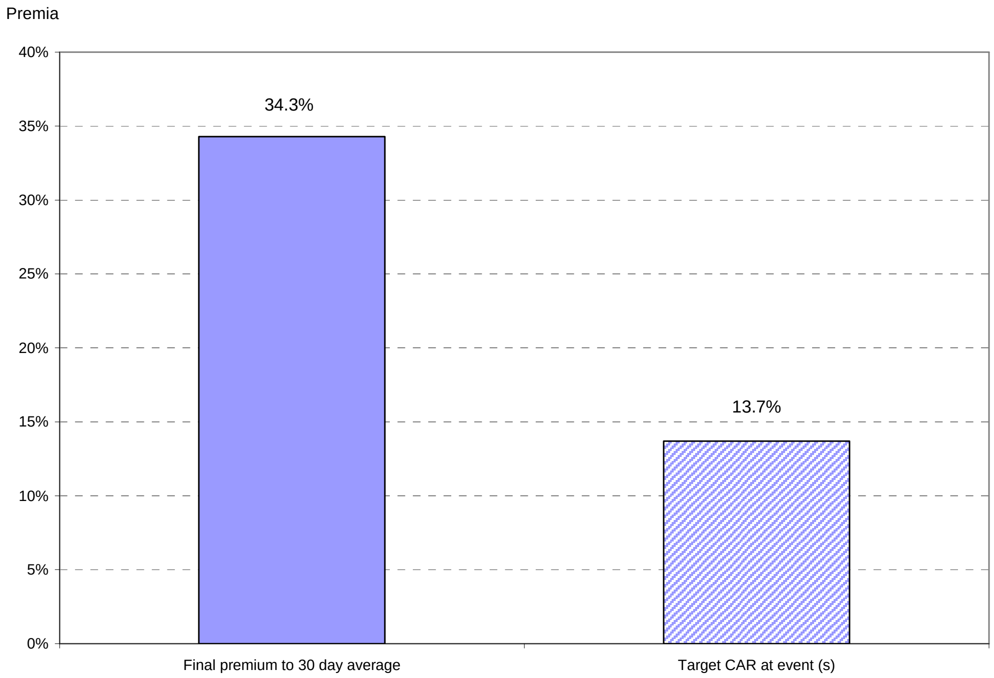


Figure 120 is a scatter plot of final offer premia to the 30-day average target share price against CAR for the target at announcement(s). As expected, there is a general trend that the higher the final offer premia to the 30-day average target share price, the higher the target CAR over the event(s).

Figure 120. Scatter plot of the final offer premia to the 30-day average target share price against the target CAR at the time(s) of the announcement(s).

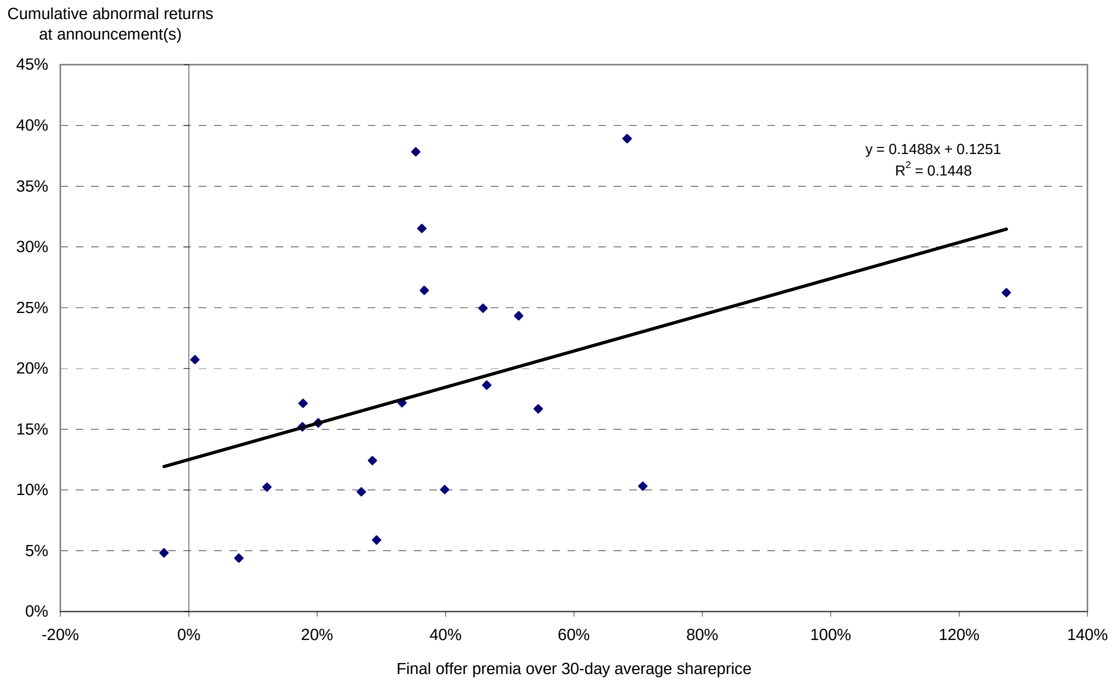
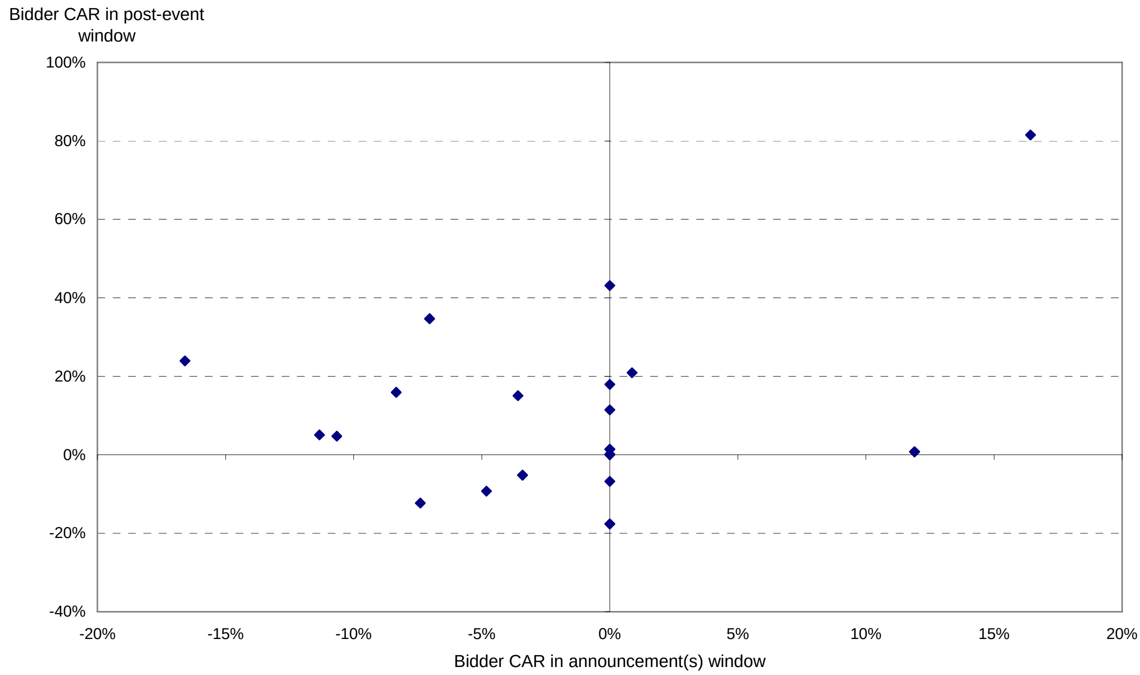


Figure 121 compares bidder CAR at the event announcement(s) window(s) with the bidder CAR in the 252-day post-event windows. While there is no evident relationship in the size of the CAR for both time periods, Figure 121 at least indicates that most bids deliver positive CAR in the post-event window irrespective of negative CAR at the time of the announcement(s).

Figure 121. Scatter plot of bidder CAR at announcement event window(s) and post-event windows.



This fact supports the contention of this thesis that *Acquisitions May Add Value to Resource Companies* and is presented graphically in Figure 122. Figure 122 plots the change in target value due to CAR multiplied by the market capitalisation of the target prior to the offer announcement. Similarly, it plots the change in bidder value as a result of the average CAR in both the announcement window(s) and the 252-day post event window. It also plots the net position of these two CAR values.

Figure 122 indicates that while the target CAR at announcement(s) has returned significant value in the transactions studied, from the bidder perspective, negative announcement(s) CAR are more than offset by positive CAR in the post-event window. In fact post-event window CAR almost twice offset the negative CAR at offer announcement(s).

Figure 122. Target CAR value at offer announcement and bidder CAR at announcement(s) and in the post-event window. Net bidder CAR value change is also plotted.

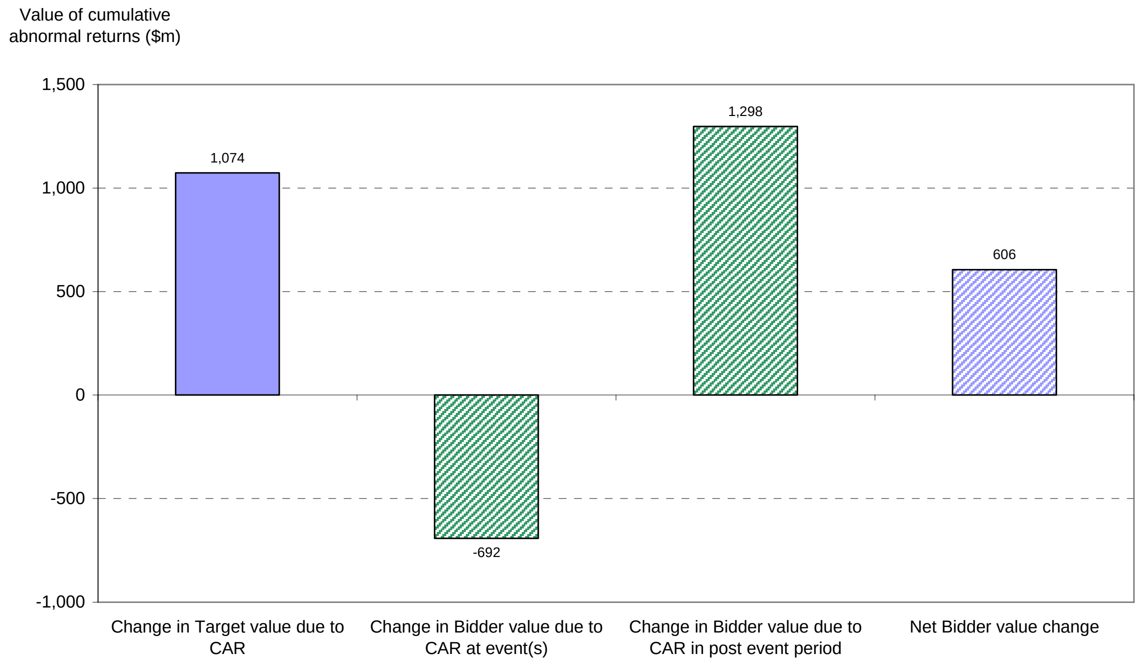
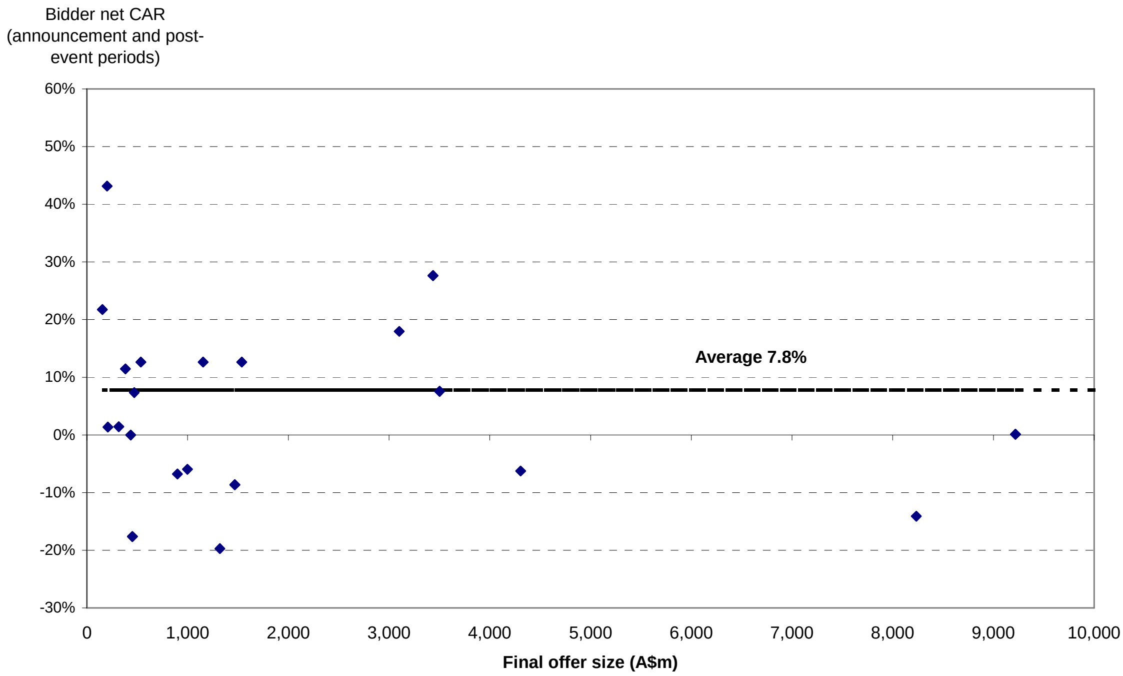


Figure 123 is a scatter plot of net bidder CAR at the initial announcement and post-event period and of the offer size. While the chart has been scaled to a maximum 60 per cent CAR return and offer size up to $10 billion, it shows that on average, a bidder has gained an average 7.8 per cent CAR on the transactions analysed. Furthermore, it highlights that 7 out of the 28 transactions had negative net bidder CAR or only 25 per cent of transactions lost bidder shareholder value.

Figure 123. Scatter plot of net bidder CAR at the initial announcement and post-event period and offer size.



Figures 126, 127 and 128 investigate the target and bidder size relationship with firstly, the final 30-day offer premia at announcement, secondly, the bidder CAR at announcement(s) and thirdly, the net bidder CAR over both the announcement and post-event windows.

This thesis argues that there is not a strongly evident relationship between target and bidder size and target premia at offer announcement or bidder returns at offer announcement or combined with the post-event period on the transactions analysed.

However, it is possible to interpret from Figures 125 and 126 that a larger target size results in low bidder CAR at the announcement window while a larger target size relative to the bidder can yield greater CAR in the post-event period. Both these interpretations are credible from firstly the ability of larger bidders relative to targets in their ability to fund and raise bids and secondly, a larger target relative to the bidder will have a greater impact on the bidder in the post-event period.

Figure 124. Average offer premia on the 30-day average target price versus the relative size of the target compared to the bidder.

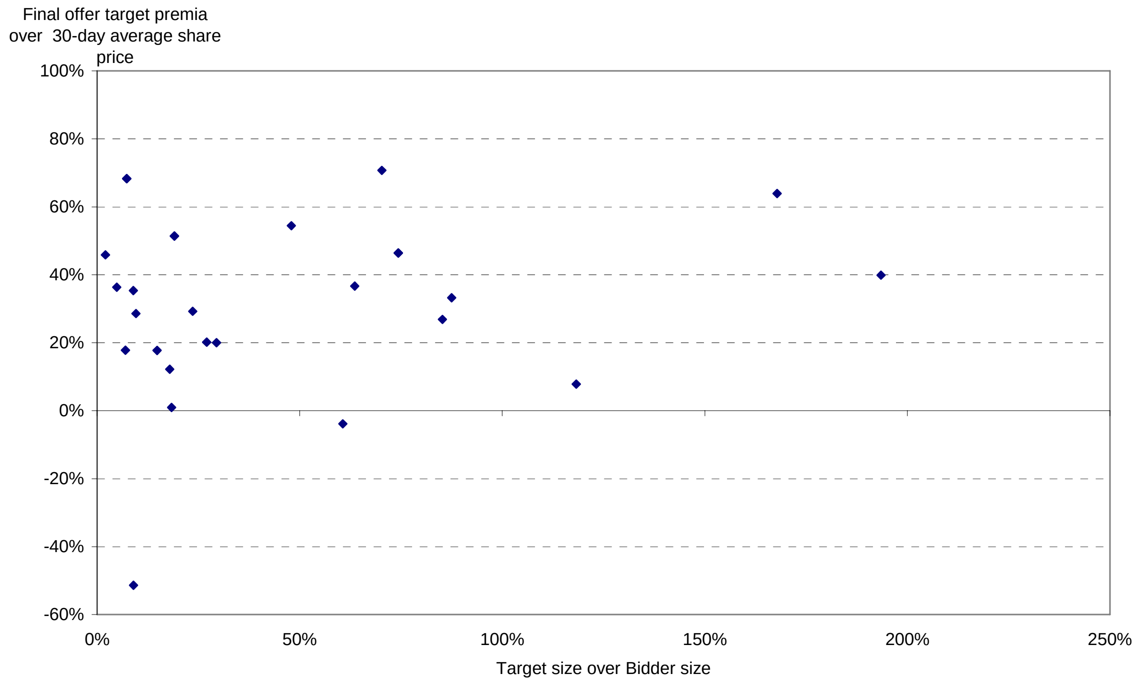


Figure 125. Bidder CAR in the announcement window(s) versus the relative size of the target compared to the bidder.

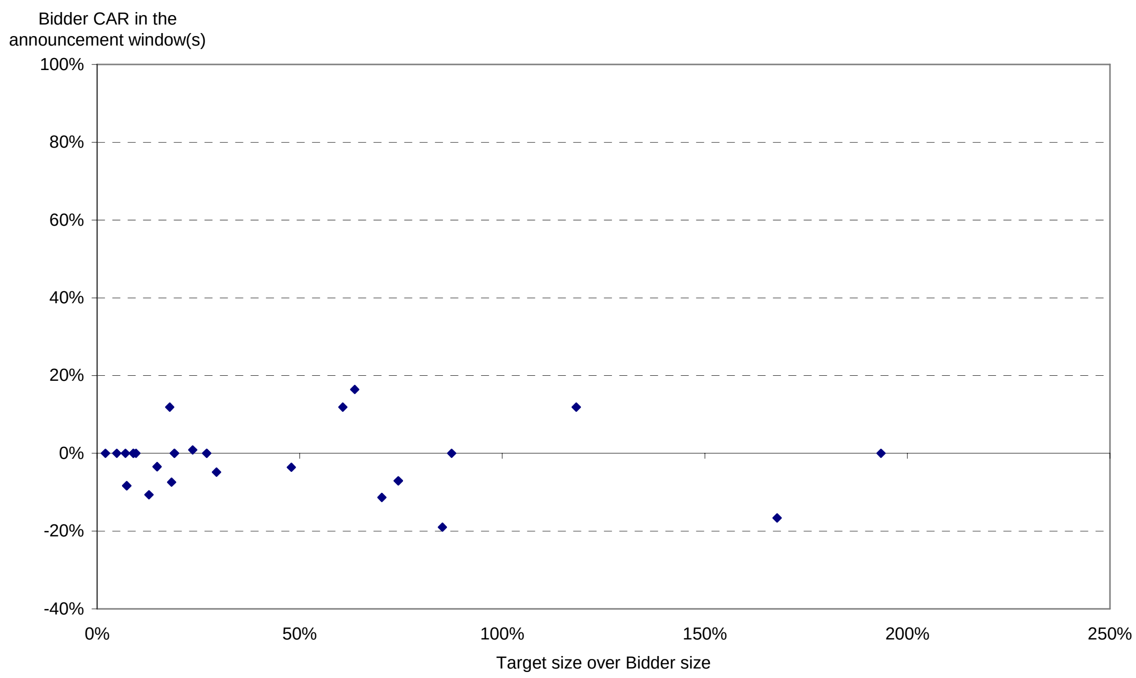
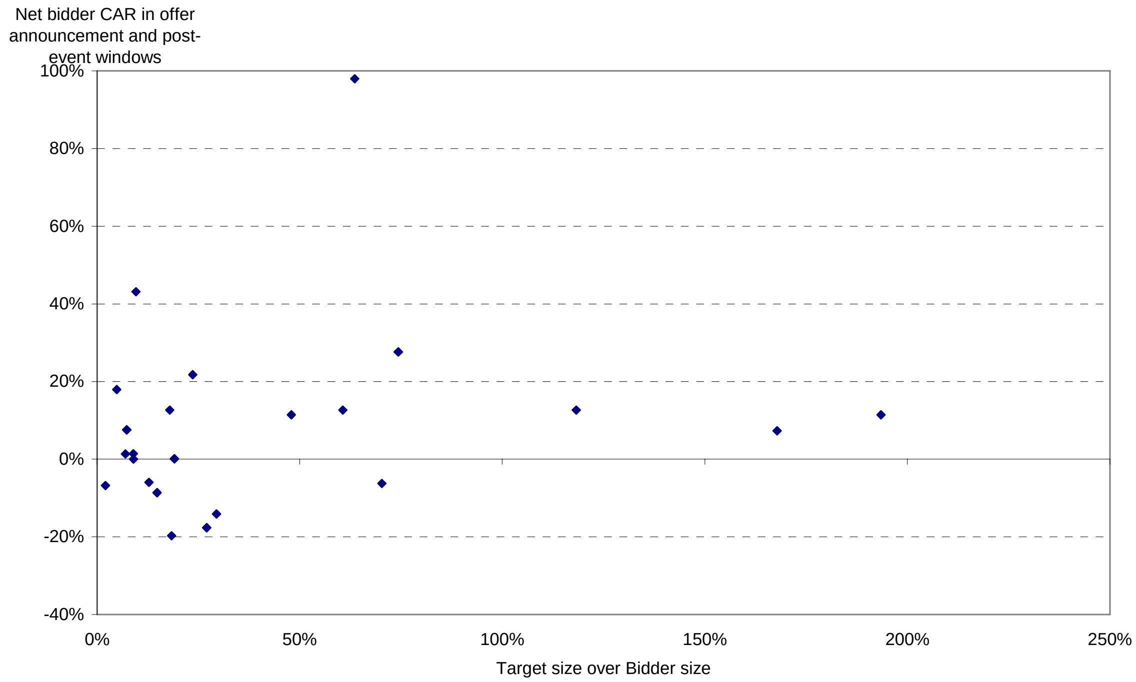


Figure 126. Net bidder CAR in the offer announcement and post-event windows versus the relative size of the target compared to the bidder.

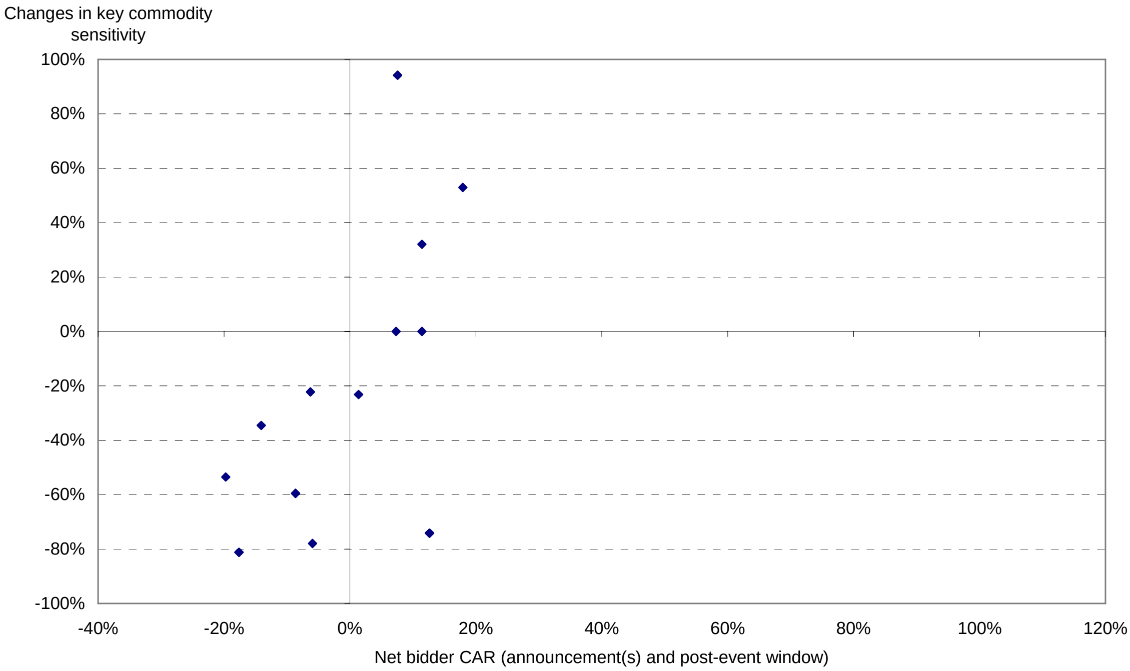


5.2.1.5 Bidder sensitivity changes

Appendix 1 presents a comparison of the sensitivity of the bidder to a key index and key commodity in the regression analysis in the post-event period. The observed t-results are compared in the post-event regression analysis with the regression analysis carried out in the estimation window. Both of these windows generally comprised 252-day periods separated by the transaction period.

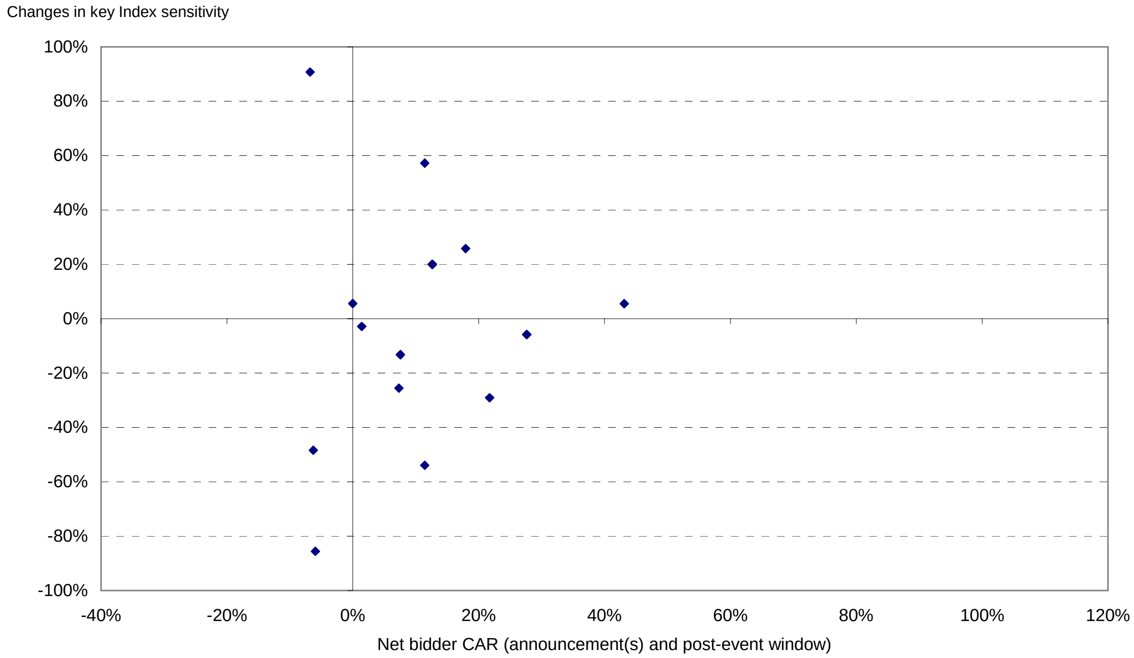
As noted in the commentary on individual transactions in Appendix 1, some of the changes were extreme, particularly when modest changes were observed over initially low t-results. There are also changes which appear unexplainable and may reflect specific company issues during one of the analysis periods. In terms of commodity exposure, resource companies were found to be relatively insensitive to changes in bulk commodity benchmark price changes reflecting typical annual negotiations, and in many cases were more sensitive to copper price movements with copper being a bellwether of the daily traded metals (see Chapter 3).

Figure 127. Changes in observed t-results in regression analysis in the post-event window compared to the estimation window for the key commodity exposure of the target company.



Despite the limitations discussed above, Figure 127 could be interpreted as indicating that higher net bidder CAR is potentially correlated to a greater change in the bidder’s sensitivity to its key commodity. This would be in accord with expectations that greater bidder returns could reflect an increase in the attractiveness of the bidder to investors and would correlate with a greater sensitivity to a key commodity.

Figure 128. Changes in observed t-results in regression analysis in the post-event window compared to the estimation window for the key index exposure of the target company.



In contrast, it appears there is no evident relationship between net bidder's CAR and changes in its sensitivity to a key index (see Figure 128). This differs from a perceived importance of index weighting although it could also reflect the diversity of the indices involved with the companies in the researched transactions, e.g. the investment universe behind international versus domestic indices. Nevertheless, this thesis would expect that companies would generally desire a greater sensitivity in specific indices to attract investment funds but transactions may not deliver this outcome.

6.0 The Exploration Alternative

Exploration projects represent part of the asset portfolio of resources companies and in the case of junior explorers, can be the main assets of the company. As for any other investment each project has a potential expected return and an associated uncertainty . The difference is that in exploration the uncertainty is much wider both on the up and downside, hence the risk of failure at the level of an individual project is extreme.

The relevance of exploration to this thesis is the dynamics between the attractiveness of investment in exploration versus acquisitions and how the market assesses these investments. As discussed in Chapter 5, in the M&A transactions analysed in Appendix 1, the average return to a bidder was 7.8 per cent and is the summation of generally negative cumulative abnormal returns (CAR) at the time of the announcement(s) and positive CAR in a 252-day post-event period. There was also a 25 per cent chance of negative cumulative abnormal returns for the bidder but despite these negative returns, the bulk of the value of the acquisition is retained by the bidder and may yet still deliver positive future returns.

The overriding factor influencing investment trends in both M&A activity and exploration is the scarcity of economic deposits. Indeed, this scarcity and risk associated with achieving exploration success has resulted in many companies preferring the reliability of acquisitions as source of corporate growth. There is evidence that the exploration alternative is experiencing:

- A general decline in discovery rates.
- A progressive decline in the deposit size of new discoveries over time for a given mineral camp.
- A steady increase in exploration discovery costs.

This chapter draws on both academic and industry publications and presentations to support these contentions. It also reviews global and domestic exploration expenditure trends and proposes a classification to categorise exploration expenditure in relation to project risk. By estimating and attributing crude probability of success to various exploration categories, it makes it possible to estimate the order of magnitude of the value of an exploration portfolio. While this is less relevant from an industry perspective given the necessity of gross generalizations in assessing the crude probabilities of success, it is important from a market perspective.

In recalling the declining probability model applied to junior explorers Anchor Resources and Cougar Metals (Chapter 4, Section 4.1.1.3) over defined time periods, it would appear that the market neither has the patience nor willingness to invest for returns on the basis of cumulative probability of success for a series of exploration projects on a realistic timeframe.

Nevertheless, exploration is the first strategic phase of the mineral supply process and the stimulus for exploration arises from the demand for the related target commodities. (Mackenzie, 1992). Exploration is also the most competitive activity within the mineral supply process, as companies tend to be more co-operative in respect to the subsequent development and processing of discovered resources, (White, 1998).

The last section and which is further developed in the discussion of Chapter 7 is the evolution of the exploration sector. It questions whether increasing commodity and acquisition prices will stimulate investor appetite for investment in exploration companies given the risks associated with exploration.

6.1 Exploration Trends

Exploration in areas later classified in this thesis as greenfield projects, can exhibit certain trends following a major discovery. These trends can involve a steady decrease in deposit size of subsequent discoveries, an increase in exploration costs and the combined decreasing discovery rates over time. These aspects are discussed below and in fact many researchers consider these characteristics can be applied on a broader scale to exploration in general over time.

Given these characteristics, it can be argued that at the time of the first discovery, the full value of the deposit and subsequent discoveries are unlikely to be fully appreciated by the owner although depending on the ground position held, there is now likely to be an enhanced upside from future exploration efforts. This thesis would argue that it is difficult to assign this as an ‘embedded option value’ as discussed in Chapter 2 (Section 2.2.1.3) but rather a probability function given that the presence of an initial discovery now increases the probability of future, albeit, potentially smaller, discoveries.

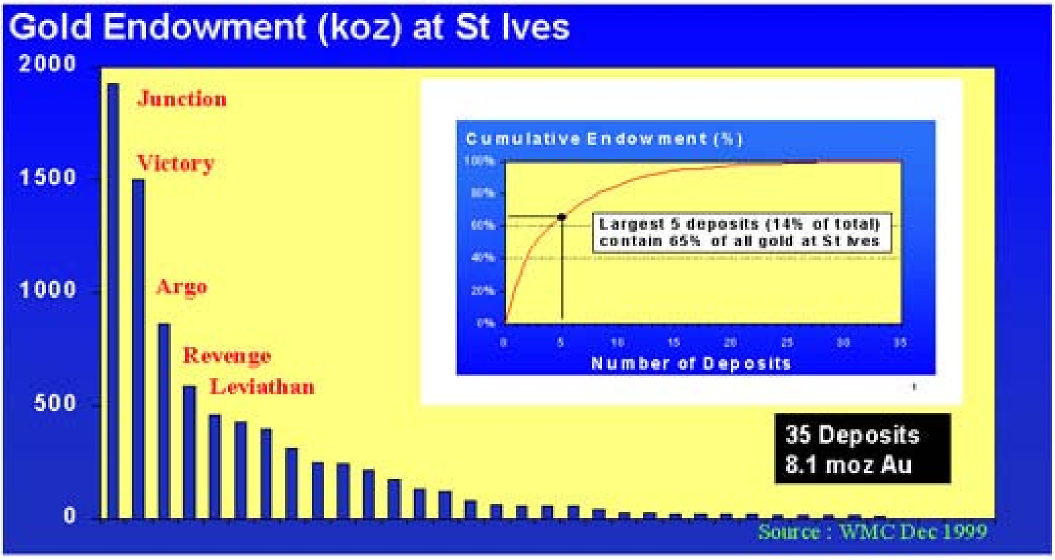
However, in considering the potential share price rerating of the company making the initial discovery and with the potential for future albeit smaller, discoveries, it is reasonable to expect that the most significant rerating will occur with the announcement and proving up of the initial discovery. While the prospect of further discoveries exists, it is more likely that after the perceived value (say an approximate market NPV estimate) of the new discovery is impounded in the share price, the market will turn to consider other factors such as the feasibility studies and development timetables and ability for the company to finance the project. This is particularly relevant in smaller companies with the market turning to firstly, the ability of the company to fund the project and what equity raisings may be required, and secondly, the timing to first project cash flows.

Therefore it is likely that the share price of smaller companies will undervalue the increased probability of future discoveries in the area after some resource quantification of the first discovery has been completed and the initial exploration hype has dissipated. As discussed later in Section 6.1.4, this leaves smaller companies particularly vulnerable to an undervalued takeover while providing larger bidding companies with confidence that significant new discoveries in smaller companies can be bought cheaply at the right time. Alternatively, if the company can progress past the financing stage and move to production, then future discoveries now offer a greater upside to shareholders with the ability to schedule processing through the operating plant.

6.1.1 Declining deposit size.

The progressive decline in deposit size over time in a given mineral camp is a well known phenomenon and has been reported in many mineral fields (e.g. Guj et al, 2010, Whiting and Shodde 2006, Guj and Fallon 2009, Huleatt and Jaques 2005, Jacques et al, 2005, Parry 2001). Parry (2001) highlights this feature in Figure 129 which presents the gold endowment at St Ives in the eastern WA goldfields.

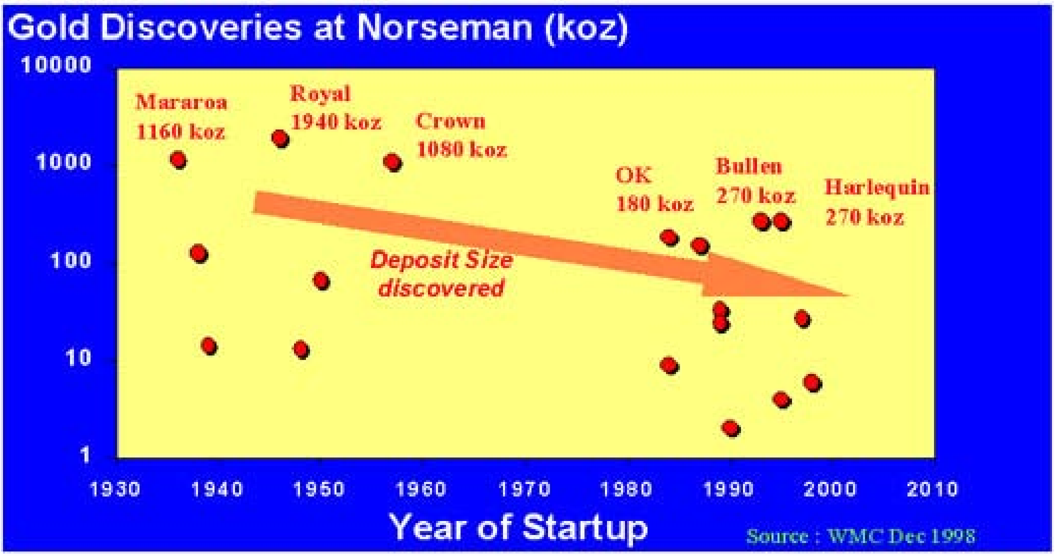
Figure 129. The size of gold discoveries at St Ives, WA.



From Parry (2001).

Deposit sizes are fitted well by a lognormal distribution (Guj et al, 2010)and reaffirms the adage that 80 per cent of the value comes from 20 percent of the deposits. Figure 130, also from Parry (2001), displays a broadly declining size of deposits discovered through time at Norseman in the Eastern Goldfields of WA.

Figure 130. Discovery trends at Norseman, WA.



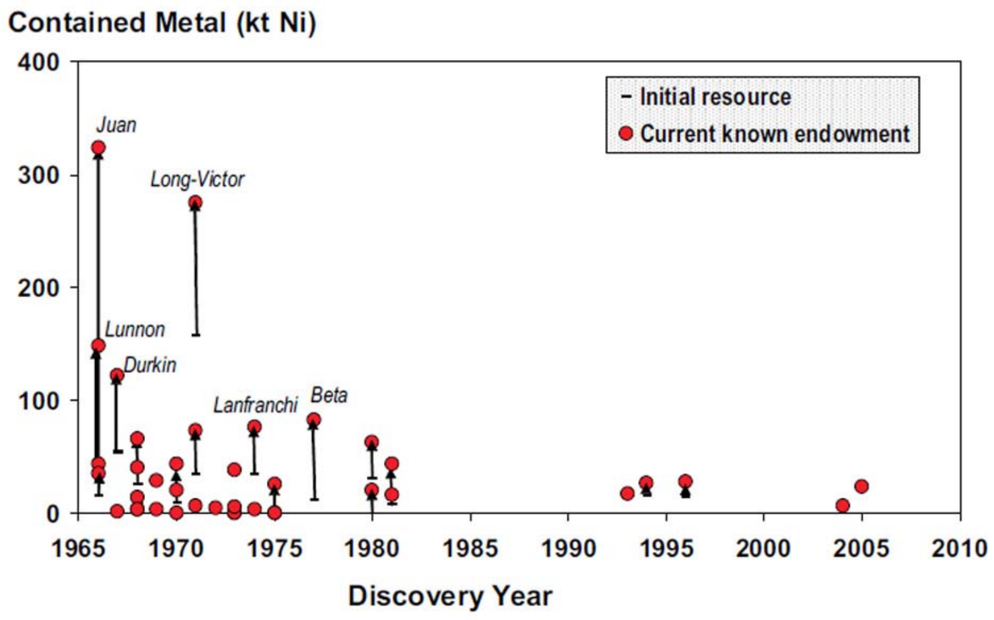
From Parry (2001).

A similar case is outlined by Whiting and Shodde (2006) with the discovery of nickel orebodies at Kambalda and includes later resource additions in subsequent exploration (Figure 131). They define a search space as a given set of conditions which constrain economically-significant outcomes of the search process and include:

- target ore-type (detectability, economics);
- cover conditions;
- detection technology;
- extraction technology; and
- political/commercial environment.

A key observation of the researchers is that the largest deposits in any given prospective search space are usually found early because they have the most obvious signatures. This was certainly the case at Kambalda, with the four largest deposits there being found in the first six years following the initial discovery (see Figure 131).

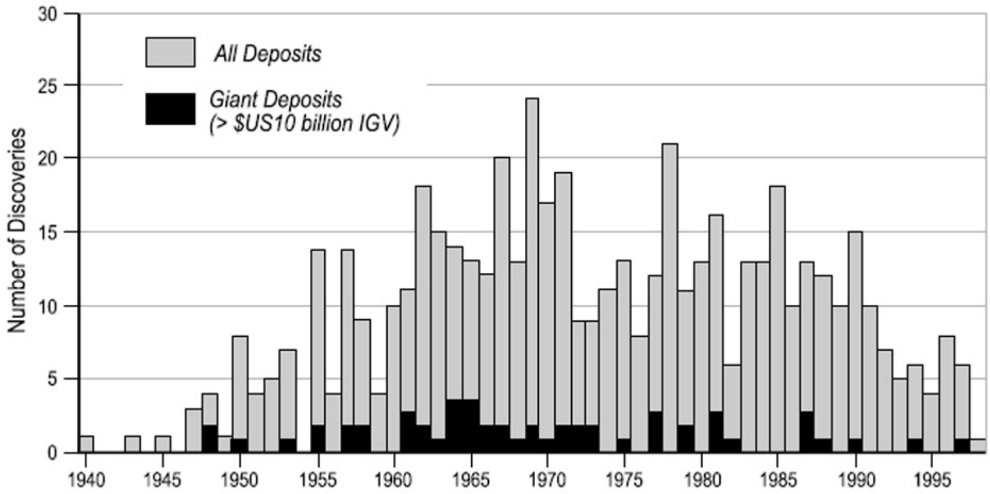
Figure 131. Size and discovery date of nickel deposits found at Kambalda



From Whiting and Shodde (2006).

The same premise has been applied to global exploration as exploration of mineral provinces around the world matures and the discovery of new deposits becomes more difficult. This is evident in discovery trends for all deposits over time including giant deposits as classified by Blain (2000) with a greater than US$10 billion in-ground value (IGV).

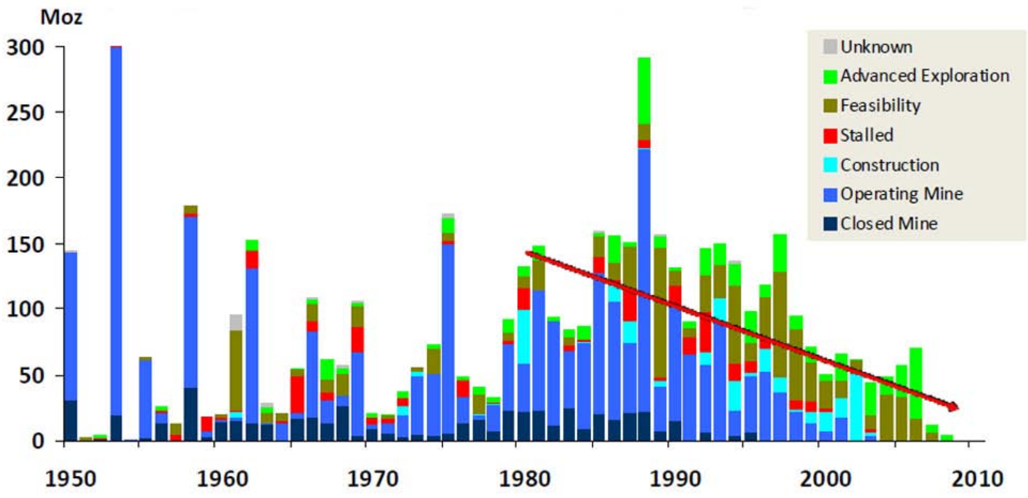
Figure 132. Discovery frequency over time for all deposit types.



From Blain (2000).

In fact McKeith (2009) argues that the gold industry itself is being sustained by maturing mines discovered many years ago. He estimates that the historic average to 1995 is that 75 per cent of discovered ounces are mined (Figure 133).

Figure 133. Discovery and development of world gold resources.



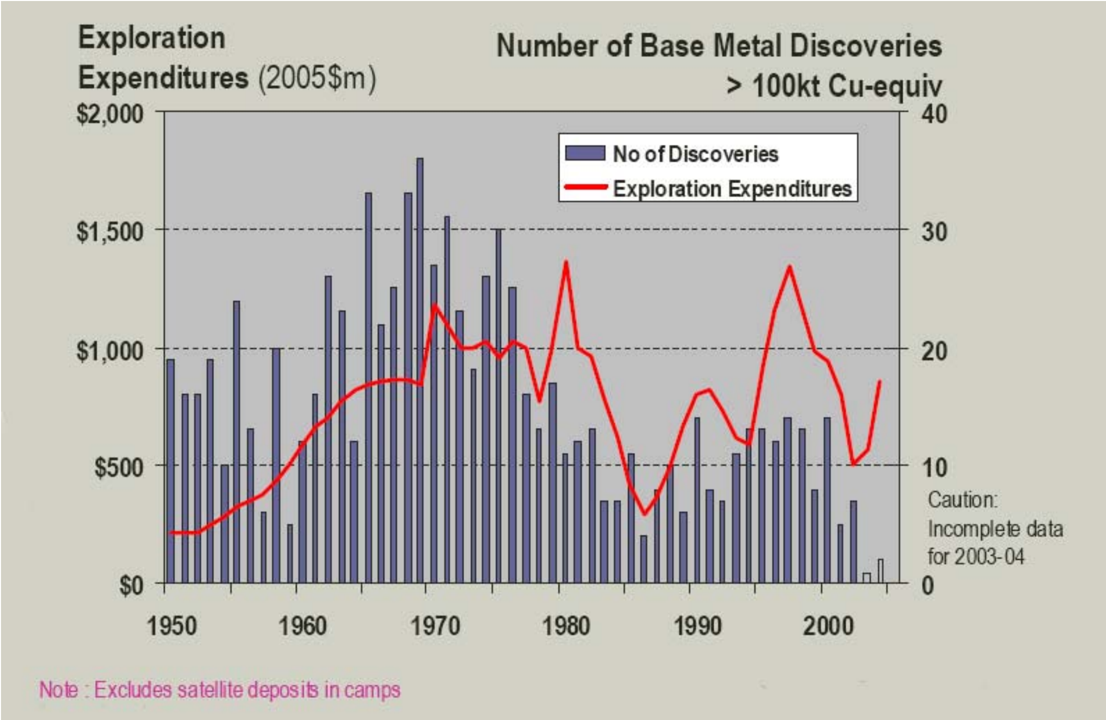
From McKeith (2009).

6.1.2 Declining Exploration Success Rates

Research also indicates that discovery success is waning over time on a per-exploration-dollar basis (Goodyear 2006, Mercer 2006, Leveille & Doggett, 2006). While the evidence is somewhat general in nature, it is in line with expectations discussed earlier that the larger, outcropping and shallower orebodies, with obvious footprints are discovered first and hence the discovery rate slows as the number of remaining undiscovered deposits decreases and they become more difficult to find.

A review of BHP Billiton's data on base metal discoveries (Goodyear, 2006) clearly shows how exploration 'effectiveness and efficiency' have generally deteriorated despite volatile but significant exploration expenditure since the 1950s (see Figure 134). Discoveries in this database exclude satellite deposits to existing operations and are limited to individual deposits or local groups of deposits containing more than 100,000 tonnes of copper or copper-equivalent metal.

Figure 134. Exploration expenditure and discovery trends in base metals.



From Goodyear (2006).

Figure 134 highlights a strong discovery rate in the 1960s and 1970s, which has observably declined irrespective of the volatile annual exploration expenditure levels.

Blain (2000) and Palethorpe and Blain (1986) contend that the high discovery rate of world class deposits in the 1950s and 1960s has deteriorated over time. These authors note that new developments in exploration technologies, including remote sensing, have contributed to more recent successes, but in aggregate, they have been insufficient to mitigate the overall declining trend.

Decreasing discovery rates conversely imply an increasing cost of discovery and therefore a lower net value of an 'average' discovery. The logical conclusion is that there is a decrease in both the effectiveness and efficiency of companies solely engaged in exploration given the higher expenditure required per given discovery. Ideally the increased rewards of an exploration discovery due to scarcity and higher commodity prices should translate into a lower-cost and more easily accessible capital for explorers (e.g. through coveted equity raisings) but this has not been the case. Most junior explorers listing on the ASX struggle to meet minimum capital raising requirements ($2.3 million) despite the increasing costs of discovery, with the proposition that a perceived higher risk due to declining discovery rates is not compensated by increasing discovery rewards by the market.

6.1.3 Trends in Discovery Cost

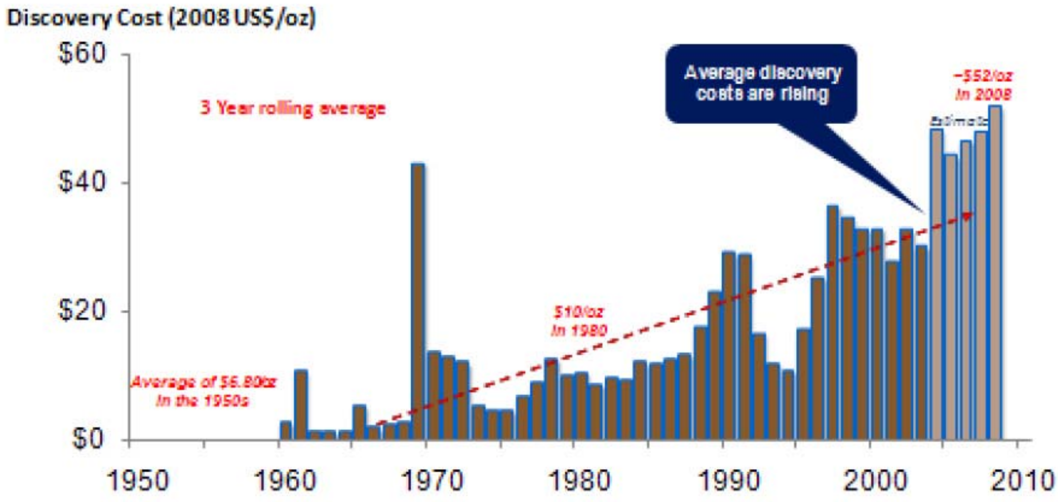
A number of researchers have estimated discovery costs over time, and in particular, in the gold sector. In fact many gold companies publish discovery costs as a method of highlighting to the market their capacity to add shareholder value by 'discovering' low-cost ounces.

Unfortunately overall discovery costs do not provide a meaningful trend as the costs are largely influenced by:

- Comparability of the cost data and the way they are collected and collated. More often than not, historical dollars of different years are used, making comparisons inconclusive or even erroneous during periods of high inflation.
- The technical ability and competitiveness of individual companies to discover further mineralization.
- The components of the exploration program in terms of *minesite*, *brownfield* or *greenfield* exploration. An example is a gold company may commence an exploration program near existing deposits where mineralization is known to occur from past drilling. This can provide an enhanced ability to 'discover low-cost ounces' in comparison to a prior program which focused on *greenfield* exploration programs.

In gold exploration, research by Huleatt and Jaques (2005) noted that average discovery costs had stabilised around A$20 to $25/oz after falling sharply during the early to mid-1990s. The early to mid-1990s was a time when a number of new discoveries were made, notably in the Yandal belt in Western Australia and the Lachlan Fold Belt in New South Wales. However in a more recent presentation by Gold Fields (Figure 135), Exploration Manager Tommy McKeith, presented a case of steadily increasing discovery costs over time from a global perspective (McKeith 2009).

Figure 135. Declining exploration efficiency based on greater than 0.1 million ounce discoveries.



From McKeith (2009).

In base metals exploration, Jacques et al (2005) note that the discovery record is strongly cyclical with resource growth for all the base metals punctuated by the discovery of some giant and world class deposits each decade (see Section 6.5.1 and Shodde & Hronsky (2006) for definition of world class). Jacques et al (2005) noted that higher metal prices and renewed interest in base metals, especially nickel, had reversed a 10-year decline in base metal exploration attended by reduced rates of discovery. This renewed interest had led to record expenditure and new nickel, copper and zinc discoveries, while also increasing the resources at a number of existing deposits, notably the Olympic Dam copper-uranium-gold deposit. With the exception of the Prominent Hill copper-gold and West Musgrave nickel-copper deposits, most of the recent discoveries, especially zinc, were noted by Jacques et al (2005) as being of small tonnage and supporting the concept of the discovery of progressively smaller sized deposits over time in mature provinces.

6.1.4 Investor sentiment to exploration

The discussion above highlights the market sentiment towards exploration as a high risk venture that may not offer returns within an acceptable timeframe. In fact declining success rates and increased discovery costs along with a general decrease in average discovery size across the broader industry does not engender investment appeal.

As an alternative to exploration, many junior companies have acquired existing undeveloped but previously marginal projects and which are later referred to as *Secondary Project Evaluation* (Section 6.5). During the 2002-2008 Resources Boom, Hronsky et al (2009) notes that the prices paid for many of these assets were significantly greater than their underlying value and that the most significant lesson to emerge from the recent boom is that *increases in commodity prices alone are not enough to make poor quality deposits economically viable*!

Their conclusion was based on the fact that while commodity prices move higher, so do the potential cost inputs (e.g. energy, labour, materials, etc.) and hence, the operating margins remain low. Nevertheless, this has not been the case with all projects, Fortescue Metal's development of the once considered marginal Chichester iron ore deposit being a prime example.

6.2 Exploration expenditure trends and the influence of markets

Researchers tend to focus on historical exploration expenditure levels as a guide to exploration activity and hence the factors that influence these expenditure levels are important analytical considerations.

Exploration expenditure is surveyed by both government organizations (e.g. Australian Bureau of Statistics with further analysis by Abare) and private organizations. Of the latter the most well known is the Canadian-based Metals Economics Group (MEG) (see ABS publications 8412.0, MEG 2008). Metals Economics Group (1992-2008) surveys provide a global perspective while Government statistical data collections along with surveys by industry or accounting bodies tend to be specific to particular countries.

The surveys also vary in comprehensiveness from reviewing company exploration expenditure in the annual accounts, collating statistical data from mail-out responses to exploration companies and to organizations conducting personal interviews with company executives. The former tends to provide historical data series while the latter seeks to provide contemporary expenditure trends.

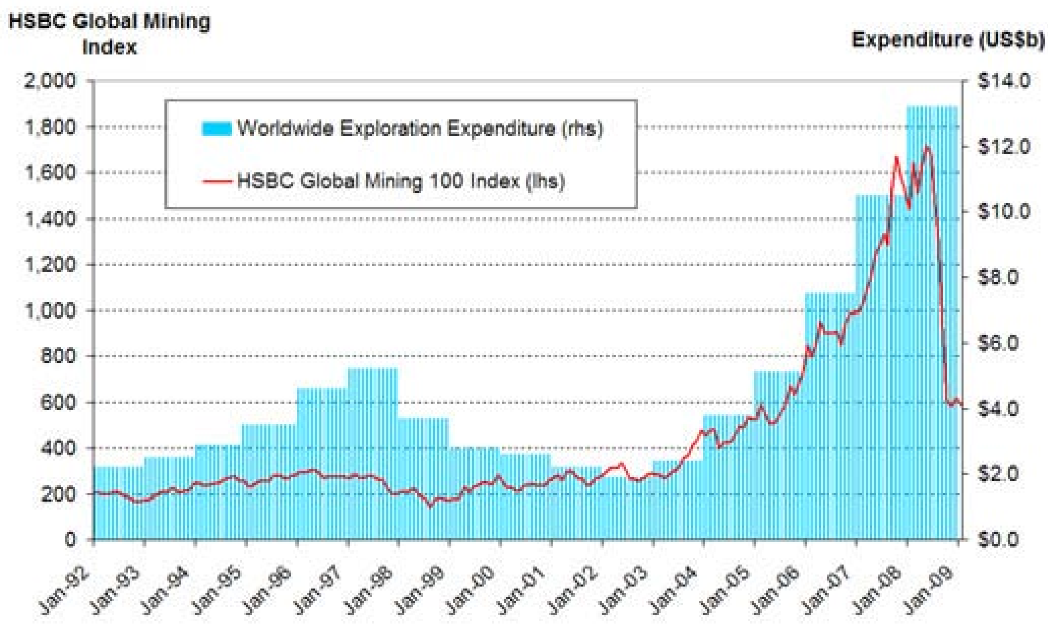
Historically, exploration expenditure has varied from year to year in response to:

- Relative commodity prices, recent price trends and future expectations
- Equity market support for the resource sector and the extent of this support to junior explorers
- Consolidation within the resource sector
- Project availability and access

In reviewing exploration funding trends on a global and domestic scale there are broad correlations between exploration expenditure and both commodity prices and equity market levels. This is evident on a global basis by comparing yearly non-ferrous world exploration estimates from MEG (2002 to 2008) with global mining indices and base metal prices.

Figure 136 plots the Metals Economic Group’s estimated global yearly exploration expenditure against the HSBC Global Mining Index. It indicates a broad correlation in the 2002-2008 Resources Boom. Due to the size of this boom, the scale overshadows earlier trends although an earlier exploration expenditure peak in 1997 does appear to correlate with an increase in the HSBC Global Mining Index with the 1992-96 Bull Run.

Figure 136. Worldwide exploration expenditure trends and HSBC Global Mining 100 Index.



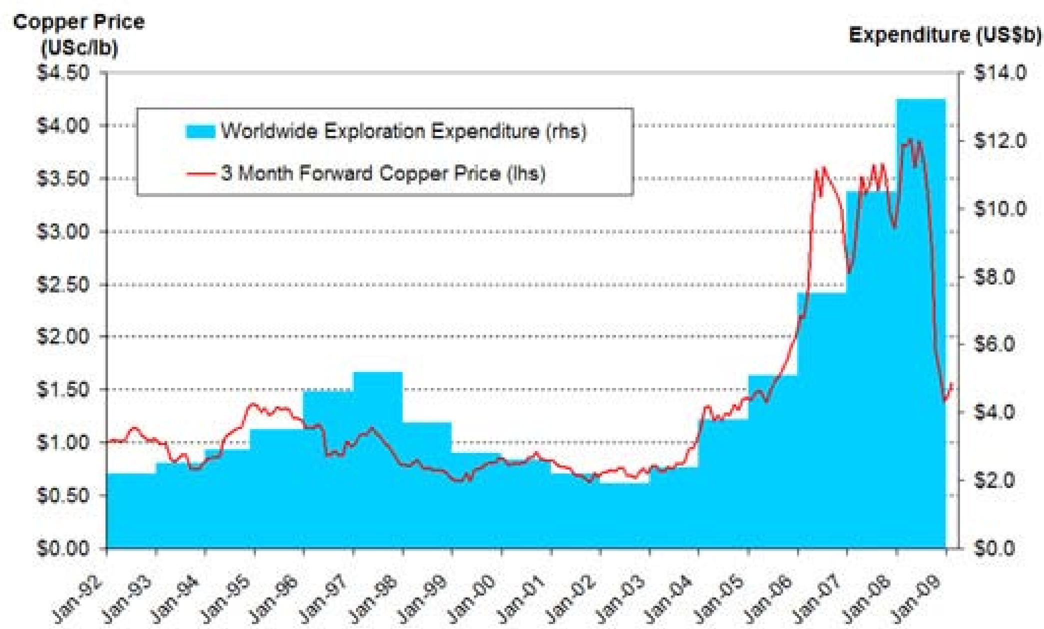
Data sourced Stock Resource, Goulden, 2009, MEG 2007, 2008.

A comparison of global exploration expenditure and base metal prices is presented in Figure 137 and 138. Figure 137 plots the LMEX index (a composite of base metal prices from the LME) while Figure 138 plots the three month forward LME copper price with Metals Economic Group’s estimated global yearly exploration expenditure.

Figure 137. Worldwide non-ferrous exploration expenditure trends and the LMEX commodity price index.

Data sourced Stock Resource, Goulden, 2009, MEG 2007, 2008.

Figure 138. Worldwide non-ferrous exploration expenditure trends and three-month forward LME copper price.



Data sourced Stock Resource, LME, Goulden, 2009, MEG 2007, 2008

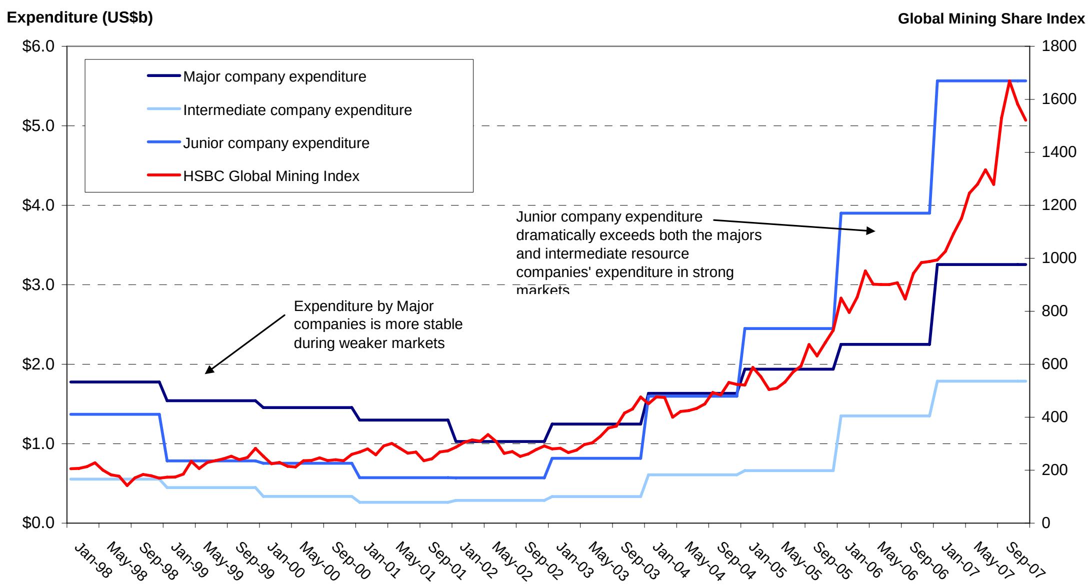
As the exploration expenditure data are annual, analysis is limited to broad trends and it is not evident whether commodity or share prices have the greatest influence.

Research by Bartrop (2009) notes that in the recent 2002-2008 Resources Boom, the share prices of resource companies have moved simultaneously with commodity prices rather than displaying a pre-emption period typical of earlier resource rallies. This is supported by comments by the Morgan Stanley Australian economist, Gerard Minack (AFR, 2008) and as discussed in Chapter 3, and is likely to reflect an increased investment in commodities as well as equities by global investment funds.

Figure 139 and 140 depict two charts adapted from MEG (2008) data, which confirms the generally recognized fact that junior explorers increase exploration expenditure when equity funding becomes available.

Figure 139 plots the annual exploration expenditure estimates for the Major, Intermediate and Junior companies along with the HSBC Global Mining Index. Recalling the 2002-2008 Resources Boom, Figure 140 highlights the dramatic increase in junior expenditure as equity funding becomes increasingly available.

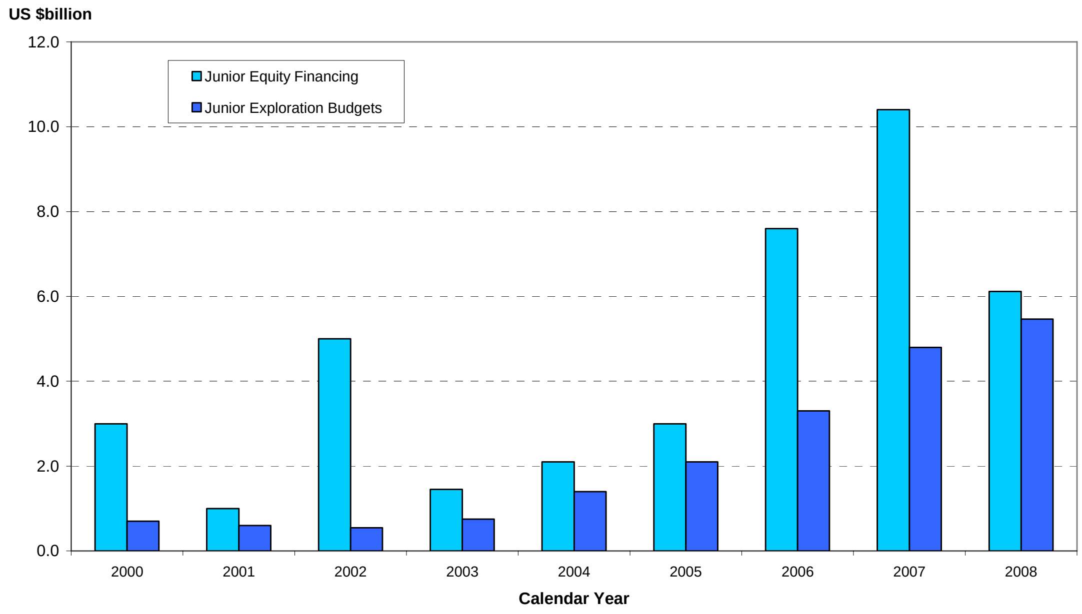
Figure 139. (a) Worldwide Exploration Budgets by company type from 1998 to 2008 and the HSBC Global Mining 100 Index.



Restructured from MEG 2002 - 2008 data

The application of this funding is evident in Figure 140 which plots junior exploration budgets with junior equity raisings. Figure 140 highlights two important issues. Firstly total junior equity financings have been double the exploration budgets over the 2002-2008 period and potentially indicating an 'opportunistic' factor in junior companies management's fund raising activities. Secondly, the yearly variation in total exploration budgets is significant and represents more than a 10-fold increase from the low point in 2002 to the highest expenditure in 2008 and hence the risk that specific exploration programs may struggle to maintain continuity from year to year. Both of these factors suggest a relatively low exploration efficiency per equity financing dollar.

Figure 140. Junior Company Exploration- Related Equity Financings and Exploration Budgets*, 2000-2008 (US$ billions)



Data sourced MEG, 2008, *2008 data pro-rata estimate on data from Goulden 2008.

In contrast to junior exploration expenditure, expenditure by the majors and intermediate-size companies are less volatile and with expenditure by the majors estimated to be greater than junior expenditure in the five to six years prior to the Resources Boom. However, over the last 10 years according to the MEG data, the total junior exploration expenditure has in fact exceeded the expenditure by the majors by around US$2.5 billion.

This concurs with Mercer (2006) who notes that approximately half of recent exploration expenditure was from junior companies in line with stronger equity markets. Interestingly over the 10-year time period in Figure 139 the MEG data indicate that junior exploration expenditure has been on average, broadly similar to the expenditure of the major companies.

A contentious issue is the effectiveness of junior exploration and this subject draws mixed and unquantified opinions. McKeith (2009) presents an assessment which claims that junior and prospector expenditure has been less effective than expenditure by majors and intermediates in the gold sector (Table 45). In contrast, AMEC (2009) report that juniors have been responsible for the discovery of two-thirds of gold deposits since the 1960's in Western Australia but unfortunately the cost of this success is not quantified nor the average discovery size relative to discoveries by the mid-cap and major companies.

Table 45. The effectiveness of exploration expenditure by major and intermediates sized companies versus and juniors and prospectors in the gold sector.

	Majors and Intermediates	Juniors and Prospectors
Greenfields and late state exploration funding	40%	59%
Average size of discovery	3.2 Moz	2.2 Moz
Cost per discovery (2008 US$m)	$104M	$174M
Cost per ounce (US$ 2008/oz)	$33/oz	$80/oz

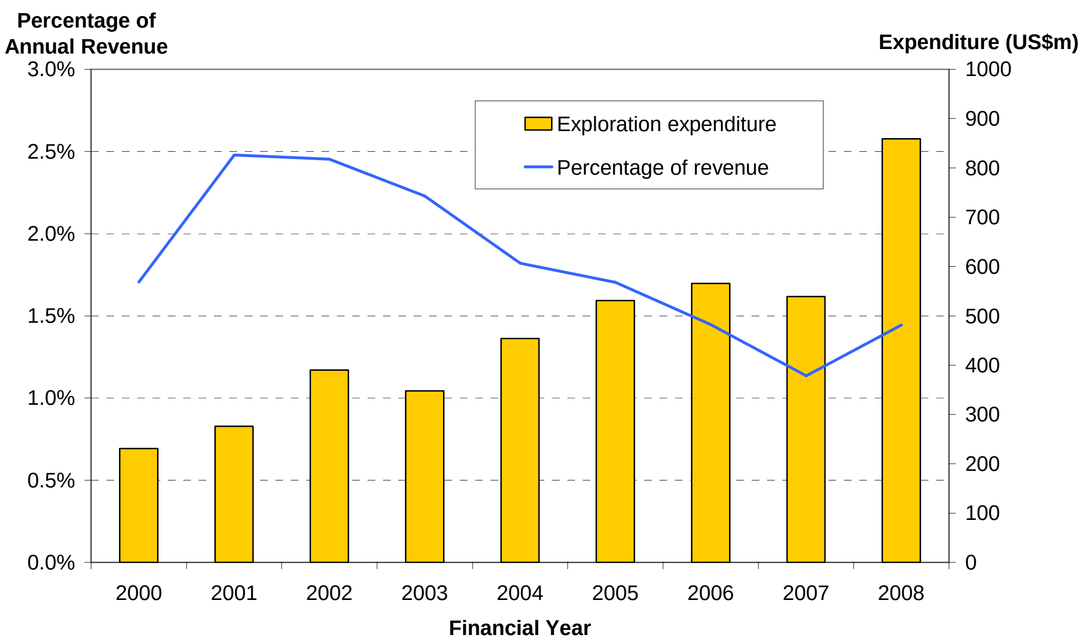
From McKeith (2009).

As noted in the earlier discussion on junior equity financings, this thesis believes that the effectiveness of exploration in smaller companies is likely to be hampered by inefficiencies such as the cost of administration relative to the scope of their activities, the necessary funding to apply the optimum exploration techniques and caution in advancing projects where there is a potential to devalue the project (e.g. see Guj, 2009, Shodde and Hronsky, 2006, Bartrop and White, 1995).

The major companies comprise the global diversified houses such as BHP Billiton, Rio Tinto, Vale, Xstrata and Anglo American and these companies tend to allocate relatively stable exploration budgets which steadily change over time in line with revenue levels (e.g. AFR 2008). This typically varies from 1 to 3 per cent of revenue although disclosure is variable, for example Rio Tinto and Xstrata do not segregate exploration expenditure in their accounts, perhaps reflecting a greater focus on growth through acquisition over the past few years.

Figure 141 plots charts BHP Billiton's annual exploration expenditure as shown in its cash flow statement as a percentage of revenue from its profit and loss statement. While this is a ratio between cash and an accrual figure, it is an approximate yet meaningful metric. Revenue reflects the impact of commodity prices and production changes (to lesser extent changes in inventory levels and other accrual items) and over this timeframe it is interpreted that exploration expenditure has not kept pace with revenue (and commodity price) increases. This exploration expenditure pattern appears to apply to most of the majors.

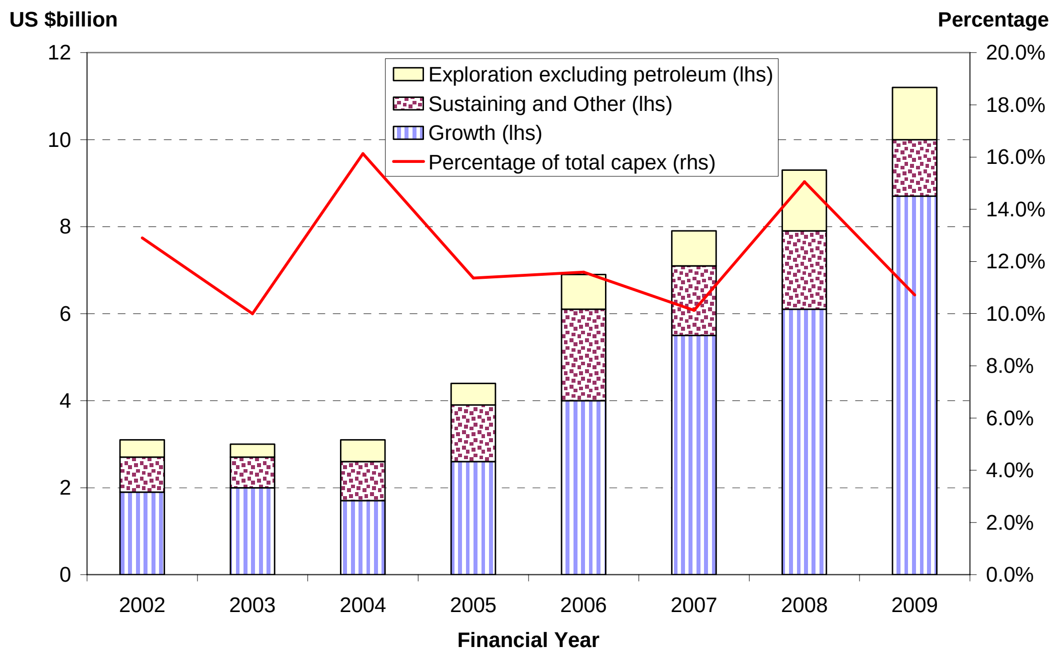
Figure 141. BHP Billiton's exploration expenditure as a percentage of revenue.



Source: BHP Billiton Annual Reports 2000-2008.

Figure 142 plots BHP Billiton's non-petroleum yearly exploration expenditure as a percentage of total capital expenditure. Interestingly, this appears to follow a closer relationship with the percentage ranging between 10.0 and 16.1 percent of total capital expenditure with levels tracking total capital expenditure.

Figure 142. BHP Billiton's yearly exploration expenditure as a proportion of total capital expenditure.

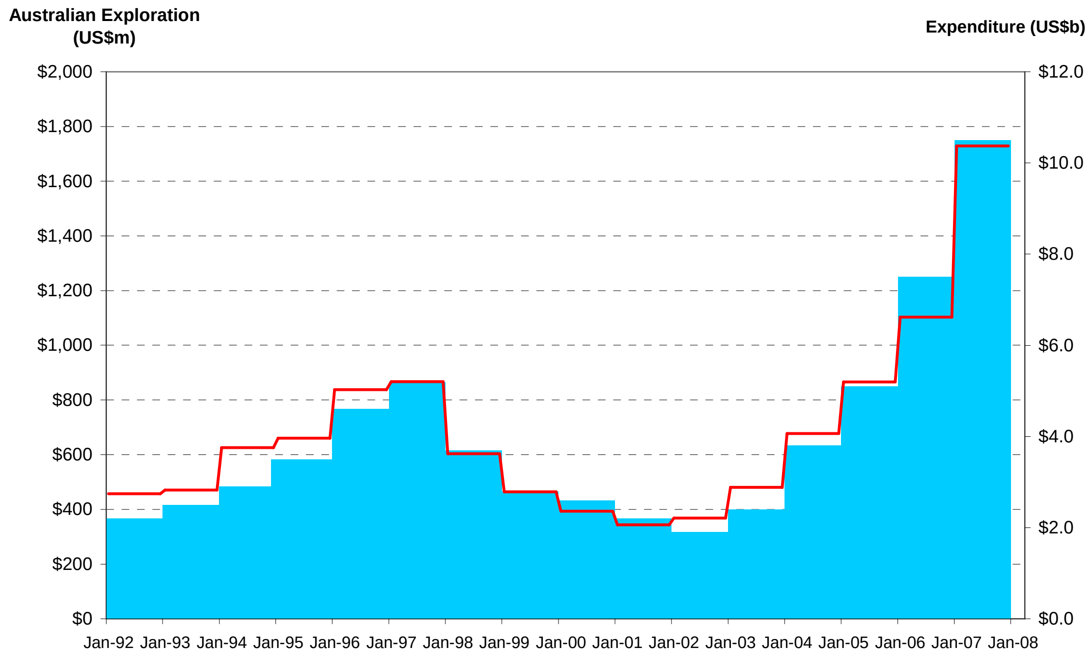


Exploration based on cash flow statements, revenue from Profit & Loss statements; Revenue restated to consolidated as proportional interests from 2004. Growth capex is the development capex attributable to new projects or expansions while sustaining capex is 'stay in business' capex. Source: BHP Billiton Annual Reports 2000-2008.

6.2.1 Australian Exploration Expenditure Trends

To compare Australian exploration spend with the global spend, the Australian quarterly exploration expenditure, as recorded by the Australian Bureau of Statistics (ABS), has been summated to an annual basis and converted to US dollars using average yearly exchange rates. As outlined in Figure 143, Australian exploration expenditure in historical dollars follows the global trends based on MEG data.

Figure 143. Australian (red line) and global annual exploration expenditure (bars) in nominal US dollars.

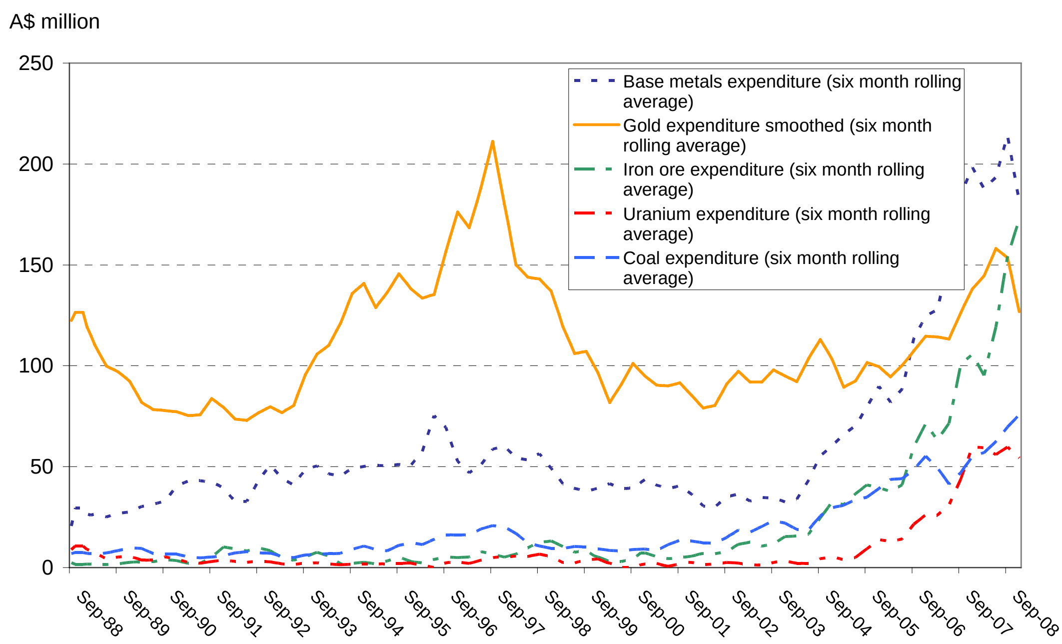


Source: ABS (2009), MEG (1996 – 2008)

The ABS data also segregate expenditure among different commodity targets. Exploration figures, however, can be distorted by expenditure incurred in the feasibility studies of large projects that is not strictly exploration, e.g. BHP Billiton's expenditure on its Olympic Dam expansion.

Figure 144 plots the exploration levels for the commodities categorized by the Australian Bureau of Statistics (ABS 1988 – 2008) prior to the Global Financial Crisis. It reiterates the resurgence of industrial-related commodities in the 2002-2008 Resources Boom and the declining importance of gold exploration. Historically, gold exploration has been a major focus of junior explorers due to the relative ease and lower costs of developing gold deposits, their generally shorter development timeframe and the ease of marketing of the gold produced.

Figure 144. ABS aggregated exploration expenditure for specific commodities from 1998 to 2008.



Data sourced from ABS (2009).

6.3 Exploration Risk Categorization

Exploration expenditure classifications, such as the one utilized by MEG (Goulden, 2008), typically divide expenditure into three categories, namely; mine, advanced and grassroots exploration. These categories are outlined as follows:

- **Grassroots:** Exploration from the earliest reconnaissance and project generation stages, through perimeter drilling to the quantification of initial resources.
- **Late stage and feasibility:** exploration to further define, quantify, and upgrade a previously identified mineral resource. It also includes all feasibility work up to a decision as to whether or not proceeding to development of a mine.
- **Minesite:** all exploration (regardless of phase) at or immediately around an existing minesite held by the company (excluding production geology on the orebody being mined such as geotechnical/rock engineering, reserves estimation, and grade control or confirmation drilling on the producing orebody). It includes the search for satellite orebodies within an economic transport distance of an operating mine and related processing plant. It also

includes exploration at or immediately around a project that has been committed to development (preproduction stage).

Yearly survey data provide a useful time series in categorising exploration expenditure. However, the classification has limitations as follows:

- The definition of the ‘Grassroots’ expenditure is very broad.
- The classification does not attribute exploration risk across the various categories although the risk of ‘Grassroots’ exploration expenditure is perceived as higher than that of the other two categories.
- It is difficult to relate company size to exploration expenditure patterns.
- Late-stage or feasibility study exploration expenditure is not clearly differentiated between that relating to advanced projects which have resulted from past exploration success in a company’s grassroots campaign from expenditure on advanced projects which have been acquired.

Bartrop and Guj (2009) recommended a slightly different approach to the classification of exploration expenditure by linking categories or target styles with generalised risk-reward scenarios. Hogan et al (2002) noted the concept of risk in exploration as failure to discover an orebody and related it to the level of geological information available on a particular area. However, the potential value of an exploration target cannot be viewed in isolation from logistical considerations as its value will be higher if it is within economic reach of an under-utilised processing plant, particularly if the plant is owned by the exploration company. Thus, to broadly categorise risk, Bartrop and Guj (2009) focused on a combination of geological maturity of the terrain of the project area and the opportunity to utilize an existing beneficiating plant or the perceived difficulty in establishing a new one. Their proposed classification follows:

***Minesite exploration* –** This refers to exploration around existing operating mines owned by the company. The targets are generally orebody extensions or satellite orebodies that can provide feed to an existing mill. The local geology is usually known in some detail. These type of projects are considered generally low risk – low reward targets. This is because economic mineralization is likely or even known to occur on the mine site but historical exploration has generally reduced the potential for a major orebody discovery. Exploration may also yield a substantial discovery at a depth below previously defined resources, however, this expectation is normally low given the presence of deep drilling to originally define the resources for mining. The presence of a plant also reduces the grade and size parameters that would be necessary for a new discovery to be economically exploitable.

***Brownfield exploration* –** This is exploration in geologically prospective areas where past discoveries have proven the existence of the style of mineralization sought and the broad geology is reasonably well known. The terrain may host existing operations generally beyond an economic trucking distance, hence there is an expectation that an economic discovery will involve the development of a new processing plant or at least, an ore treatment deal with a third party. An example could be prospective targets along a structural trend from historical mining centres, as is typically the case in Archaean gold exploration in the Eastern Goldfields of Western Australian. Exploration may involve soil sampling, localized geophysics and drilling rather than detailed large scale remote sensing. Previous exploration generally precludes the scope for a major world class discovery, but encourages realistic expectations for reasonably attractive middle and small size targets. These are classified as moderate risk – moderate reward targets.

***Greenfield exploration* –** This is typically grassroots exploration over broad areas where there is generally no capacity to utilise an existing processing plant and any new plant is likely to involve major infrastructural requirements. The project geology is not well known and the exploration targets may be mineralization styles that are not necessarily known to occur in the area, but which, based on conceptual target generation, have potential to be present. This set of circumstances primarily arises when an area is opened up to exploration for the first time or a new exploration concept unveils as-yet-untapped potential in a previously accessible area. Greenfield exploration may also take place when the geology of a terrain, which may have hosted some mining operations in the past, is reviewed and re-interpreted on a regional scale and new exploration concepts and strategies applied to it. Typical exploration will involve remote sensing over large areas to identify anomalies before a more detailed exploration program may be justified and implemented. To the degree that the terrain is virgin or has not been actively mined for a while, previous exploration does not constrain the potential size of a possible discovery and the possibility of a world class or even giant discovery cannot be dismissed even though their discovery may have a relatively low probability. These types of projects are considered high risk – high reward targets given a generally perceived greater capacity for the projects to yield a world class discovery.

Acquisitions **–** This refers to expenditure which is allocated towards assets which are in a 'post-discovery' stage and may even be a fully developed operating mine or portfolio of mines, and can be extended to broader M&A activity discussed in other chapters in this thesis. In contrast, acquisitions of *brownfield* or *greenfield* tenements prior to any material discovery are regarded as the normal process of gaining access to prospective ground in a similar manner to farming into joint ventures and are excluded from this category. This paper classifies these as low risk- low reward targets as the purchase price is often set by market valuations and significant due diligence is required to ensure that the purchaser does not over pay for the asset. However, in comparison to direct exploration expenditure, acquisition price risk is significantly lower than discovery risk.

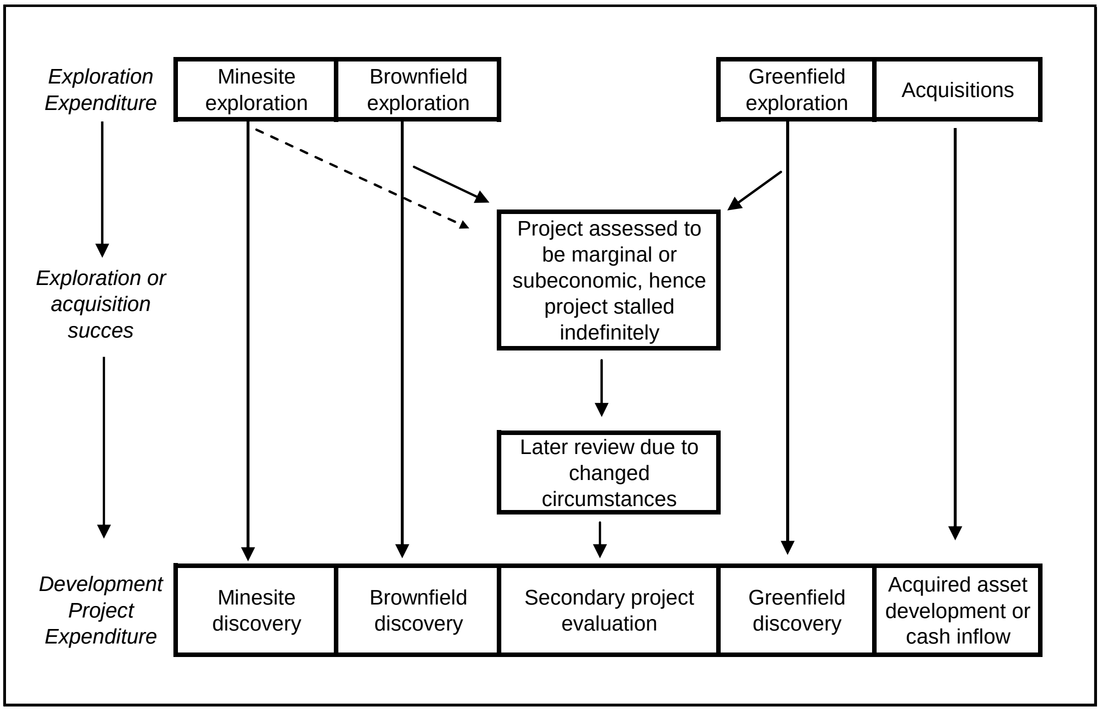
In this classification system, success in discovery or acquisition can lead to further expenditure. This expenditure would then be classified to a *greenfield* discovery, *brownfield* discovery or *minesite* discovery in recognition of the success of the original exploration program. Likewise if a company has been successful by investing in mergers and acquisitions and the acquisition involves further expenditure in developing an acquired asset, this expenditure would be referred to as *development project expenditure on an acquired asset*. The classification also avoids using the term "grass roots" which really depicts the type of exploration program and which may be unrelated to whether it is a *minesite*, *brownfield* or *greenfield* target, e.g. a company may conduct a broad geophysical or geochemical sampling survey in minesite exploration to generate new targets as existing reserves diminish.

There is one further category which denotes special cases where there has been a delay in the development of a discovery and generally reflects sub-marginal economics at the time of discovery outlined below. Mercer (2006) aptly refers to these projects as *resurrections.*

Secondary project evaluation **–** This refers to exploration expenditure on projects where previous exploration has discovered and defined resources which can be non-JORC compliant but represent material commodity tonnages. However, project development has stalled for some years after the time of discovery. Some of these projects may have been dormant due to marginal economics during periods of weaker commodity prices or due to previously unresolved technical, political or environmental challenges and differ from a successful discovery where resources are progressively and continuously delineated, assessed for commercial feasibility and developed on a progressive timetable from the initial discovery. These are classified as moderate risk – low reward targets given that their potential upside is diminished somewhat by the earlier quantification of their resources.

Figure 145 outlines the relationships between the categories and their advancement with exploration or acquisition success. As outlined earlier, this success is classified into the respective discovery classifications (*minesite*, *brownfield* or *greenfield*). Alternatively it is directed towards secondary project evaluation or lastly, it is directed towards developing an acquired project.

Figure 145. The relationship between the various proposed exploration expenditure classifications.



In line with the increasing risk from *minesite* to *brownfield* to *greenfield* exploration, there is an expected corresponding increase in returns from the value of a potential discovery. However, *secondary* p*roject evaluation* is a special case where the potential rewards of the initial discovery have not been realized other than by the meagre proceeds from a possible sale of the project to a third party. As mentioned, this is based on three generally identifiable factors:

- Geological understanding:
    - Well known – *minesite* exploration, *secondary project* evaluation.
    - Reasonably well known – *brownfield* exploration.
    - Poorly known – *greenfield* exploration.

- Proximity to a beneficiation plant:
    - Close to currently owned plant and within trucking distance – *minesite* exploration.
    - Assumption that development of a plant will be necessary although third party plants may be in the area – *brownfield* exploration.
    - No available plant and possibly considerable infrastructure development required – *greenfield* exploration.
- Project viability at the time of discovery:
    - Initial project assessments warrant ongoing exploration and evaluation programs following initial discovery – *minesite*, *brownfield* and *greenfield* discoveries.
    - Initial project assessments indicate marginal or sub-marginal economics resulting in exploration and evaluation programs being stalled indefinitely at the time of discovery – *secondary project* discovery.

Another relevant aspect is the cost of exploration of particular projects and this tends to accentuate the risk profile of the exploration expenditure categories outlined above. The financial commitment to an exploration program is likely to increase from a *minesite* project to that of a *brownfield* project and in turn is likely to increase in a large scale *greenfield* project given decreasing logistics and the style and breadth of the exploration activities that are likely to be involved. This increased financial commitment compounds the generalized decreasing discovery probability in creating a money-at-risk profile across the exploration expenditure categories. It stands to reason that in *greenfield* projects, company management must view that the higher exploration expenditure, the lower probability of discovery and later higher development costs need to be compensated for by the expected size and value of a possible discovery in the project area.

Table 47 summarises the general aspects of the exploration expenditure categories along with their potential risks, returns and exploration costs. It also includes an acquisition category for comparison which offers the lowest risk but potentially lowest returns given the overriding influence of the acquisition price. However, as noted in Chapters 3, 4 and 5 there are factors which can mitigate M&A risk, particularly in relation to acquisition timing relative to the commodity price cycle.

Table 47. Generalised profiles targets, risk, returns and exploration costs of the proposed exploration expenditure categories.

Exploration Target Profiles	Target Size	Target Risk	Potential Return	Exploration Costs	Risk/Reward/Cost
Minesite exploration	Generally orebody extensions or satellite resources	Low risk given geology and mineralisation styles generally well understood	Low to moderate with economics supported by existing infrastructure	Low as existing infrastructure and access generally in place	Low/Low - Moderate/Low
Brownfield exploration	Medium given that large orebody discoveries are likely to have occurred previously due to earlier exploration	Medium given that there is generally a reasonable knowledge of geology and existence of mineralisation styles	Moderate	Moderate as preliminary exploration has normally been carried out and large reconnaissance programs generally not necessary	Moderate/Moderate/Moderate
Greenfield exploration	Potentially large as area is generally not well explored	High, given little previous work carried out and geology not well known	Very High	High as areas are often remote, and where comprehensive staged exploration program may be required including large scale remote sensing programs	High/Very High/High
Secondary project evaluation	Variable depending on project parameters although the larger undeveloped projects are normally less viable at trend commodity prices	Moderate to High risk given initial resource has already been identified but viability dependent on other parameters	Low as project was previously marginal	Moderate as preliminary exploration has normally been carried out	Moderate to High/Low/Moderate
Acquisition	Variable	Low as parameters of target generally well known	Low given often stock market influenced acquisition price	High as often fully priced and potential competing stock market pricing	Low to moderate/Low/High

As all explorers appreciate, the classification system and its risk-reward profiles represent broad generalizations in an imperfect industry with many exceptions. An example is that increasing exploration costs on higher risk projects can sometimes be justified on mine sites containing significant invested infrastructure but a rapidly declining reserve base. Sims and Bartrop (1993) highlight this situation at Mount Isa Mines where the economics of locating additional ore can justify a higher exploration risk profile in testing conceptual targets than would normally be carried out.

Nevertheless, a classification system similar to the one outlined above provides an expenditure profile which enables non-explorers, in particular participants in the financial markets such as investors, analysts and other interested parties to assess the total risk-return contribution of exploration portfolios and hence, assign any material contribution to the valuation of a company. Government organisations including Treasury departments, the ABS and Abare also need to determine the risk profile of Australian exploration expenditure to assess whether the current balance is meeting Australia's long-term economic objectives.

6.3.1 Risk-reward comparison of exploration expenditure categories

Exploration risk is defined as the probability of sinking the expenditure of an exploration budget in the absence of a successful discovery. In other words, the focus is squarely on the downside of the negatively skewed distribution of all possible outcomes from an exploration program that defines its expected or mean value or return on investment and which generally includes a few successful discoveries and a predominance of failures.

In this context *greenfield* exploration is characterised by expected returns which are higher than those from *brownfield* and *minesite* exploration, but also by greater uncertainty, as measured by the standard deviation of all possible outcomes, which can be much higher as well as much lower than expected. By contrast *brownfield* and *minesite* exploration and acquisitions are characterised by progressively lower expected returns but also by decreasing uncertainty surrounding these returns. On the assumption that all companies expend allocated exploration budgets, the risk is a continuum from total exploration failure to partial success ranging from the discovery of sub-economic mineralisation through to the discovery of the target orebody initially sought under the exploration expenditure classification.

Quantification of historical average exploration risks and returns is extremely difficult. However a number of authors have reviewed various data sets from different time periods to estimate probabilities and returns from discovery success.

The financial returns based on the NPV of exploration expenditure and the NPV of 'economic' exploration discoveries has been estimated by a small number of researchers and these returns are summarized in Table 47. The data and analyses are generally designed to highlight the attractiveness of exploration over the long-term.

Table 47. Estimated exploration returns from past research.

Period	Internal Rate of Return	Comments	Reference
1955 - 1978	12%	After tax basis, Australian exploration and discoveries surveyed	Mackenzie and Woodall (1987)
1946 - 1977	22%	After tax basis, Canadian exploration and discoveries surveyed	Mackenzie and Woodall (1987)
1961 – 1984	9%	After tax basis; based on BHP's Australian discoveries during this period and excluding petroleum	Palethorpe & Bain (1986)

The data indicate that if a company can match the historical average exploration success rates, it can achieve a return of around 10 per cent on its Australian exploration budget. However, as noted by both Mackenzie and Woodall (1987) and Palethorpe & Bain (1986), it is the importance of 'world class discoveries' that underpins the average return and there is considerable variation in exploration expertise and therefore success across the resources sector (Mackenzie and Woodall, 1987). Under the proposed classification system, world class discoveries are most likely to be derived from *greenfield* exploration programs.

To quantify the highest returns from *greenfield* exploration programs this thesis refers to the research by Shodde & Hronsky (2006) and Shodde (2006b) who proposed an economic definition for major and world-class projects for gold, diamond, and base metal deposit discoveries made over the period 1985 to 2003. In terms of size they classify a "major" deposit as containing more than one million ounces (Moz) of gold or three million carats of diamonds or half million tonne (Mt) of copper or other metals expressed as copper-equivalents. It is estimated that during this period a total of 258 major *greenfield* discoveries were made throughout the world, including 87 base metal deposits, 160 gold deposits and 11 diamond deposits. Among these, deposits containing at least 6 Moz of gold or 5 Mt of copper-equivalent metal were classified as "world-class". Shodde's and Hronsky's (2006) analysis, based on the sub-set of 143 major discoveries in lower risk countries over the period, shows that deposits above this threshold have special economic and geological characteristics that result in the deposits having a minimum Net Present Value (NPV) of US$250 million in 2004 US dollars at the development decision point, based on a 7 percent after-tax real rate of discount and rather conservative commodity prices assumptions.

Bartrop and Guj (2009) were granted access to the discovery database assembled by Shodde (2009, P. Guj personal communication), which indicated that only 151 of the 258 world-wide major *greenfield* discoveries returned positive NPVs under these criteria. These included 53 out of 87 base metal deposits, 89 out of 160 gold deposits and 9 out of 11 diamond deposits. Many of the other discoveries proved sub-economic under the rather conservative evaluation criteria applied, with a number returning significantly negative NPV. Around 70 per cent of the major discoveries led to subsequent development.

As the size distribution of mineral deposits is interpreted to be lognormal, Bartrop and Guj (2009) were able to use the entire database to estimate a mean value of $270 million, (median: $103 million, mode: $14.8 million) and a standard deviation of $658.2 million. In specific sectors, the mean value for a base metals discovery was estimated at $262 million while gold was $162 million. Unfortunately, the number of major diamond discoveries was too low to fit a distribution to them, but their arithmetic mean value is $1416.40 million.

Bartrop and Guj (2009) also note that the fact that the values of major discoveries also distribute lognormally provides scope to estimate the probability of a major discovery exceeding any given target value either by calculating the percentile of the distribution corresponding to the minimum target size required or visually by plotting the relevant value distributions on a probability-log graph. Bartrop and Guj (2009) estimate that given a feasible major base metal discovery there is a 90 per cent chance that its NPV will be $37 million or greater, 50 per cent that it will exceed the median value of $148 million and a 10 per cent chance that it will be greater than $582 million with an outside chance of 1 per cent of it exceeding $1,782 million. The 151 major *greenfield* discoveries over the 19-year period 1985 – 2003 included 39 world-class discoveries. This equates to an average annual rate of discovery of 7.94 and 2.09 respectively. Using assumptions relating to the average expenditure by Majors, Intermediates and Juniors as well as assumptions for the discovery of smaller target sizes, Bartrop and Guj (2009) devised Table 49 as a probability matrix for greenfield exploration success.

Table 49. Matrix of probabilities of a greenfield discovery for various combinations of budget allocations and costs of exploration

Percentage of budget to greenfield exploration: Majors, Intermediates and Juniors	Number of trials	PROBABILITY OF AN ECONOMIC GREENFIELD DISCOVERY			Deposit size
70%, 30%, 10%	2669	0.44%	**0.88%**	1.31%	Irrespective of size
		0.15%	**0.29%**	0.44%	Major
		0.03%	**0.07%**	0.10%	World-class
60%, 25%, 7.5%	2259	0.52%	1.03%	1.55%	Irrespective of size
		0.17%	0.34%	0.52%	Major
		0.04%	0.08%	0.12%	World-class
50%, 20%, 5%	1849	0.63%	1.26%	1.90%	Irrespective of size
		0.21%	0.42%	0.63%	Major
		0.05%	0.09%	0.14%	World-class
		US$ 0.25 M	**US$ 0.5 M**	**US$ 0.75 M**	
		Average cost of a greenfield exploration program			

Preferred combination

From Bartrop and Guj (2009).

The preferred probability estimates for *greenfield* exploration success are around 0.3 per cent (i.e. 7.9 discoveries in 2669 trials) or about 3 in 330 for a major orebody and 0.08 per cent (i.e. 2 discoveries in 2669 trials) or just under 1 in 1000 for a world class orebody. The latter figure is of the same order of magnitude of the probability of a world-class discovery as estimated by RIO's Director of Exploration (Finlayson, 2008), i.e. 0.03 per cent. The difference between the two may be a function of RIO's more ambitious definition of what constitutes a world-class exploration target. The estimate of the probability of discovering a major orebody is consistent with unpublished estimates by Shodde (2009, P. Guj personal communication) of one in two hundred to one in three hundred.

The importance of Shodde's database cannot be underestimated in deriving deposit values and in addition to research on gold discoveries in WA goldfields (Lord et al, 2001; Guj and Fallon 2009), Bartrop and Guj (2009) estimate probabilities for both brownfield and minesite exploration along with average discovery values for each category. In combination estimated cost of the average exploration program for each of the categories, Table 50 presents a probability weighted return per exploration program.

Table 50. Exploration probabilities for achieving a minimum desired target (NPV values stated) for each exploration category and how this translated into a probability weighted value per exploration program.

Exploration Classification	Probability of Achieving Minimum Desired Target	Minimum NPV Value expected for discovery success (US$m)	Probability Weighted Succes (US$'000)	Average cost of applicable exploration program (US$'000)	Probability weighted return per exploration program (US$'000)
Greenfield	0.30%	$270	$810	$500	$310
Brownfield	5%	$75	$3,750	$250	$3,500
Minesite	20%	$5.0	$1,000	$125	$875

From Bartrop and Guj (2009).

Interestingly, based on the above assumptions, *brownfield* exploration programs offer the most attractive returns reflecting the combination of a reasonably-sized expected target with a good probability of discovery. This is also evident within industry trends although Hronsky et al (2009) question for how long the dominance of investment in *brownfield* relative to *greenfield* exploration can be sustained. They argue that following the recent rapid increases in *brownfield* exploration budgets the average probability of discovery and with it the efficiency of *brownfield* exploration will fall. This, combined with the lower contribution that *brownfield* discoveries make to the supply of metals, may eventually lead to a "*greenfield* renaissance".

However this thesis would argue that there is a risk that this doesn't materialise outside the exploration effort of the majors as the increased value in deposits through increasing commodity prices relative to the development and operating costs over say, the 2004 database of Shodde (2006) may not adequately compensate most investors, who are generally risk-averse, for the exploration risk. While the probability weighted return may look attractive, it requires a degree of confidence in ultimate success to encourage sustainable investment in the high-risk side of the spectrum and this is only possible if potential investors have access to significant level of risk capital and can therefore be less risk-averse.

6.5.2 Degree of Confidence

Unfortunately to achieve a degree of confidence in an outcome implies specific levels of the investment. A simple example is rolling a die six times. On average, the die should roll one six but to have a high degree of confidence that it will roll at least one six requires many more throws. The number of throws necessary to achieve a given level of confidence estimated by Saliu (2009) is derived from the following formula:

$$N = \frac{\log(1 - DC)}{\log(1 - p)}$$

Where:

- N = the number of trials to achieve the desired level of confidence
- DC = the degree of confidence
- *p* = the probability of the desired outcome in each individual trial

This formula makes use of a continuous expression of the discrete binomial distribution, which is based on sampling with replacement. The author acknowledges that exploration is a form of sampling from the natural endowment of mineral deposits without replacement, and that as deposits are progressively discovered from a finite pool the probability of success in each trial decreases. This process could be better simulated by a difficult to handle hyper-geometric distribution. The depletion effects are to some degree counteracted by increasing geological knowledge and advancements in exploration technology. Thus while the formula gives a somewhat optimistic view of the level of confidence that can be achieved at any given level of investment, it nonetheless provides a broadly acceptable order of magnitude. In this light this thesis has applied this formula to *greenfield*, *brownfield* and *minesite* exploration probabilities to estimate the level of expenditure required to meet a range of degrees of confidence. The level of expenditure is estimated by multiplying the number of trials (N) above by the estimated average expenditure per applicable exploration program as per Table 50.

Figure 146 plots the degree of confidence along the X axis against the expenditure required to meet it on the Y axis for each exploration expenditure classification. Figure 147 plots the degree of confidence for *greenfield* programs given the higher expenditure levels that are required compared to *minesite* and *brownfield* programs in Figure 146.

Figure 146. Total exploration expenditure versus degree of confidence for the various exploration classifications.

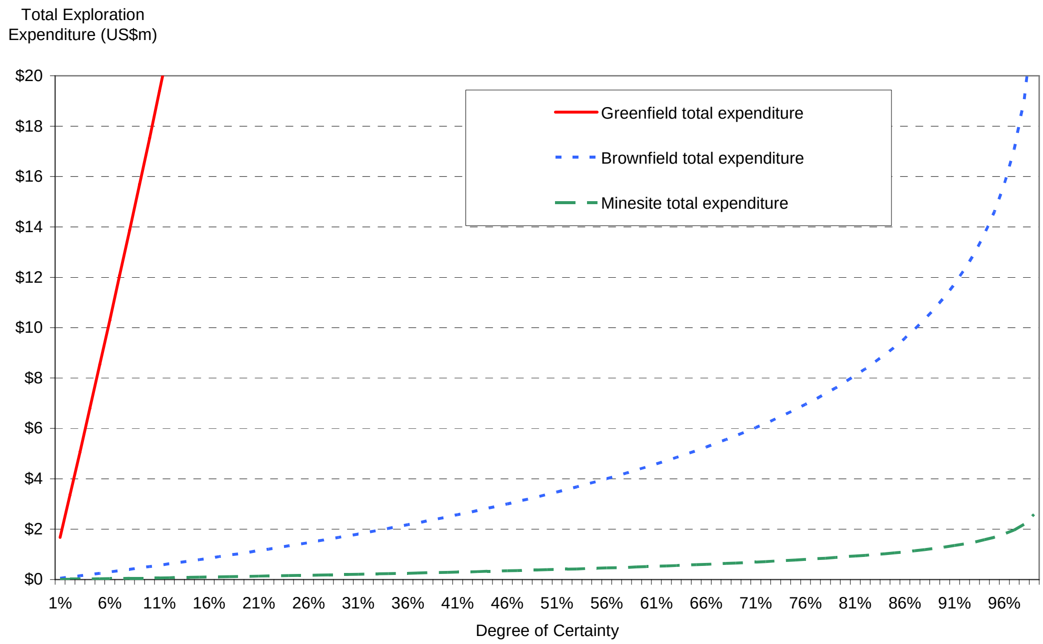
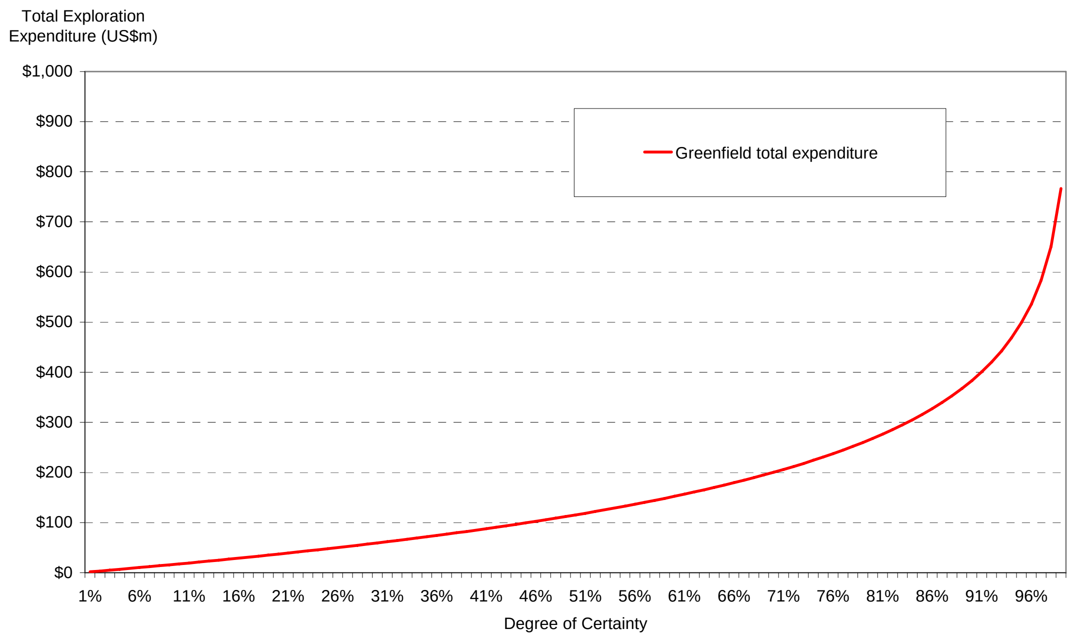


Figure 147. Total exploration expenditure versus degree of confidence for *greenfield* exploration.



Figures 146 and 147 highlight the difficulties faced by explorers. An explorer offering investors exposure to an exciting *greenfield* exploration portfolio has to spend more than US$100 million on exploration to put together a portfolio offering greater than 50 percent confidence of discovery – a price tag normally well beyond all juniors and most mid-cap explorers. Hence, the only companies capable of funding *greenfield* exploration with a high confidence of success are the majors.

Similarly, in brownfield exploration which is the main focus of junior explorers, to achieve a greater than 50 per cent level of confidence of an exploration success requires a budget of $3.4 million. As discussed earlier many junior explorers struggle to raise the minimum $2.3 million to list on the ASX, while Kruezer et al, (2007) report that the average junior exploration float from 2001 to 2006 raised $4 million. After removing capital raising fees (normally around 5 per cent) and administration, legal and listing costs, most junior explorers are really only offering shareholders at best a 50 percent degree of confidence of achieving discovery success in brownfield exploration.

In the case of *minesite* exploration, the low cost of exploration programs combined with the presence of the operating plant means that a level of certainty is not a significant consideration for investors.

6.4 Investment Approach to Exploration

Early in this Chapter, it was noted that exploration on *greenfield* and *brownfield* projects can exhibit certain trends following a major discovery. These trends can involve a steady decrease in deposit size of subsequent discoveries, an increase in exploration costs and the combined decreasing discovery rates over time. In fact, these aspects are evident on a broader scale to exploration in general over time.

In Chapter 4, this thesis discussed the proposition that share prices move in response to share price drivers which impart a probability weighted change in value, $\Delta \nu$ according to the formula:

$$\Delta S = P(\Delta \nu)$$

Where:

$\Delta S =$ The change in company value reflected in the change in the company share price

$P(\Delta v) =$ The probability weighted change in value

Probability weighted values per 'average exploration program' have been crudely estimated for *greenfield*, *brownfield* and *minesite* projects and with *brownfield* projects appearing to offer the greatest probability weighted return of the three classifications.

As the market (and industry) is yet to embrace these classifications, the market does not generally discern between the probability weighted discovery values for each classification and groups all exploration activities as a high risk venture that may not offer returns within an acceptable timeframe. The exception may be *minesite* exploration but with generally lower value targets, these may not be significant from an overall company value perspective at the outset of a *minesite* exploration campaign.

The dilemma is interpreted to reflect the low levels of certainty in each exploration program or conversely, the high level of expenditure required to deliver a high degree of certainty. In the above formula markets will not assign any share price value unless the probability is generally above a threshold that invokes contemplation that there is a real possibility of an occurrence. This threshold is likely to be in the order of greater than 50 percent at a minimum although this is dependent on the value of occurrence, e.g. a lower probability of say below 20 percent may impart some value with an exploration program in a highly prospective terrane potentially containing very high value discoveries. However, in the case of exploration properties, it is not atypical for the market to assign zero value to a portfolio of exploration properties in a resource company if there are other more substantial assets such as an operating mine or a defined lead project.

In markets where investment alternatives include risk free interest rates and reliable dividend yielding stocks as well as more general market investments, the magnitude of these higher probability levels means that the segregation of degree of certainty from the actual probability of returns is not a consideration. The degree of certainty only becomes a factor where the probability level is low enough that the occurrence is deemed an unlikely outcome as in exploration.

Chapter 4 also proposed the following equation to model the declining expectation that junior explorer, Anchor Resources would make a discovery within an acceptable time frame as follows:

$$XV_t = 2X_{t=0} - XV_{t=0}e^{rt}$$

Where

$XV_t =$ Excess Value at time *t*

$XV_{t=0} =$ Excess Value at the start (*t=0)*

e^{rt} = Continuous compounding factor at a rate of interest r

The compounding function accelerates the declining expectation over time and matches the empirical observation that as the first round of projects are tested and fail to deliver encouragement, there is increasing divestment on the expectation that the company is likely to be unsuccessful over the medium term and ‘burn’ all its cash. The market recognizes that the high levels of expenditure required to deliver a high degree of certainty in exploration may well be beyond the financing capabilities of the company as well as the time frame of the investor. Hence, investors may compensate the high levels of risk by expecting high returns but then rapidly discounting the share price if signs of an exploration discovery fail to materialise.

This is also in accord with the perception that a company will test its best targets first and therefore with unsuccessful exploration over time, there is a diminishing probability for future discoveries. This can apply to entire company exploration portfolios as well as individual projects and suggests that the declining expectation of exploration success in junior explorers over time could be equivalent to the declining probability of exploration success where exploration activities are actually being conducted (viz; Cougar Metals versus Anchor Resources examples in Chapter 5, Section 4.1.1.3, p243).

Recalling, the M&A transactions analysed in this thesis provided an average return to the bidder at 7.8 per cent. There was also a 25 per cent chance of negative cumulative abnormal returns for the bidder but despite these negative returns, the bulk of the value of the acquisition is retained by the bidder and may yet still deliver positive future returns. This contrasts with the high degree of uncertainty in exploration where investments manifests itself as short-term ‘punts’ and lack of success is quickly reflected in the company’s share price.

It is concluded in this thesis that while the value of new discoveries will increase over time due to economic scarcity, opposing factors such as declining exploration discovery rates and market impatience are likely to undermine the attractiveness of pure exploration plays to the market unless there is a structural change in the risk-reward dynamics. The existing structure is likely to continue the polarization of the Australian resources sector as outlined earlier in Chapter 3.

7.0 Discussion and Conclusions

This thesis has sought to investigate M&A activity in the Australian resource sector and to draw out conclusions on whether it has created shareholder value for bidders and merging companies. To develop a model to estimate this value, research has been directed primarily at investigating the movements of share prices of resource companies and their relationship with commodity prices. The fact that commodity prices appear to be the main drivers of share prices of resource companies offers an opportunity to explore how this interaction relates to generally accepted models of share price movements based on Markovian processes.

Elsewhere, the thesis investigates the characteristics of and recent trends in the Australian and global resources sector to provide a background for a discussion on the implications of the M&A activity which has occurred over the last two decades, and the prospects of further industry consolidation.

Lastly the thesis investigates the investment in exploration as an alternative as well as a complement to M&A, keeping in mind that it competes with M&A in terms of a resources companies' budgets. It is notable that all major companies have utilised M&A activity for corporate growth in preference to direct exploration, hence it is important to understand how exploration is valued in this decision process. Particularly in the case of under-funded junior explorers, their share prices wanes over time as successive failure erodes their meagre risk capital and gradually reduces the degree of investors' confidence in a possible discovery.

Discussion of the research findings has been organised into five main categories, as follows:

- Global Mining Sector
- Consolidation of the Australian Resource Sector
- Movements of the share price of resource companies
- M&A findings
- Exploration

These are then drawn together in a final discussion and further research is proposed.

7.1 Global Mining Sector

Apart from the presence of the four global majors (BHP Billiton, Rio Tinto, Anglo American, Vale), the "line up" in the resource sector has changed considerably over the last decade. Foremost is the presence of Xstrata plc which is now larger than Anglo American in market capitalisation but unlike the other diversified majors, has not been founded on a world class deposit discovered many years ago. In contrast Xstrata has claimed to be the 'consolidator' of the mid-tier companies and has rapidly grown in the last decade through aggressive acquisitions.

The most recent phase of global consolidation has involved diversified miners taking over base-metal companies (e.g. 2004 BHP Billiton takeover of WMC Resources, 2006 Vale takeover of Inco, 2006, Xstrata takeover of Falconbridge, 2007 Rio Tinto takeover of Alcan, etc.) and this has led to an expansion of the diversified sector at the expense of the base-metal sector, reducing the scope for pure investment opportunities in base-metals. In Australia similar takeovers during this period included the 2002 Rio Tinto bid for Comalco, the 2003 Xstrata takeover of MIM and 2007 bid for Jubilee Mines and the 2007 Zinifex bid for Allegiance Mining.

This M&A activity has been stimulated by a corporate growth imperative and as discussed later, probably represented an 'overhang' from the Asian Crisis through to the Tech Boom period where smaller companies traded at significant discounts to fundamental (NPV) value. This was evident in charts like Figure 50 (Chapter 3) which plot an increasing prospective P/E ratio against increasing market capitalisation for global resource companies. These size premia created a justification to bidding companies for much of the M&A activity that has occurred since 2000 and as highlighted in Chapter 4, represents the second of the two causes for a change in value of a resource company, viz:

- An expectation of a material change in future earnings and cash flow levels leading to an increase in the value of the asset base of the company; and/or
- A change in the value ascribed by the market to the combined asset base where, for example, threshold production levels are met which attract a higher market rating than the previously lower production levels.

However, given the lack of significant mid-tier sector and ongoing takeover threat, these premia have now probably disappeared (see Figures 52 to 55, Chapter 3) and bidders will increasingly have to justify their acquisitions to their shareholders on the basis of the first cause.

The focus on base-metals companies and particularly copper production has also not been accidental. In terms of market size among various traded metals, the largest is the copper market which is estimated to have a value in the order of US$226 billion (Table 49, Chapter 3). It represents the bellwether of the LME daily traded metals and therefore an increased exposure to copper offers greater share price sensitivity to major resource indices – generally a desire of company management to attract global funds. The second largest is estimated to be aluminium (US$169 billion), which is followed by the gold sector (US$138 billion). Desirable opportunities in the aluminium sector have been limited except for the 2007 Rio Tinto takeover of Alcan, while the gold sector is fragmented and gold itself doesn't necessarily follow an industrial production growth cycle typical of most commodities. Nickel (US$75 billion) and zinc (US$57 billion) represent the next largest sectors in terms of potential market size. Hence, while the large diversified companies can further accumulate new and expand existing coal and iron ore projects, M&A activity in the base-metal sector has been the logical avenue to growth with an early focus on copper.

In Australia the term *resources* has been used to cover both the mining and energy sectors and while this includes the oil and gas sector, this thesis (and Australian investors) use this terminology to predominantly refer to the mining sector, which includes energy stocks, (other than oil and gas ones) such as coal and uranium.

As outlined in Chapter 3, the global mining sector represents 3.4 per cent of the world stock market. However in Australia the resources sector represents 33 per cent of the ASX 200 Index after excluding the oil and gas sector. Hence investment in the ASX provides an approximate 10-fold increase in exposure to mining companies relative to the global market. Combined with Australia's significant A$150 billion per annum mineral commodity exports, both the ASX and Australian currency offer leverage to changes in commodity prices.

However, in line with other resource markets, the resource component of the ASX 200 Index is now dominated by the diversified miners BHP Billiton and Rio Tinto, which combined represent over 50 per cent of the resources component of the index. Hence, patterns of investment have changed and given the commodity diversification offered by these companies and their dominance in the index many investors only hold positions in these companies to capture their resources exposure. Therefore if the takeover premia discussed earlier diminish due to the market entering another period when resources are out of favour, it is likely that the resource sector will return to an increasingly polarised state based on market valuations. Nevertheless, as discussed in Chapter 1 (Section 1.9.1) the most coveted mining assets are ones with long mine lives and low operating costs and material production rates and, depending on their balance sheets, companies holding these assets are likely to always remain under takeover threat.

7.2 Australian Resource Sector Consolidation

This research has analysed 30 transactions outlined in Appendix 1 and extended this number with a review of a further 22 transactions to investigate the M&A component in Australia (Table 51).

Table 51. Total and average transaction values for each commodity group.

Commodity group	Number of transactions	Total transaction value (A$m)	Average transaction size for sector (A$m)
Uranium	2	$1,178	$589
Mineral sands	1	$470	$470
Gold	23	$14,944	$650
Diversified/iron ore	5	$12,551	$2,510
Diamonds	3	$836	$279
Coal	4	$4,283	$1,071
Base metals	13	$34,061	$2,620

Recalling from Chapter 5, the uranium transactions are skewed by the 2007 Paladin takeover of Summit Resources while the only mineral sands transaction recorded is the 1998 merger of RGC and Westralian Sands.

The average transaction value covering 51 transactions but excluding the 2007 BHP Billiton bid for Rio Tinto is $1,340 million. Inclusion of the BHP Billiton bid for Rio Tinto would skew this value to $4,804 million due to its abnormally large size. The most common transaction size range was from $250 million to $500 million representing more than 27 per cent of all transactions, while more than half (51.9 per cent) of the transactions were less than $500 million in value. As noted in Chapter 5, this is in line with expectations given the size distribution of companies in the sector and tendency for companies to acquire smaller companies than themselves.

There was also a confirmed expectation that bidders would acquire targets in similar commodities (90 per cent of transactions) with the exceptions involving companies seeking commodity (and geographical) diversification.

Interestingly, both base metal and diversified/iron ore transactions averaged similar transaction sizes around A$2.5 to A$2.6 billion and generally involved mid-tier companies that were in existence during the 1990s and before. Elsewhere, numerous gold transactions involved smaller transactions amounts (average A$650m) while relatively recently a number of coal transactions have averaged $1,070 million in value.

Figure 148. Transaction number and total value per calendar year since 1991.

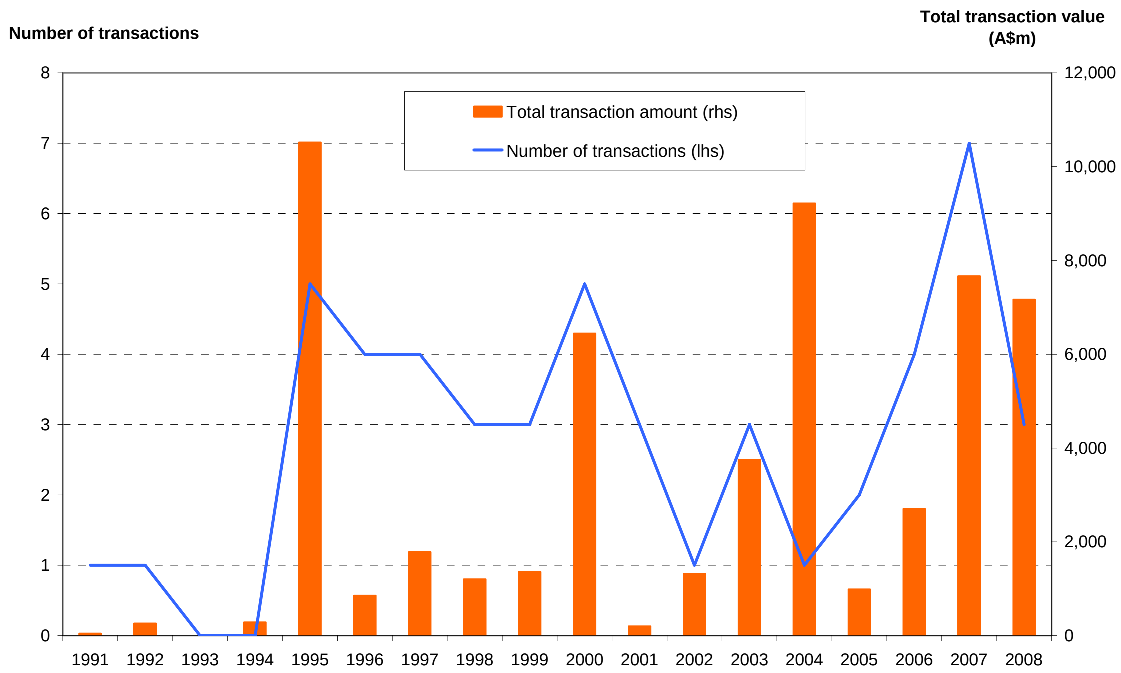


Figure 148 charts the number and value transactions since 1991 and highlights that consolidation has occurred in three waves since the early 1990s. These periods are:

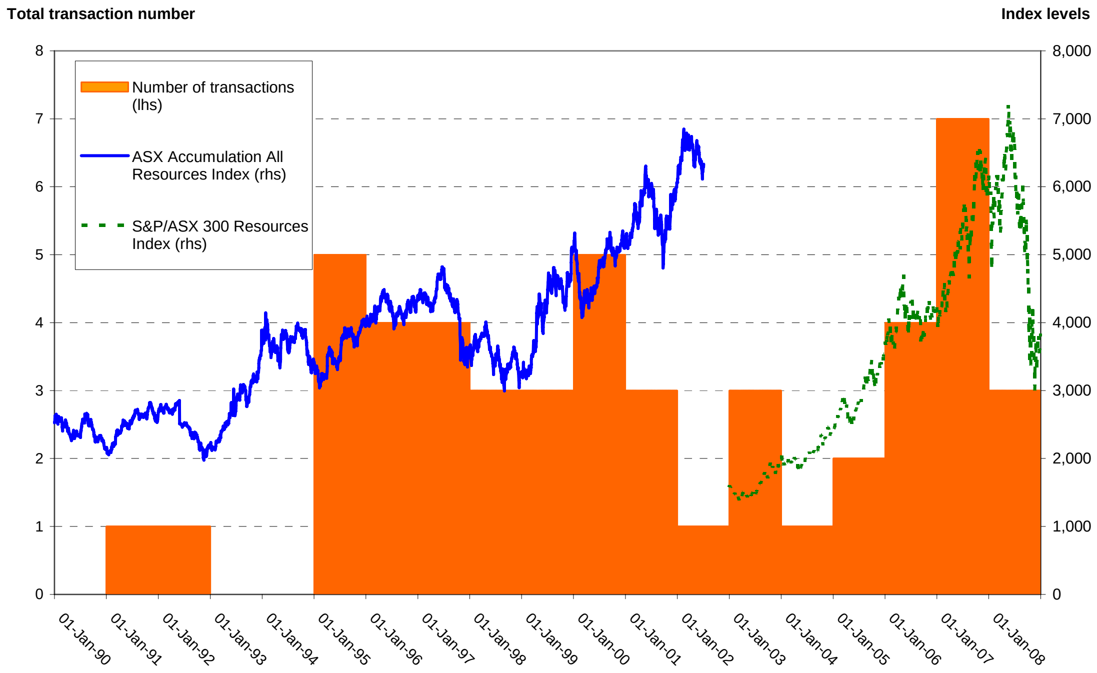
- Firstly, a period starting in 1995 and ending in 2000 including the end of the 92-96 bull run, the Asian Crisis and a period known as the 98-2000 bull run and ending during the start of the Tech Boom drift,
- Secondly, a period between 2002 and 2004 covering the waning stages of the Tech Boom drift and the commencement of the 2002-2008 Resources Boom, and,
- Thirdly, in a more recent period from 2006 to near the end of the 2002-2008 resources boom.

This observation is in line Andrade et al’s (2001) reporting that mergers occur in waves, and within a wave, mergers strongly cluster by industry. In the US the authors report a trend of rapidly increasing numbers and values of transactions from a nadir in 1992 and continuing to 1999 at the end of their study period, which broadly corresponds to the observation in this thesis that takeovers became prevalent from 1995 until 2008. Andrade et al (2001) also report that in the 1990s Metals and Mining was one of the top five industries based on average annual merger activity.

Schleifer and Vishny (2003) characterise the takeovers of the 1990s as often being friendly and while this research doesn’t record the very low levels of hostility reported in the US during this period (estimated at 4 per cent of all transactions by Andrade et al, 2001) 30 per cent of the transactions analysed were hostile and represents a decrease from the period involving the Australian corporate raiders in the 1980s.

To compare the frequency of transactions against the Australian resource indices, Figure 152 charts the ASX Accumulation All Resources Index (series ends 5 July 2002) and the S&P/ASX 300 Resources Index (commences 1 January 2003) along with the annual transaction numbers presented in Figure 149.

Figure 149. Total annual transaction number and Australian Resource Indices.

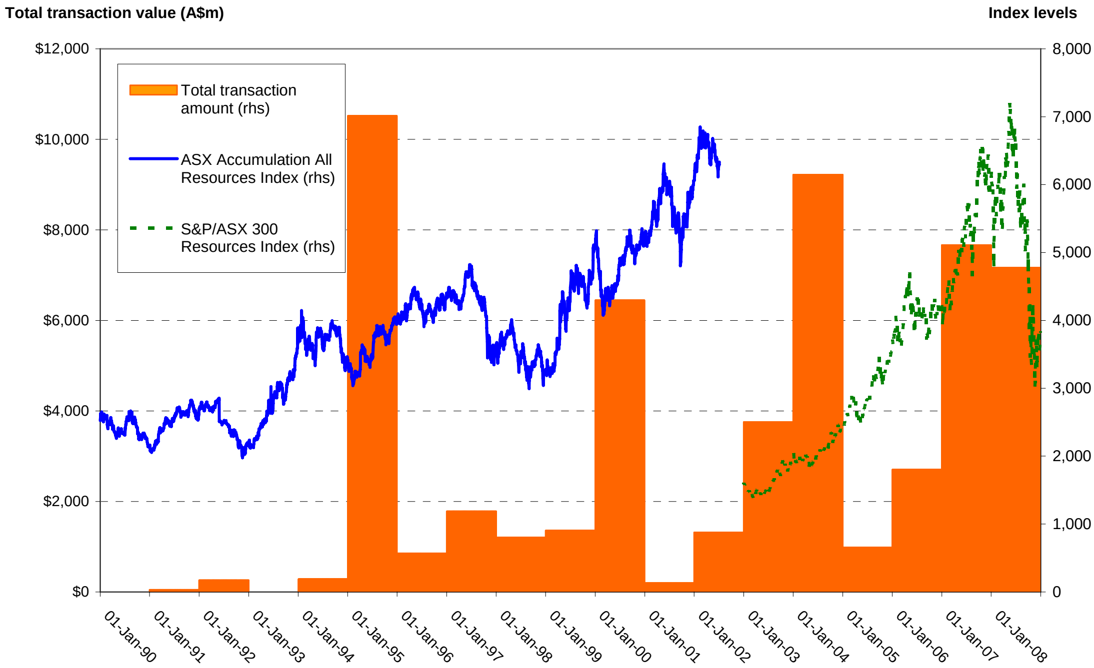


Index data from Stock Resource.

It is evident that the peaking number of transactions appears to correlate to lower, albeit temporary points in the Australian indices apart from the period in the latter part of the 2002-2008 Resources Boom.

This tends to be supported in Figure 150 which charts total annual transaction values and the two Australian resource indices.

Figure 150. Total annual transaction values and Australian Resource Indices.



Index data sourced from Stock Resource.

During these periods M&A activity in particular commodities exhibited specific trends which are outlined below:

With respect to gold M&A, contrary to some market opinion during the Tech Boom, Australian gold shares were generally priced in accordance with their global peers after adjusting for the exchange rate. At that time it was considered that share prices hadn't fully compensated for a higher A$ gold price due the overall lack of market interest in Australian resource shares at that time. Essentially global gold shares were at a nadir in 2001.

However there was a dramatic increase in foreign takeovers of the Australian gold sector from the mid-1990s through to the end of 2003. In fact all of the six takeovers in the 2000 to end 2003 period were carried out by foreign bidders at a time the gold indices were at low levels. These transactions accounted for only 26 per cent of the total number of gold transactions but accounted for 60 per cent of the $15 billion in M&A transactions or $9 billion of takeovers of the Australian gold sector during the overall study period. With this surge in foreign activity in the late 1990s through to the end of 2003, it is little wonder that the ASX abandoned the ASX Gold Index series.

Interestingly most of the transactions involved scrip (2001 Newmont takeover of Normandy, 2002 Placer Dome takeover of AurionGold, 1999 Anglo Gold takeover of Acacia, etc.) which meant that the bidders didn't fully capture the lower equity values at that time with cash bids. The only exception was Harmony Gold in its takeovers of Hill 50 in 2001, Abelle in 2003 and New Hampton Gold Fields in 2000. Overall the use of scrip was probably more a function of low cash reserves given the weak gold prices than a perception of overpriced scrip by the bidders, whereas in the Harmony takeovers, it is unlikely that management of the target companies would have recommended Harmony scrip as payment.

It can also be argued that the Australian gold sector experienced a significant period of consolidation in 1996 and beyond. Most of the sector with a few exceptions eventually ended up in foreign ownership, the most notable exception is Sons of Gwalia which went into administration in 2004. At present, the ASX-listed gold sector is rebuilding with new emerging producers but remains polarised with the two major companies, Newcrest and Lihir and only several companies in the mid-tier part of the sector.

Trends in base-metal M&A are different to gold and are dominated by fewer but generally larger transactions, generally at the rate of only one per year. However the five dominant transactions all occurred later than 2000. In 2001 BHP conducted its merger with Billiton plc, in 2003 Xstrata took over MIM, in 2004 BHP Billiton took over WMC Resources in a bid prompted by Xstrata and in 2007 Xstrata took over Jubilee Mines. Lastly Oxiana and Zinifex merged in 2008. Hence three of the five dominant takeovers stemmed from the acquisitive nature of Xstrata plc.

Apart from Rio Tinto buying out the minority interests in Comalco with a cash or scrip offer in 2000, most of the earlier Australian takeovers have met with mixed success. The Pasminco takeover of Savage Resources and the Western Metals takeover of Aberfoyle appear to reflect opportunistic cash bids in 1998 following the Asian crisis, while the more recent Zinifex takeover of Allegiance in 2007 was timed at the top of the market.

Overall, in the base metal sector it is questionable whether many of the transactions would have occurred without the aggressive acquisition strategy of Xstrata. As noted in the competitive transactions in Appendix 1, it has been an early aggressive takeover that has potentially stimulated the more natural owner into action (e.g. 2000 DeBeers bid for Ashton Mining to be overbid by Rio Tinto, 2000 Italian Eval bid for Eastern Aluminium to be overbid by Alcoa). Many larger companies appear hesitant to be the first bidder for 'Australian icons' but once a target company is 'in play' then they do not hesitate because it is deemed that the target will be taken over anyway.

Trends in M&A activity in the diversified and/or iron ore sector appear relatively straightforward. The dominant transaction has been the 1995 dual listing of RTZ and CRA which was friendly and not particularly sensitive to market timing. Similarly the 2000 takeover of Norths by Rio Tinto appears at a time of moderately lower share prices but also involved strategic factors in the consolidation of the Pilbara iron ore projects.

More recent M&A activity has involved consolidation in the iron ore sector (e.g. 2006 Mt Gibson takeover of Aztec Resources) and foreign companies investing in the sector (2005 Cliffs partial takeover of Portman Mining, 1997 Palmary takeover of Consolidated Minerals). This activity and growth in the iron ore sector have been in direct response to perceived growth in iron ore demand from the industrialisation and urbanisation of China and other emerging economies and increasing prices which have made many previously marginal deposits viable.

This has also been the case with most coal transactions representing foreign acquisitions of domestic coal producers. These include the 2006 Peabody Energy takeover of Excel coal and the 2007 Xstrata takeover of Resource Pacific Holdings. An exception is the 2005 takeover of Austral Coal by Centennial Coal although this was later sold to Xstrata.

7.3 M&A findings

One of the important findings of this research has been the ability to adapt a market based event analysis model to resource companies to provide credible analysis of the returns from resource company M&A activity. In Chapter 2, this thesis noted that Australian research had generally excluded mining companies due to their systematically different financial, operating and risk characteristics (e.g. see Bugeja & Walter, 1995; da Silva Rosa, Izan, Steinbeck, and Walter, 2000).

While not documented in the past research, this thesis expects difficulties may stem from the influence of commodity prices on resource company share price performance with specific commodity exposure varying from company to company. Resources share price movements may also be potentially independent of the changes in resource indices which tend to be dominated by BHP Billiton and Rio Tinto. As highlighted in analysis in Chapters 4 and 5, there is not a strong relationship between the returns from commodity price movements versus share price movements in contrast to a stronger relationship between absolute commodity price levels with absolute share price levels.

Hence, a market model as outlined in Beninga (2008) has been adapted involving:

- Estimating a theoretical share price series based on the coefficients estimated from multiple regression of significant parameters over a 252-day estimation window
- Using the returns from the movement in theoretical prices to estimate the abnormal returns from the actual share price movements during the event and post-event windows.

The significant parameters vary depending on the attributes of individual companies involved in the M&A activity and it was preferable to include a specific commodity price series as well as a market index series to account for varying commodity exposure. Where companies have a portfolio of projects with diversified commodity exposures or produce commodities such as iron ore and coal which are mostly sold at infrequently negotiated contract prices, the copper price was tested for significance (>5 per cent level) given its standing as an economic bellwether commodity.

Key findings of the research are summarised in the following points with important aspects discussed at the end of the chapter. Recalling, the takeover offer premium refers to the premium of the initial or final offer price compared to the 30-day average target share price prior to the initial announcement of a potentially impending transaction. This is abbreviated to either *initial offer to 30-day average premium* or *final offer to 30-day average premium*. Transactions are deemed hostile when there is an initial rejection of a takeover offer differentiating them from friendly transactions where there has been a degree of cooperation between the bidder and target companies prior to the initial announcement. Competitive bids are where there is more than one bidder.

- Friendly transactions on average offer target shareholders a lower final offer to 30-day average premium (dual listing – 17.8 per cent, mergers – 12.9 per cent) compared to traditional takeovers which average 48.7 per cent. In traditional takeovers the initial offer to 30-day average premium was 37.2 per cent with the increase to the final offer to 30-day average premium of 48.7 per cent reflecting the impact of bidders raising bids, particularly in competitive bidding. Mergers are noted as co-operative approaches to takeovers and hence there is an expectation that shareholders will have lower premium expectations.
- The takeover premium is almost 70 per cent higher in competitive bids (final offer to 30-day average premium of 66.1 per cent) compared to non-competitive bids (final offer to 30-day average premium of 39.3 per cent).
- The final offer to 30-day average is similar for both hostile and recommended takeovers (44.8 per cent verus 44.5 per cent for hostile) but the recommended premium increases to 52.8 per cent if the dataset includes the competitive bidding for Consolidated Minerals, which is considered an outlier.
- Excluding two outliers (2007 Palmary bid for Consolidated Minerals and the 2002 Placer Dome bid for AurionGold) the difference between the initial bid premium and final bid premium over the 30-day average target share for non-competitive offers was 3.9 per cent compared to 27.3 per cent for competitive offers. It is evident that competitive bidding can lead to an average 20 to 25 per cent increase in the initial offer to 30-day average premium.
- There is no significant premium difference between all scrip offers and cash offers and whether the cash is from a foreign company (excluding the Consolidated Minerals outlier).

- There is a difference in the final offer to 30-day average premium between foreign scrip and total scrip offers and is expected to stem from the ‘encouragement’ required for Australian shareholders to receive foreign scrip *albeit* it may be listed on the ASX. The average final offer to 30-day average premium was 64.7 per cent and is approximately 30 per cent higher than the average of all the scrip final offers to 30-day average premium at 35.7 per cent. However, while there were only two Australian domiciled hostile scrip bids in the dataset, their average final offer to 30-day average premium was 45.6 per cent suggesting hostile foreign scrip offers may only require an additional 20 per cent premium.
- In reviewing payment type through time, bids in buoyant markets tend to be with scrip while bids during low market periods are with cash. One exception is the dual listing of RTZ and CRA in 1995 and as discussed earlier, the nature of the deal meant that it wasn’t share price or market sensitive. Overall there is a broad trend of foreign bidders acquiring Australian companies during weaker markets apart from during the 2002-2008 Resources Boom.

It is interesting to note that in approximately half the transactions the payment involved scrip (two involved a scrip/cash alternative) while Andrade et al (2001) reports that in the US market in the 1990s 70 per cent involved scrip compensation with 58 per cent entirely stock focused. Interestingly, this 70 per cent does match Australian transactions in the 1995 to 1999 period and it is likely that a move to increased cash consideration, which occurred during the 2000-2002 Tech Boom, reflected the weaker resource market conditions. As discussed in below, a bidder’s choice in using scrip or cash is likely to reflect market conditions and the ability for the bidder to pay. In buoyant markets, scrip is preferred by bidders while in weaker markets, cash is preferred.

In terms of initial offer to 30-day average premium for traditional takeovers, the 37.2 per cent average premium is in line with takeover expectations elsewhere, for example Shoenberg and Thornton (2006) report that average bid premia in the UK between 35 and 45 per cent. The final offer to 30-day average premium for traditional takeovers increasing to 48.7 per cent was contributed by competitive bidding with an average increase of 57.6 per cent (*N*=4). This compares to the 'sweetening' of the offer by bidders which averaged a 16.6 per cent increase.

While there was a significant increase in premia required for foreign bidders using scrip (64.7 per cent compared to 45.6 per cent final offer to 30-day average premium), the lack of premia difference between domestic scrip and cash (or foreign cash) is surprising. This thesis believes it is likely to reflect the size of the Australian resource market with many investors accepting bidder scrip to remain exposed to the target assets and commodity exposure and as a consequence not demanding an additional premium for scrip.

In summary, friendly transactions offer target shareholders a lower final offer premium to the 30-day average target share price prior to the announcement (dual listing – 17.8 per cent, mergers – 12.9 per cent) and compare to traditional takeovers which average 48.7 per cent. In traditional takeovers the initial offer to 30-day average premia was 37.2 per cent but increases to the final offer to 30-day average premium of 48.7 per cent mostly reflecting the impact of competitive bidding. Average increases in the final offer prices in non-competitive bidding were 16.6 per cent.

While both scrip and cash bids offered similar premia to target shareholders, foreign scrip on average offer a 20 per cent higher premium. Elsewhere, there was no material differences between the premia offered in hostile compared to non-hostile takeovers.

Overall there is a broad trend of foreign bidders acquiring Australian companies during weaker markets apart from during the 2002-2008 Resources Boom.

7.3.1 Target abnormal returns

The cumulative abnormal returns (CAR) have been assessed for both the target in generally in a 3-day event window at the time of the announcement(s) and similarly for the bidder in this period as well as in a 252-day post-event period (Appendix 1). This section summarises the key findings in relation to target CAR from Chapter 5 before discussing them in light of previous research. The findings are:

- The average final offer premia over the 30-day average target share price prior to the initial announcement are:
    - 35.7 per cent for all scrip offers
    - 64.7 per cent for foreign scrip offers
    - 35.9 per cent for all cash offers (excluding the Consolidated Minerals outlier)
    - 34.4 per cent for foreign cash offers (excluding the Consolidated Minerals outlier)
- The average target CAR during the announcement event window was 19.0 per cent. The target CAR during the event window with scrip bids was significantly lower (13.7 per cent) compared to cash bids (23.9 per cent).
- Both hostile and friendly cash offers return similar target CAR during the event window (23.7 per cent for hostile, 24.2 per cent for friendly). Bids involving foreign scrip returned a slightly lower target CAR at 22.9 per cent.
- There is also a general trend that the higher the final offer premium as a proportion of the 30-day average target share price, the higher the target CAR.

In the first instance, it is interesting that scrip and cash offers have similar average premia to the 30-day average target share price although foreign scrip offers on average are at a 30 per cent higher premium. As previously discussed, scrip offers include mergers which attract a lower premia and hence it is likely that the foreign scrip offers are elevating the average scrip premium. Foreign scrip offers are expected to offer a substantially higher premia given the required inducement for Australian shareholders to accept the foreign scrip even though there may be a ‘token’ listing on the ASX.

The fact that the target CAR is lower than the 30-day average target share price is not unexpected given that the share price prior to the announcement may vary from the 30-day average and in many cases potentially will be increasing on approaching the initial announcement given the risk of leakage of the transaction. Other reasons why the CAR will be lower reflect the estimation of the CAR with the overall market sector likely to increase in response to the announcement of a potential transaction and therefore reducing abnormal returns.

Other factors which will influence the difference between the offer premium to the 30-day average target share price prior to the announcement and the CAR during the event window include:

- Potential uncertainty associated with the likely success of the transaction
- The desirability of scrip in scrip offers
- A required arbitrage return, e.g. selling Homestake Mining US shares to purchase Homestake Gold Australia shares to then accept the Homestake Mining offer.

As noted earlier this research indicates that the final premium over average 30-day average target share price prior to the initial announcement appears independent of transaction type and whether the transaction is hostile or recommended. However the premium is dependent on whether it is a competitive transaction.

As outlined above, there is a relationship between the target CAR during the event window and the size of the final premium over average 30-day average target share price prior to the initial announcement. There is also a relationship as to whether the offer payment is in cash or scrip. This supports the research of Fuller et al, (2002) who report that returns are more positive for cash offers in comparison to scrip offers. An average target CAR of 19.0 per cent is higher than the 16 to 17 per cent recorded by Budega and Walter (1995) and 16 per cent by Andrade et al (2001) but closer to the 18.21 per cent reported by Le and Schultz (2007) and is likely to reflect the greater number of foreign acquirers in the resource sector. However the target CAR for scrip payments is significantly lower at 13.7 per cent than the 18.3 per cent reported by Budega and Walter (1995). Using a subset of their data, Andrade et al, (2001) also report that CAR to target companies was an average of 13.0 per cent with scrip payment compared to a 20.1 per cent average using cash payment over a 2-day event window.

Scrip offers include mergers in this research which attract a lower premia, and hence, it is expected that target CAR will be lower during the event window. However, it has been previously highlighted that the final offer premium over the 30-day target share price prior to the initial announcement have been similar for both cash and scrip offers, which may reflect generous foreign scrip bids which are less valued by the market.

This research also contrasts with da Silva Rosa et al (2000) who found that abnormal returns earned by Australian bidders and targets over the announcement period were not significantly associated with the type of payment.

This research also reiterates the problems associated with defining a merger versus a takeover. As noted elsewhere, there are many mergers which are essentially takeovers but utilise a scheme of arrangement due to other factors (e.g. financing), therefore the merger classification will always involve a range of friendly and ‘less friendly’ transactions. On the other hand a cash offer is deemed final in terms of removing the association of the target shareholders with the target company and irrespective of whether it is friendly or not, it is simply a price consideration.

Therefore, this research expects that a bidder offering a 35 per cent premium (whether cash or scrip) to target shareholders will generate CAR for the target shareholders around 24 per cent on the bid announcement. If the bid involves foreign scrip then the premium needs to be raised by 30 per cent but then the CAR for target shareholders will be slightly lower than non-foreign scrip bids at 22.9 per cent. If however, the bidder can structure a merger then the premium can reduce to zero in a ‘merger of equals’.

7.3.2 Bidder abnormal returns

The following highlights findings from Chapter 5 on bidder CAR during the event window and in a 252-day post-event window.

- On average, bidder CAR during the event period was negative 2.0 per cent and offset by positive CAR in the post-event period which averaged 9.1 per cent.
- Bidders with scrip offers experienced a negative CAR of 0.9 per cent and a positive CAR in the post-event period of 12.2 per cent. In contrast, bidders

with cash offers experience a negative CAR of 3.0 per cent during the event period and a lower CAR of 6.5 per cent during the post-event period.

- While there is no evident relationship in the size of the CAR for the announcement and post-event periods, most bids deliver positive CAR in the post-event window irrespective of negative CAR at the time of the announcement(s).
- On average a bidder has a net gain of 7.1 per cent combining both periods. Only 7 out of the 28 transactions had negative net bidder CAR or only 25 per cent of transactions lost net bidder shareholder value.

The negative CAR at the event window contrasts to some degree with some Australian research suggesting takeover announcements having no significant impact on bidder CAR (Walter 1984; Bellamy & Lewin 1992; Bugeja & Walter 1995, Le & Schultz 2007, Hackbarth & Morellec 2008) with typical bidder event window CAR at less than 1 per cent.

However the increased negative CAR in the event window for cash offers is in accord with the finding of Bellamy and Lewin (1992) who report a negative 3.0 per cent CAR for cash offers while bidders offering cash earned on average a positive 1.3 per cent during the event window. It also contrasts with Andrade et al (2001) who found CAR of negative 1.5 per cent for bidders using scrip and 0.1 per cent for bidders using cash in a 3-day event window.

In addition, the research also contrasts with da Silva Rosa et al, (2000) who found that abnormal returns earned by Australian bidders and targets over the announcement period were not significantly associated with the type of payment. However this research also contrasts further where da Silva Rosa et al, (2000) found that over a long-term post-bid period, bidders who offer shares significantly under perform regardless of the bid outcome. In this research it was found that bidders offering scrip on average perform almost twice as well as cash offers in the 252-day post-event window.

The stronger overall CAR for bidders offering scrip (event and post-event windows) contrasts with the concept that bidders use scrip if there is uncertainty in a target's value and use cash if there is uncertainty in the bidder's value (Rhodes-Kropf & Viswanathan 2004, Dong et al 2006). Under these circumstances, there is an expectation that the CAR for bidders in both the event and post-event windows would be lower than for cash bids given the increased uncertainty. However, Rhodes-Kropf & Viswanathan (2004) also believe that cash offers are more likely to occur in undervalued markets and this thesis would concur with this observation as highlighted earlier.

Healy et al (1997) argues that takeovers involving scrip can sometimes be referred to as strategic takeovers, involving similar businesses and are therefore more likely to create a better outcome for bidders. This would stem from greater synergies, more accurate target valuations and sharing the cost of valuation mistakes by using scrip.

The lack of correlation between the size of bidder CAR in the event window compared to bidder CAR in the post-event period also contrasts with Sirower (1997) who believes that the initial share price reaction is a good indicator of the likely future success of a transaction.

This thesis argues that the net positive CAR from both the event and post-event windows (average net positive gain of 7.1 per cent) supports the proposition that resource acquisitions add value, Andrade et al, (2001) believe that the positive net gain for target positive CAR and bidder negative CAR at the event window (in this research, averages 17.0 per cent) is testament that acquisitions add value.

Nevertheless, there are a number of confounding issues in the research, not the least that mergers generally offer scrip payments but also offer lower premia so there is an expectation that a lower premium will lead to less negative bidder CAR in the event window. In the post-event window higher CAR could reflect this lower premium paid but also the fact that there is likely to be a degree of cooperation between both companies and hence greater scope to realise merger synergies early.

In the analysis in this thesis, cash bids are more prevalent during weaker markets but then the presence of a weaker market itself may also lead to greater negative CAR for the bidder with the takeover announcement.

Overall, the negative bidder CARs during the event window are more than offset by positive CARs during the post-event window, leading to a net positive CAR for acquirers on average of 7.1 per cent. The positive net CAR for acquirers using scrip bids is 11.3 per cent but falls to 3.5 per cent for bidders using cash offers.

7.3.3 Toeholds and Strategic Stakes

In Chapter 2 (Section 2.7.8) this thesis briefly reviewed research on the influence of toeholds and strategic stakes on target and bidder returns with the most recent Australian research by Le and Schultz (2007) reporting that there was a positive association between the presence of toeholds and bidder abnormal returns.

In this research it is reported that acquirers with toeholds or strategic stakes do offer on average smaller premia based on the final offer price to the 30-day average target share price prior to the initial announcement (9.0 per cent with *SD* of 25.3 per cent compared to 51.9 per cent with *SD* of 33.0 per cent). However some of the acquirers include foreign entities e.g. Homestake Mining Company, Placer Dome, etc. which are likely to offer higher premia given their foreign scrip offers and hence the premia are probably overstated relative to toeholds across the entire market in Le and Schultz's (2007) research. In general, it is expected that companies with toeholds include mergers which involve a lower average offer premium relative to takeovers, e.g the Normandy Group mergers.

In terms of bidder CAR during the event window and post-event 252-day period, this research supports that of Le and Schultz (2007) with the average bidder CAR at the event window with and without toeholds were 3.7 per cent and negative 4.8 per cent respectively. However this changes in the post-event window with CARs for acquirers with and without toeholds recording 2.3 and 12.6 per cent respectively to average a net CAR for acquirers with and without toeholds at 6.0 and 7.9 per cent respectively.

It can be argued that this is a logical outcome given the market will factor in more rapidly the benefits of a takeover of a subsidiary or associated company although the upside is likely to be less given that part of the value of the target will already be factored into the bidder’s share price as a consequence of previous control or association. In contrast, the benefits of a takeover of target without a prior toehold could involve uncertainty during the event window as the market takes time to assess the implications of the transaction and whether the bidder is likely to be successful. However in the post-event period with the uncertainty removed the market will continue to assess the merits of the acquisition. It may experience ‘surprises’ to the upside where promotional and marketing programs by the bidder may highlight the future synergies and present early evidence of their occurrence while overall, for the same size target a non associated company should yield greater post-event synergies given the likelihood of its more significant impact on the project portfolio of the bidder.

7.3.4 Independent Valuations

The presence of Independent Expert valuation ranges provides useful data in terms of the range itself and to the extent that a report and valuation has been commissioned for a particular transaction. Key findings of this research in this area have been:

- In the 30 transactions analysed, 15 of the target companies had commissioned valuations from Independent Experts to assist their shareholders in their decisions. All the independent experts provided both high and low valuations to present a valuation range.
- On average, the final offer price was close to 92 per cent of the mid point of the valuation range in transactions with Independent Expert valuations.
- On average, the high valuation is around 25 per cent higher than the low valuation and hence a final offer price offer at 92 per cent of the mid point of the valuation range means that the offers fall within the valuation range.
- There is a discernable trend of higher final offer premiums to the 30-day target average share price prior to the initial announcement and the range between the low and high valuations.
- The final offer premia to the 30-day target average share price prior to the initial announcement is lower for transactions with an Independent Expert’s valuation (30.3 per cent) versus transactions without an independent valuation (47.7 per cent). However hostile transactions with an independent valuation had an average premium of 43.8 per cent.

In terms of past research these findings contradict Eddey (1993) who found bid premia where an expert's report was issued were not significantly lower than bid premia in other bids. Bugela (2005) also contradicted some of the findings by Eddey (1993) and as noted above, there are clearly lower bid premia for transactions with commissioned Independent Expert reports in the resources sector (whether hostile or not).

This thesis argues that the presence of an independent valuation may constrain offer premia as the valuation itself creates benchmarks where the Boards of target companies feel compelled to accept offers only if they are within or above an Independent Expert's valuation range. On the other hand, a bidder could be perceived as overpaying if its offer price is above an independent expert's valuation range.

As noted above, approximately half the transactions involved the commissioning of an independent expert's report while in the US, Kisgen et al (2009) report that over the period 1994-2003, 80 per cent of targets and 37 per cent of acquirers obtained third-party assessment of the fairness of a merger or acquisition. Their findings were also in line with this research that if an acquirer obtains a fairness opinion (as was the case in the 15 cases in this dataset) the deal premium is lower than otherwise.

Overall, this thesis would argue that it is not in the interest of a target to commission an Independent Expert's report unless the target is entering into an agreed transaction. Once a valuation range is presented to the acquirer and the market, the fiduciary duties of Boards are likely to maintain offer prices within the valuation range.

7.3.5 Commodity and Index sensitivity changes

In comparing target and bidder commodity exposure it has been noted earlier that 90 per cent of the bidders had a similar exposure, including all takeovers by gold companies. This is not surprising but indicates that bidding companies are more interested in building their existing asset portfolios with similar assets rather than seeking diversification strategies for growth. As noted in Chapter 3, the gold price is also influenced by monetary factors and less by world industrial production than other commodities and attracts a ‘gold premium’ relative to non-gold stocks. Therefore it is unlikely that a gold company would seek to dilute an existing gold exposure with non-gold assets.

The post-event regression analysis compared to the estimation window can be interpreted as indicating that higher net bidder CAR is potentially correlated to a greater change in the bidder’s sensitivity to its key commodity. This would be in accord with expectations that greater bidder returns could reflect an increase in the attractiveness of the bidder to investors and would correlate with a greater sensitivity to a key commodity.

In contrast, it appears there is no evident relationship between net bidder’s CAR and changes in its sensitivity to a key index. This differs from a perceived importance of index weighting although it could also reflect the diversity of indices involved with the companies in the researched transactions, e.g., the investment universe behind international versus domestic indices. Nevertheless, this thesis expects that companies would generally desire a greater sensitivity in specific indices to attract investment funds. While the transactions do not appear to have delivered this outcome, further research may be required to determine what is the most relevant index for a particular company in relation to investability rather than share price correlation.

7.4 Share price movements of resource companies

In Chapter 4, this thesis refers to events which lead to perceived changes in company valuations as share price ‘drivers’. However it also highlighted that there is an important distinction between ‘drivers’ and sustainable changes in company valuations as a share price driver may or may not lead to an actual underlying change in the fundamental valuation of the company – it may be only perceived at the time of the emerging driver.

The mechanism interpreted to move share prices involves a continuous process stimulated by emerging share price drivers along the following steps:

9. A share price driver emerges resulting in a market perception that the company fundamental valuation may change.
10. Share price movement (positive or negative).
11. Ongoing assessment as to the credibility and sustainability of the new valuation.
12. Potential refinement of the share price movement (positive or negative).

This mechanism employs the Bayesian probability theorem with the market assigning a probability to these factors and hence the change in value, $\Delta \nu$ will be probability weighted according to the confidence the market has in the change in value. Hence, the change in share price (S) can be described as:

$$\Delta S = P(\Delta \nu)$$

Where:

$\Delta S =$ The change in company value reflected in the change in the company share price

$P(\Delta \nu) =$ The probability weighted change in value

The two separate factors – the perceived change in value and the probability that this value change is real, sustainable and capable of being expressed in the share price may also be quite unrelated.

Nevertheless, while the process is simple, the probability distribution can incorporate the summation of complex items. This was highlighted in Chapter 4 with an example of the factors involved in the share price change following a company announcement (the announcement is the share price driver, the material content represents the change in value and the probability incorporates both the ability to sustain this change in value as well as the degree to which the market will factor in this change in value into the share price).

While it is difficult to model across the broader market, this thesis can interpret waning probability associated with the lack exploration discovery success over time and which is evident in other market scenarios. In the analysis of the share price movements of Anchor Resources, a model incorporating continuous compounding as reflecting declining expectations of imminent exploration success is deduced from the excess value (XV_t) in the share price at time t above the net cash backing per share. Therefore the model assumes that XV_t is equal to XV at time zero ($XV_{t=0}$) less the excess continuously compounded value of XV over the time period (t) less $XV_{t=0}$ such that:

$$XV_t = XV_{t=0} - \left(XV_{t=0}e^{rt} - XV_{t=0}\right)$$

Or

$$XV_t = 2XV_{t=0} - XV_{t=0}e^{rt}$$

Where

$XV_t =$ Excess Value at time t

$XV_{t=0} =$ Excess Value at the start ($t=0$)

e^{rt} = continuous compounding factor for an interest rate r over time t

However, in the case of Cougar Metals where exploration activities were relatively continuous, declining expectations could be interpreted as declining probabilities of exploration success on particular projects or programs over time. This stems from the fact that many explorers test their best targets first and hence, over time, the probability of a successful discovery does diminish as noted in Chapter 6.

Returning to the original equation:

$$\Delta S = P(\Delta v)$$

Where:

$\Delta S =$ The change in company value reflected in the company share price

$P(\Delta v) =$ The probability weighted change in value

In the case of Anchor Resources, with no new share price drivers, the decline in the share price can be attributed to the declining expectation of imminent exploration success with the market assigned probability at time *t* derived from:

$$P_t = \frac{(2XV_{t=0} - XV_{t=0}e^{rt})}{XV_{t=0}}$$

And Δv is the potential for exploration success within an acceptable timeframe. Hence, it can be argued that at any point in time, the share price is:

$$SP_t = IV_t + \frac{(2XV_{t=0} - XV_{t=0}e^{rt})}{XV_{t=0}}\Delta v$$

Where:

SP_t = Share Price at time *t*

IV_t = Intrinsic Value of the company per share at time *t*. In the case of an exploration company it may reflect its cash backing but in other companies, the share price prior to the emergence of the share price driver could be a reasonable approximation. In other situations it may be some other form of valuation, e.g. NPV valuation.

Adapting the earlier formula leads to the following derivation:

$$SP_t = IV_t + P(\Delta v)$$

Where again:

$$P_t = \frac{(2XV_{t=0} - XV_{t=0}e^{rt})}{XV_{t=0}}$$

In most cases, given that share price drivers occur frequently, e.g. daily commodity price changes, the 'wane' or decline estimated in the equation above is small and can be ignored. Alternatively, the probability factor may be applied to a more permanent value change and there is not a 'waning' expectation. However the formula provides an important basis for discussing exploration probabilities in Section 7.5.

One of the key observations for resource companies is that daily movements in commodity prices are a significant share price driver. Bartrop and Guj (2006) hypothesise that, on average over a full market cycle, resource shares tend to trade around NPV values. However, NPV values often follow share prices given that they are responding to the same drivers and this thesis interprets that the market strives for a quick assessment of the change in expected value reflecting say an overnight increase in a commodity price. This may ideally involve an NPV recalculation, although this is generally not practical. Instead the market assumes a relationship between the percentage change in share price and that of the corresponding commodity price movement, which is often simplified to a one to one relationship.

The relationship between commodity prices and share prices is strongest when both prices are viewed in absolute terms rather than comparing the returns from daily price movements. This can reflect the fact that share prices may pre-empt or lag commodity price movements at certain times and react to other factors such as improving macro-economic conditions. A number of scatter plots of commodity and share price levels in Chapter 4, however, highlight the linear relationships over specific periods of time and under the probability weighted value model, $\Delta S = P(\Delta v)$ the P component is interpreted as being relatively stable during these periods leading to the linear relationship.

As reported in Chapter 2, the most widely used model of stock price behaviour is a generalised Wiener process adapted for expected stock returns according to Hull (2008):

$$dS = uSdt + \sigma Sdz$$

Where:

$S =$ stock price at time t

$u =$ expected rate of return on the stock

$\sigma =$ volatility of the stock price

Given the relationship between commodity prices and resource company share price movements, the question is then whether commodity prices follow a Markov process and can be modelled as a geometric Brownian motion variable. There is general acceptance that the returns from holding physical metal distribute lognormally. The mean of the distribution is dictated by the commodity supply/demand fundamentals as well as the general macro-economic outlook and the influence of speculators. These factors are likely to cause the trend commodity and resource company prices in a common direction most of the time as evident in the linear relationships outlined earlier. Furthermore there is no evidence of an increasing variance of this distribution over time as evidenced in Chapter 4 where relationships can remain in place over time and over a range of commodity prices until a new share price driver emerges. This study in share price movements has created confidence to adapt the market models in event analysis to derive the CAR estimates in the previous sections as well as apply its ramifications to exploration companies (next section). Further work can build on this model, particularly as the resource sector is unusual as it differs from other market segments given the presence of a dominant share price driver.

7.5 Exploration

Investment opportunities are generally assessed in terms of their risk-return profile and as noted in this thesis, the prices of shares and of other investments are set on expected value basis. On the other hand, the probability of positive returns on exploration expenditure is generally so low that an expected value can only be determined on the basis of a very significant number of projects and for this reason exploration is deemed a necessary but risky alternative avenue to corporate growth in mining. In contrast, the petroleum industry frequently outlines the probability weighted returns (i.e. estimates of possible NPV values) on drilling oil and gas targets. Investors in junior explorers and to lesser degrees, small-cap, midcap and a major mineral producers have generally been incapable of evaluating their projects on a risk-adjusted basis when allocating exploration budgets. In research associated with this thesis, a simple classification system was proposed to provide a platform for the categorization of exploration projects as follows:

- Greenfield exploration – *areas with poor geological understanding, where exploration often involves remote sensing to identify target areas*

- Brownfield exploration – *areas with reasonably well known geological knowledge and past indications of mineralizing styles, often exploration 'along strike' from existing deposits*
- Minesite exploration – *areas neighbouring operating mine sites and which can utilize existing infrastructure*

The series is characterised by decreasing risk but with a corresponding decreasing value of potential discoveries. Naturally a smaller *brownfield* size discovery can be made in a *greenfield* exploration project, while a large world-class discovery is unlikely in a brownfield.. There are also two further classifications to cover the remaining spectrum:

- Secondary project evaluation – *past discoveries of significant mineralization (JORC or non-JORC resources) where development has stalled due to submarginal economics at the time of initial discovery and assessment*
- Merger and acquisition – *acquisition of significant assets including mines (operating or non-operating) through to company takeovers and mergers*

Utilising limited historical research, stock market expectation and experience a risk and return profile for each exploration category is presented in Table 52, which also includes an estimated average exploration program budget, the estimated minimum NPV of an expected discovery and an overall probability weighted return per exploration program for each category.

Table 52. Exploration categories and risk-return estimates.

Exploration Classification	Probability of Achieving Minimum Desired Target	Minimum NPV Value expected for discovery success (US$m)	Probability Weighted Succes (US$'000)	Average cost of applicable exploration program (US$'000)	Probability weighted return per exploration program (US$'000)
Greenfield	0.30%	$270	$810	$500	$310
Brownfield	5%	$75	$3,750	$250	$3,500
Minesite	20%	$5.0	$1,000	$125	$875

In Chapter 6, this thesis has highlighted the attractiveness of *brownfield* exploration expenditure given the combination of a higher probability of success and the value of a moderate size discovery. The potential of a *brownfield* discovery on some *greenfield* programs also increases the attractiveness of this normally high risk exploration expenditure. Overall, apart from pure *greenfield* exploration, the probability weighted return on exploration expenditure provides significantly attractive returns.

However, applying degrees of confidence or certainty in achieving the probability weighted return per exploration program means that there is significant risk involved in achieving these returns. As noted in Chapter 6, to achieve a greater than 50 per cent level of certainty for each type of exploration requires, under the assumptions of Table 52, the expenditures levels outlined in Table 53.

Table 53. Expenditure levels required for greater than 50 and 75 per cent degrees of certainty.

Minimum expenditure for…..	>50% degrees of certainty (US$m)	>75% degrees of certainty (US$m)
Greenfield	$115	$231
Brownfield	$3.4	$6.8
Minesite	$0.39	$0.78

These levels of expenditures have important implications for the ability of companies to fund and execute effective exploration programs. An example is that the only companies capable of funding *greenfield* exploration with a high certainty of success are likely to be the majors.

Similarly, in brownfield exploration which is the main focus of junior explorers, to achieve a greater than 50 per cent level of certainty of exploration success requires a budget of $3.4 million. As discussed in Chapter 6, many junior explorers struggle to raise the minimum $2.3 million to list on the ASX while Kruezer et al, (2007) report that average junior exploration float from 2001 to 2006 raised $4 million. In both these scenarios it is doubtful whether a junior can offer investors a 50 per cent degree of certainty in its exploration portfolio.

With regards to *minesite* exploration, this is considered a core activity of all producers, irrespective of size. The level of commitment is dependent on current reserves, the expected conversion rate of remaining resources to reserves, the level of investment in existing infrastructure as well as the overall economics of individual operations. Therefore mine site exploration budgets will be least influenced by the size of a company and to some degree, the vagaries of the overall exploration budget.

Perkin (2004) believes that the fundamental truth behind mineral exploration is the fact that the more you explore, the more you find, and that one success will often lead to further discoveries. This thesis takes this further to highlight that it is simply not the overall level of exploration but who is spending and hence, is it being spent where it delivers the best probability weighted returns with an optimal degree of certainty of success?

Table 54 outlines the typical company size involved in the mentioned activities. The assumptions are necessarily generalised but the activities are a consequence of the cost and availability of capital for companies, which in turn are generally related to the company size.

Table 54. Resource company size and expenditure preferences.

Company Status	Junior Explorer	Small Cap Producer (often pure play)	Mid Cap Producer	Large Cap Diversified
Presence of Mining Operations	None	Generally one, maybe two	Several	Well Diversified Portfolio
Common Funding Sources	Stock Market	Stock Market/Internal Cash Generation/Limited Corporate Debt	Internal Cash Generation/Project Debt	Internal Cash Generation/Project Debt
Cyclicality of Funding	Totally	To a significant extent	Less given some diversification but still dependent given volatile earnings and cash flows	Not reliant but strong earnings can result in additional funding
Cost of capital	High	Moderate	Moderate/Low	Low
Minesite exploration	No	Yes	Yes	Yes
Brownfields exploration	All	Mostly	Significant	Minor
Greenfields exploration	Minimal	Minimal	Minor	Major
Secondary project evaluation	Yes, if available	Yes	Minor	Minor
Acquisition of mines/companies	Extremely limited	Minimal except to build 'critical mass'	Moderate, particularly targeting smaller producers	Significant and targeting major or world class assets

In summary, the trend is that larger companies with a number of operating assets producing a reliable cash flow are likely take greater risks in exploration. This includes both budget and the allocation to a greater proportion of *greenfield* programs. This risk appetite is also matched by the relevance of the target being sought as outlined above. G*reenfield* exploration has become increasingly the domain of the majors with mid-caps and especially juniors requiring a comparative advantage to ‘beat the odds’.

However most of the majors have exploration expenditure levels which would exceed the expenditure level of a 75 per cent degree of certainty of a *greenfield* discovery although the number of greenfield discoveries are estimated to average around two per year (Shodde and Hronsky, 2006). While this is at odds with the degree of certainty expectations, the author believes that this level of *greenfield* discovery is to be expected given the logistical constraints in exploration. To meet a 75 per cent degree of certainty requires this expenditure to be spread over 462 individual projects – a difficult task for even the largest exploration company and then each project is likely to be staged over a number of field seasons. Assuming the exploration probability for *greenfield* exploration is reasonable at 0.3 per cent, then discoveries are likely and it simply becomes a matter of time.

Nevertheless, given the size of the majors and the logistical time constraints in attaining *greenfield discoveries*, there is question as to whether these discoveries have the ability to deliver the required corporate growth. Goodyear (2006) commented that while the average value of a world class target was estimated by Shodde and Hronsky (2006) at US$650m, it represented only a small proportion of the market capitalization of large companies such as BHP Billiton. Hence, exploration is likely to remain as one part of the overall growth strategy for companies like BHP Billiton but project expansions and acquisitions will remain necessary components.

The risk-return analysis outlined earlier suggests that the greater probability weighted value lies in brownfield exploration and while the discovery size (US$75 NPV) is not material to the majors, it offers modest upside to the mid tier sector and the strongest returns (in line with expectations) to a junior explorer. This thesis has already discussed the funding issues faced by juniors above, but in any economic model, the risks are normally counterbalanced by the returns. However it is evident that while scarcity and increasing commodity prices have increased the values of discoveries, these increased returns are outweighed by the risks (probability of discovery with an acceptable level of certainty) and companies often struggle to raise the same level of funding as they did a decade ago.

With the market (and industry) yet to embrace these exploration project classifications, the market tends to group most exploration programs as high risk-high-return 'plays'. The exception may be *minesite* exploration but with generally lower value targets, these may not be significant from an overall company value perspective at the outset of a *minesite* exploration campaign.

Investors tend to compensate for the high levels of risk by expecting a high return but then rapidly discounting the share price if signs of an exploration discovery fail to materialise. This decline may be modelled using a continuous compounding factor described earlier and but underpins the difficulties faced by junior explorers in raising capital in the face of negative exploration results.

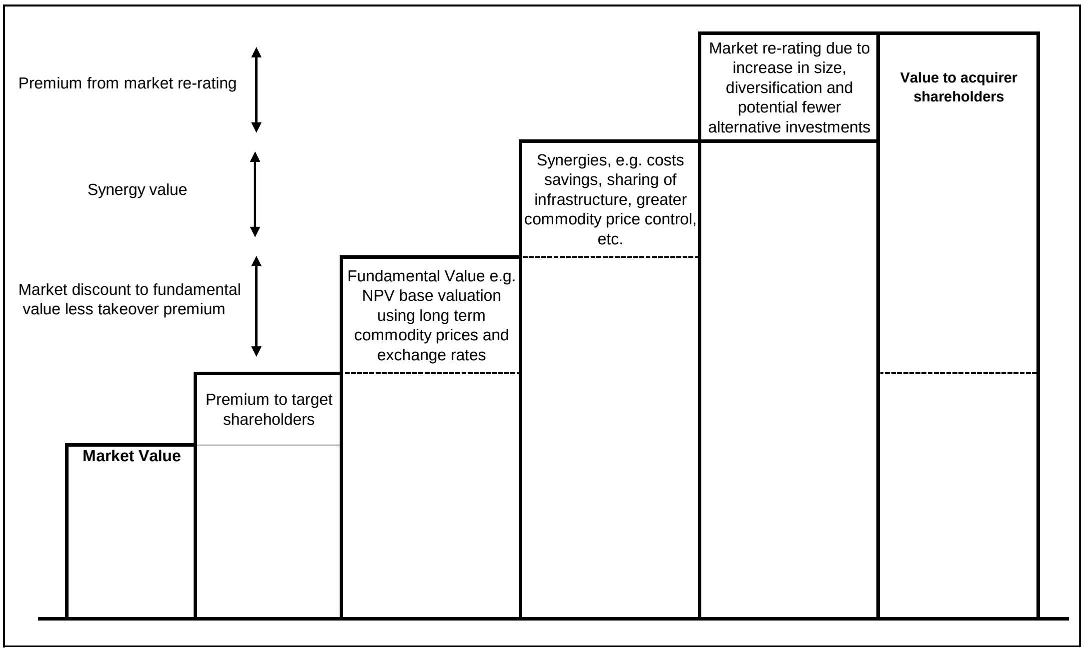
As a consequence, many juniors will focus on *secondary project evaluation* and *brownfield* exploration while *greenfield* exploration is becoming increasingly the domain of the majors. To reverse this situation requires a structural change in the risk-reward equation where *greenfield* exploration can attract lower cost funding and not simply represent the 1- 3 per cent of revenue expenditure of the majors.

7.6 Final Discussion

In Chapter 2, this thesis presented modified Figures 23 and 24 to present the opportunities for adding value in resource acquisitions. These figures are reproduced below in Figures 151 and 152 but importantly highlight that there are three identifiable areas where an acquisition can add value. These are:

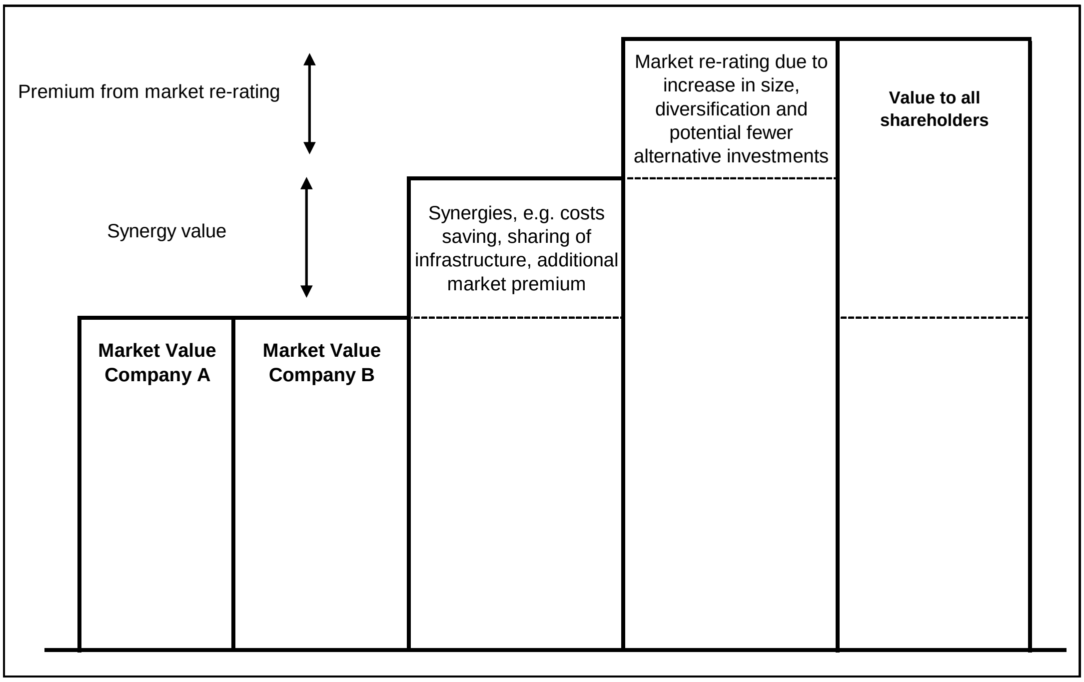
- Acquisitions at a discount to NPV
- Synergies
- Premium for market rerating

Figure 151. Potential value creation in resource acquisitions.



In the case of mergers, while a discount to NPV may not be available, there is still scope to capture the value from synergies and a market rerating.

Figure 152. Potential value creation in resource company mergers.



This ability to add value through these opportunities are likely to contribute to the positive returns to bidders observed through the cumulative abnormal returns in the post-event period offsetting the potentially modest cumulative abnormal losses in the announcement (event) window.

However, what is particularly interesting is the ability for the bidder to take control of the transaction, leaving the target management struggling to divert the market onto other issues. Appendix I profile the 30 transactions and include a number of these cases although there are situations where the target has exerted greater control as in competitive bids.

In this final discussion it is worth briefly reviewing the 2007 BHP Billiton US $183 billion bid for Rio Tinto which represented 72 per cent of the size of the world's largest mining company with a market capitalisation of US$251 billion. At the bid announcement Rio Tinto shareholders earned cumulative abnormal returns of 16.7 per cent on a bid premium to the 30-day average Rio Tinto share price prior to announcement of 55.5 per cent. Over this event window, BHP Billiton shareholders lost cumulative abnormal returns of negative 3.6 per cent.

Over the subsequent period the Rio Tinto share price was generally locked into a trading pattern around the offer price (and an increased over price) over the next 10 months. This was irrespective of Rio Tinto's management rejection of the bid and its operational and strategic performance elsewhere.

On the 25 November 2008, BHP Billiton withdrew its offer. This generated cumulative abnormal losses for Rio Tinto of negative 49.4 per cent but cumulative abnormal gains for BHP Billiton of 8.6 per cent.

In this scenario where the market's expectations are set by the bidder, it almost appears that the bidder is in a 'no-lose' situation whereas the target finds it difficult to break a trading pattern established by fund managers who start arbitraging any price differential.

7.7 Conclusions

The last two decades have witnessed a high degree of M&A activity which has largely involved the foreign takeover of Australian resource companies and the loss of household names such as Normandy Mining, Comalco, Norths, MIM, WMC Resources etc. Since 2000 Xstrata has been the main stimulator of M&A activity and by also bringing other companies into 'play' both here and overseas, has led other companies that may not consider launching hostile bids, providing "white knight" offers. However in the mid to late 1990s, many Australian gold companies were taken over or consolidated first, then taken over by other foreign companies.

Since the Tech Boom, a major factor in the justification of takeovers has been the size premium associated with larger companies. Using this justification, bidders have been able to justify non-eps accretive acquisitions. However, an irony has been that these acquisitions have delivered greater than expected returns given the forthcoming 2002-2008 Resources Boom at that time. This size premium is not now evident but the scarcity of quality mineral deposits and projects are now seen as a major driver of future M&A activity.

This thesis concludes that acquisitions add value to resource companies which is evident in positive post-event window cumulative abnormal gains offsetting cumulative abnormal losses in the event window. These abnormal gains have been estimated using an adapted market model for event analysis and draw on the strong correlation of absolute resource share prices and commodity prices.

Overall, acquisitions of resource companies appear almost a 'one way bet' as only 25 per cent of transactions lost bidder shareholder value and a carefully structured acquisition where the market's expectations are designed to suit the bidder, can leave the bidder in total control of the process,

This is unlike exploration where attractive probability weighted exploration returns are dampened by high levels of expenditure required to achieve satisfactory levels of certainty. This will continue to undermine the investment appeal of junior explorers while *greenfield* exploration will become solely the domain of the majors.

7.8 Further Research

The breadth of this thesis has left many areas suitable for further investigation. While an obvious area is to extend the number of analysed transactions to produce more statistically meaningful results and to record transaction data before it is lost, there are a number of other areas which include:

- Investigating the oil and gas sector in a similar study
- Investigating overseas transactions in a similar study
- Investigating company share price response to significant *greenfield* discoveries and quantify further share price value from subsequent, albeit smaller, discoveries over time.
- Further developing the *q* NPV parameter using consensus NPVs
- Investigating gold company sensitivities to A$ and US$ gold price versus hedging positions
- Further developing the resource share price movement model and characteristics of commodity price behaviour.

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Western Australian School of Mines

Acquisitions May Add Value to Resource Companies

Stephen Bruce Bartrop

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Appendix 1

Dual Listing, Merger and Takeover Analysis

Contents

BHP merger with Billiton plc

On 19 March 2001, BHP and Billiton plc (Billiton) announced a merger in the form of a dual listing similar to the dual listing for CRA and RTZ created in 1995.

Under the terms of the merger, one existing Billiton share would have an economic interest equivalent to 0.4842 existing BHP shares. This implied an apparent premium of about 20% to the closing share price on Friday 16 March, the last closing price prior to the announcement of the proposed merger (Tomlinson et al, 2001).

To meet the respective shareholder group interests' in the combined entity, bonus shares were issued to BHP shareholders. After this allocation it was deemed that the dividend, capital and voting rights of each BHP share relative to each Billiton share would be equivalent.

BHP would issue bonus shares in a ratio of 106.51 additional shares for every 100 BHP shares held and the BHP shares on issue after this bonus issue would total around 3.705 billion. Including Billiton's existing shares on issue the merger would leave the combined company with approximately 6.024 billion shares on issue. BHP and Billiton shareholders' interests in the new group would therefore be about 61.5% for BHP and 38.5% for Billiton (Tomlinson et al, 2001).

At the time the author noted that there was some disappointment that the merger appeared to favour Billiton shareholders, particularly as the market generally viewed Billiton as having inferior assets. Reports at that time suggest merger ratio terms at 70/30 rather than 61.5/38.5 would have been preferred by BHP investors.

BHP shareholders have approved the proposed DLC merger with Billiton Plc at a vote on the 18 May 2001 with 88.2% shareholders voting in favour of the transaction (BHP 2001). On the 22 May 2001, 91.5 percent of Billiton plc shareholders gave their approval at a similar meeting in London (Hiscock 2001).

On 29 June 2001 BHP Limited (BHP) and Billiton Plc (Billiton) announced that they had formally completed their merger with the combined group to be known as BHP Billiton (BHP 2001a).

Assets

Prior to the merger, Billiton was promoted as a global leader in mining and metals and a major producer of aluminium and alumina, chrome and manganese ores. It had previously been undergoing an expansion phase prior to the merger, having purchased Rio Algom, a Canadian based base metal and metal distribution business for $1.75 billion, a 56% stake in Worsley, a Western Australia alumina refinery for $1.49 billion, CdelC and CZN, two Columbian coal companies, for $291 million, and a 2.3% indirect interest in CVRD, the Brazilian mineral company, for $327 million (Tomlinson et al, 2001).

At the completion of the merger, BHP (2001a) outlined a plan of aggregating the major operating assets into Customer Sector Groups ("CSGs"). These would comprise:

- Aluminium (Aluminium, Alumina)
- Base Metals (Copper, Silver, Zinc, Lead)
- Carbon Steel Materials (Coking Coal, Iron Ore, Manganese)
- Stainless Steel Materials (Chrome, Nickel)
- Thermal (Steaming) Coal
- Petroleum (Oil, Gas, LNG)
- Steel

Hiscock (2001) commented that BHP’s CEO Mr. Anderson had told shareholders the merged company would have "a truly global scale" that would be "well and truly on the radar screens of international funds managers". BHP is the world's third largest iron ore producer, the largest exporter of metallurgical coal, is a significant oil and gas producer and the world's fourth largest copper producer. Billiton is one of the world's biggest producers of aluminium, nickel, copper, steaming coal and mineral sands.

Synergies related to procurement savings, reduction of corporate offices by the combining of the two head offices, and the less tangible items such as joint marketing and common customers were expected to be in the range of $250-400 million per year (Tomlinson et al, 2001)

Unfortunately the Billiton plc share price data prior to the merger is not available, hence the analysis has focused on the performance of BHP during firstly the announcement period (around 19 March 2001) and secondly, at the time of shareholders' approval for the merger on the 29 June 2001. The 252-day post-event period from this time is also analysed. BHP is referred to as the bidder.

Takeover details are summarised in Table A1.

TableA1. Takeover Parameters.

Bid Price (38.5% of a BHP share)	$3.55
Bid premium over 30 day average share price	20.0%
Offer Value ($m) (based on $1.30)	$8,233
Date	19-Mar-01
Initial target director response	Recommended
Independent Valuation: low value	na
Independent Valuation: high value	na
Independent Valuation range (increase on low value)	na
Final bid over Independent Valuation mid point	na
Target director recommended acceptance	16-Oct-00
Takeover Completion (shareholder approval)	1H CY 2009

As evident in TableA2, Billiton plc was around 30% the size of BHP prior to the takeover announcement.

TableA2. Bidder and target relative sizes.

Company Size Data	**Market Capitalisation prior to bid (A$m)**
Billiton plc	$18,896
BHP	$32,074
Offer (final) value as percentage of Bidder	12.8%
Target size as percentage of Bidder	29.5%

The regression analysis outlined in Table A3 indicates that the BHP Billiton share price was most sensitive to the ASX Accumulation All Resources Index and with a lower level of sensitivity to the Spot LME copper price and the MSCI Metals & Mining Index.

Table A3. Regression analysis for bidder.

Bidder	**BHP**	
	Estimation window (days)	252
Regression analysis		
HSBC Global Mining Index	*observed t-result*	1.97
Spot LME copper price (US$/lb)	*observed t-result*	2.97
MSCI Metals & Mining	*observed t-result*	3.09
ASX Accumulation All Resources Index	*observed t-result*	23.68
Intercept	*observed t-result*	10.82
Factors of significance (>5%)		
Spot LME copper price (US$/lb)	Slope	-1.14282
MSCI Metals & Mining	Slope	-0.00465
ASX Accumulation All Resources Index	Slope	0.00144
	Intercept	3.09348
	R^2	0.86
	Standard error	0.18
	F-statistic	373.6
	$SS_{regression}$	48
	$SS_{residual}$	8
Model	Three factor	
Actual versus Theoretical Returns regression error	Steyx	0.00825

Table A4 summarises the cumulative abnormal returns for the bidder at -4.8% over the three day event window during the merger announcement and is likely to reflect the earlier discussed disappointment at the size of the premium paid to Billiton shareholders. No cumulative abnormal returns were recorded at the time of shareholder approval for the merger.

Table A4. Cumulative Abnormal Returns for the bidder over the 3-day event window.

	CAR	**Share Price prior to event**	**Shares on Issue (m)**	**Change in value (A$m)**
Target (Billiton)	na	£3.00	2,319	na
Bidder (BHP) at announcement	-4.8%	$9.22	3,478	-$1,542.8
Bidder (BHP) at shareholder approval	0.0%	$9.70	6,024	$0.0

However in the post event 252 day period BHP is estimated to have experienced 29 days of abnormal returns with total cumulative abnormal returns of -9.3% over this period (Table A5). This corresponded to a value decrease of around A$3 billion. This represents around 5% of total market capitalisation, it is an interesting observation given the high level of promotion of the merits of the merger during this period.

Table A5 Post event window abnormal returns for Harmony.

Days in post-event window	Number of days of AR	CAR over period	Change in value (A$m)
252	29	-9.3%	-$2,979

In the regression analysis of BHP Billiton in the 252-day period following shareholders' approval of the merger, it is also interesting to note that the significant increase in share price sensitivity to the HSBC Global Mining Index but not the MSCI Metals & Mining Index. As with the HSBC Global Mining Index, the observed increased sensitivity to the ASX Accumulation All Resources Index is also likely to reflect the increased weightings (TableA6). Tomlinson et al (2001) report that the MSCI Metals & Mining Index was undergoing a review to determine the appropriate weightings for dual listed entities at that time.

Table A6. Regression analysis in the post event period.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
HSBC Global Mining Index	*observed t-result*	7.55	1.97	283.5%
Spot LME copper price (US$/lb)	*observed t-result*	1.94	2.97	-34.5%
MSCI Metals & Mining	*observed t-result*	1.86	3.09	-40.0%
ASX Accumulation All Resources Index	*observed t-result*	34.04	23.68	43.7%

BHP's share price sensitivity to the spot LME copper price also appeared lower in the post-event period which could correspond to increased diversification (e.g. aluminium) away from copper.

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CRA: RTZ dual listing

On 9 October 1995 London based RTZ Corporation plc and CRA Limited (CRA), which was 49% owned by RTZ, announced they had agreed to combine their businesses in a dual listing. The companies argued that this would place them in a better position to respond to the challenges and opportunities in the world metals and minerals industry into the next century (Business Wire 1995).

The dual listing involved establishing an Implementation Agreement between RTZ and CRA, dated 3 November 1995, which set out the terms and conditions for the implementation of the operation in a dual listed company structure (DLC). The structure would not involve any change in the legal or beneficial ownership of any assets of RTZ or CRA. Rather, the DLC operation was to be effected by the entering into of contractual arrangements designed to ensure that as far as possible, RTZ and CRA operate as a single economic enterprise. The relative values of the two companies were such that the combined public shareholder ownership was approximately in the proportion of 76.5% RTZ shareholders and 23.5% CRA shareholders (Official Publications of the European Communities 1995).

Prior to the merger announcement, RTZ had 1,068 million shares on issue and with a market capitalisation of A$21.1 billion. CRA had 598 million shares on issue giving it a total market capitalisation of A$13.0 billion of which RTZ owned 49%. Allowing for the cross shareholding of RTZ in CRA, the total market capitalisation of the DLC would be A$27.8 billion (O'Connor 1995).

In the period to 10 October the share price of CRA had traded at a 7.5% premium to that of RTZ. In order to bring the share prices into line for the merger of the assets, the Board of CRA issued an additional 7.5% of CRA shares as a bonus issue to existing shareholders (O'Connor 1995). This is outline in Table A7.

Table A7. Adjustment of CRA shares for dual listing.

	CRA Shares (m)	RTZ Shares (m)
RTZ issued shares		1,068
CRA issued shares	598	
Add bonus shares	45	
Total CRA shares issued	643	1,068
CRA shares held by RTZ	315	
CRA shares held by public	328	328
CRA/RTZ total issued shares		1,396

From O'Connor (1995).

In effect the bonus shares were a premium that RTZ shareholders were paying for the implementation of the dual listing.

On 21 December 1995 RTZ Corporation announced that, following approval of the dual listed companies merger by both RTZ and CRA shareholders, and satisfaction of the other conditions precedent, completion of the merger has taken place with immediate effect (Business Wire 1995a).

Overall, the announcement and approval for the dual listing was conducted in a short space of time and while there were vocal opponents that RTZ was in effect not paying an adequate premium for a takeover, Australian shareholders voted for the dual listing. The group was shortly after renamed Rio Tinto.

Assets

RTZ and CRA were separately managed and operated, with CRA focusing on opportunities within Australasia and RTZ operating in the rest of the world.

RTZ's principal mining interests were in copper, gold, borates, titanium, steaming coal, talc, zircon and uranium. These interests were primarily located in North America, South America, Southern Africa and Europe.

CRA was a mining and metals producer based in Australia. Its principal mining and processing interests were in iron ore, coal, bauxite (including alumina and aluminium), diamonds, gold and salt. In addition to its major operations in Australia, the group had interests in mines, smelters and fabrication plants principally in Indonesia, New Zealand and Italy (Official Publications of the European Communities 1995).

Takeover and Event Analysis

Unfortunately there is uncertainty over the share price series from various data sources for CRA although it is likely that the RIO AU share price data series prior to the merger does reflect these data (Bloomberg 2009). There are also complications from the data series being adjusted for future issues. This analysis incorporates some assumptions and utilises data from research at the time of the dual listing process (e.g. O'Connor 1995).

Table A8 summarises the transaction with the bid value reflecting the estimated share price prior to the dual listing announcement and the value of the 45 million bonus shares issued to CRA shareholders. The offer value is adjusted for RTZ's prior interest in CRA.

Table A8. Dual listing merger parameters.

Bid Price (value of 45 million bonus shares to CRA shareholders)	$25.04
Bid premium over 30 day average share price	15.7%
Offer Value ($m)	$7,087
Date	9-Oct-95
Initial target director response	Recommended
Takeover Completion	2H CY 1995

The relative company sizes are presented in Table A9.

Table A9. Bidder and target company sizes.

Company Size Data	Market Capitalisation prior to bid (A$m)
CRA	$13,927
RTZ	$21,097
Offer (final) value as percentage of Bidder	33.6%
Target size as percentage of Bidder	66.0%

The regression analysis for CRA and RTZ are presented in Table A10 with both companies regressed against the spot LME copper price and the relevant domestic resource indices. RTZ share price movements were only sensitive (at a 5% significance level) to movements in the FTSE Mining Index in which it dominates.

Table A10. Regression analysis of CRA and RTZ.

Target	CRA	
	Estimation window (days)	252
Regression analysis		
LME Spot Copper Price (US $/lb)	*observed t-result*	7.64
ASX Accumulation All Resources Index	*observed t-result*	34.08
Intercept	*observed t-result*	7.53
Factors of significance used (>5%)		
LME Spot Copper Price (US $/lb)	Slope	4.11309
ASX Accumulation All Resources Index	Slope	0.00412
	R^2	0.83
	Standard error	0.470
	F-statistic	601.9
	$SS_{regression}$	265.61
	$SS_{residual}$	54.94
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.01355
Bidder	**RTZ**	
	Estimation window (days)	252
Regression analysis		
FTSE 350 Mining Index	*observed t-result*	131.06
LME Spot Copper Price (US $/lb)	*observed t-result*	1.90
Intercept	*observed t-result*	1.36
Factors of significance (>5%)		
FTSE 350 Mining Index	Slope	0.18333
	R^2	0.99
	Standard error	4.89
	F-statistic	8,799
	$SS_{regression}$	421,139
	$SS_{residual}$	5,959
Model	Three factor	
Actual versus Theoretical Returns regression error	Steyx	0.00856

Table A11 outlines that there were no cumulative abnormal returns for either company from the announcement of the dual listing through to final shareholder approval.

Table A11. Cumulative abnormal returns for CRA and RTZ.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
CRA	0.0%	$23.29	598	$0.0
RTZ	0.0%	£9.50	1,068	$0.0

This continued in the subsequent 252-day post event window for RTZ suggesting early benefits of the merger were not evident (Table A12).

Table A12. Cumulative abnormal returns in the post event period.

Days in post-event window	Number of days of AR	CAR over period	Change in value (A$m)
252	0	0.0%	$0.0

Lastly in Table A13, regression analysis of RTZ in the post-event period suggests a decline in sensitivity to the FTSE 350 Mining Index but an increase in the sensitivity to the copper price. The former may reflect further differentiation from other companies in the FTSE 350 Mining Index (e.g. less iron ore, coal exposure).

Table A13. Regression analysis of RTZ in the post-event window.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
FTSE 350 Mining Index	*observed t-result*	55.58	131.06	-57.6%
LME Spot Copper Price (US $/lb)	*observed t-result*	15.06	1.90	693.8%

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Excel Coal: Peabody Energy merger

On 6 July 2006 Peabody Energy announced a takeover offer of $8.50 cash per share for Excel Coal and which was to be implemented by a Scheme of Arrangement (Excel Coal 2006). The Board of Excel Coal appeared supportive of the bid although shareholder pressure encouraged the Board to seek some ‘sweetening’ of the offer.

On 19 September 2006 Peabody Energy announced an increase in the offer price under its Scheme of Arrangement from $8.50 to $9.50 per share. At that time it was rumoured that Anglo American was about to make a counter offer for Excel (Energy Minerals 2006).

A successful Scheme Meeting was held on 4 October 2006 and the company was delisted on 10 November 2006. Overall, Excel Coal was a company that grew rapidly by acquiring mid-tier coal assets over a short period of time and which later, became attractive with an increase in world coal demand.

Assets

The company owned coal assets in NSW, Queensland and Venezuela. It had three operating mines, viz: Wambo, Metropolitan and Chain Valley. It also had a number of promising coking coal development projects including the Queensland Millennium project.

Takeover and Event Analysis

This research has only focused on Excel Coal and its performance at the time of the announcement and lead up to the Scheme meeting on 4 October 1996. Table A14 summarises the offer details. The company commissioned an independent valuation which was included in the Scheme Booklet (Excel Coal 1996).

Table A14. Offer parameters.

Bid Price	$8.50
Bid premium over 30 day average share price	10.5%
Offer Value ($m)	$1,827
Date	5-Jul-06
Initial target director response	Recommended
Final bid price	$9.50
Bid premium over 30 day average share price	23.5%
Offer Value ($m)	$2,042
Date	19-Sep-06
Independent Valuation: low value (from initial valuation)	$7.00
Independent Valuation: high value (from initial valuation)	$7.60
Independent Valuation range (increase on low value)	8.6%
Final bid over Independent Valuation mid point	130.1%
Takeover Completion	2H CY 1996

The regression analysis with the S&P/ASX 300 Resources is presented Table A15 with unfortunately a low R^2 value.

Table A15. Regression analysis for Excel Coal and the S&P/ASX 300 Resources Index.

Target	**Consolidated Minerals**	
	Estimation window (days)	252
Regression analysis		
S&P/ASX 300 Resources Index	*observed t-result*	6.40
Intercept	*observed t-result*	18.75
Factors of significance used (>5%)		
S&P/ASX 300 Resources Index	Slope	0.00051
	R^2	0.14
	Standard error	0.592
	F-statistic	40.9
	$SS_{regression}$	14.33
	$SS_{residual}$	87.51
Model	One factor	
Actual versus Theoretical Returns regression error	Steyx	0.00038

The cumulative abnormal returns are presented in Table A16. While the returns are relatively modest, they are in line with the offer price and the share price at that time in a rising resources market.

Table A16. Cumulative abnormal returns for Excel Coal.

	CAR	**Share Price prior to event**	**Shares on Issue (m)**	**Change in value (A$m)**
Excel Coal (at announcement)	-0.6%	$7.94	215	-$9.6
Excel Coal (to Scheme Meeting)	9.7%	$7.94	215	$165.4

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Normandy Mining: Merger with PosGold, Gold Mines of Kalgoorlie and North Flinders Mines

On 14 November 1995, Normandy presented the investment community with a proposal to merge Normandy Mining, PosGold, Gold Mines of Kalgoorlie and North Flinders Mines. Normandy Mining would remain the listed company for the merged group (Bartrop 1996). Normandy already held effective controlling interests in each of the other gold producers.

Normandy stated that the benefits in merging were:

- To enhance the group's financial strength
- To achieve internal management savings across the broader group
- To eliminate potential conflicts within the group

The merger was conditional on a successful merger of Normandy Mining and PosGold. Further merging with GMK and North Flinders Mines was desirable but not essential for the Normandy/PosGold entity.

Each company appointed an independent expert to assess the merger terms with the findings reported on 9 February 1996 (Grant Samuel 1995). The merger terms are presented in Table A17.

Table A17. Normandy merger terms.

Posgold (PGO)	157 NDY share for 100 PGO shares
Gold Mines of Kalgoorlie (GMK)	71 NDY shares for 100 GMK shares
North Flinders (NFM)	425 NDY shares for 100 NFM shares, or
	300 NDY shares plue 100 "Tanami options" for every 100 NFM shares

From Grant Samuel (1995)

Previously North Flinders shareholders had been the most vocal opponents to the merger with Normandy as the company promoted a deemed higher level of prospectivity of its Tanami exploration tenements relative to the exploration potential of the broader group. To help placate these shareholders, North Flinders shareholders were offered Tanami options.

The "Tanami" options enabled North Flinders Mines shareholders to retain direct exposure to the exploration potential of the Tanami desert in Central Australia. Their conversion rate was dependent on the exploration success in this area over the subsequent four years until the exercise data of 31 March 2000 (Bartrop 1996). The option provides the right to acquire one new Normandy share for each 1 million ounces of gold (or part thereof rounded down to the nearest 0.5 million ounces) contained in measured, indicated or inferred resources with a minimum average grade of 3.5 g/t discovered on existing North Flinders' exploration tenements other than the Granites and Dead Bullock Soak mining leases and on tenements under application. The exercise price for each Normandy share was $0.20 or the weighted average Normandy share price for the 5 days prior to exercise less $2.30 (Normandy 1996).

Normandy's expert valuer stated that it based the merger terms on the relative value contributed by each group measured in terms of both underlying values and share market values. Underlying values were generally determined by discounted cash flow analysis of each operation while the share market values were based on share prices at 13 November 1995 and the weighted average share prices in the three months to 13 November 1995 (Grant Samuel 1995).

Table A18 is reproduced from the expert valuer's report and summarises the "underlying" and share market values.

Table A18. Estimated underlying values of the merger companies.

	Underlying Value Per Share	Market Prices as at 13 January 1995	Disount to Underlying Value
NDY	$2.18 - $2.53	$1.75	24.6% - 44.6%
PGO public (49.86%)	$2.40 - $2.82	$2.61	(8.0%) - 8.0%
GMK public (68.92%)	$1.26 - $1.38	$1.18	6.8% - 16.9%
NFM public (50.97%)	$6.54 - $8.72	$7.75	(15.6%) - 12.5%

From Grant Samuel (1995).

One of the more controversial aspects of the merger was that Normandy announced on 14 November 1995 its intention to issue new options to holders of existing 1996 options and to its shareholders. At the time Normandy had previously issued 146 million options that were well ‘out-of-the-money’ with a $2.10 strike price and expiring on the 31 May 1996.

The new options had an exercise price of $2.50 and expired on the 31 May 2001. They were offered on the basis of two new options in exchange for each five existing options and for every five shares. The offer of options to Normandy shareholders and holders of the May 1996 options was to occur irrespective of the outcome of the merger proposals.

In justifying the issue of Normandy Mining options to Normandy Mining share and option holders, the expert valuer emphasised the perceived discount of the underlying value to share prices as outlined in the final column in Table A18 as the company was deemed to trade with a ‘holding company’ discount (Grant Samuel 1995). This thesis notes that in the issue of options and Normandy’s holding company discount, Normandy shareholders had the most to gain from a successful merger.

However, in early March 1996 Newcrest Mining Limited (Newcrest) acquired a substantial shareholding in Normandy and in PosGold from Minorco S.A. (AngloAmerican) and subsequently expressed a desire to participate in a merger involving the Normandy Group companies. On 15 March 1996, the PosGold scheme was voted down by Newcrest despite an overwhelming level of support from the remaining (non-Newcrest) shareholders who voted. On the same date GMK shareholders voted in favour of the GMK scheme but the scheme was conditional on the success of PosGold scheme (Normandy 2006).

At a meeting on 4 April 1996, North Flinders shareholders voted against the North Flinders Scheme with North Flinders shareholders holding approximately 10% of the issued capital voting for the North Flinders scheme.

On 14 June 1996, Normandy announced that the merger schemes for PosGold and GMK were being reactivated and at the same time announced a takeover offer for North Flinders share with the considerations based on the original merger terms.

This merger was successful with both PosGold and GMK delisted on 4 October 1996 (delisted 2009). The minority interests in Normandy North Flinders were eventually acquired by Newmont and this company was delisted on 29 May 2003.

The focus of this analysis is on the period prior to the announcement that Newcrest had acquired Minorco S.A.'s stakes in Normandy and PosGold as this action was confounding at that time given the uncertainty of Newcrest's intentions.

Merger Analysis

This study has focused on the period between the merger announcement on 14 November 1995 and 29 February 1996 prior to the confounding news that Newcrest had purchased the Minorco's stake in Normandy Mining and PosGold.

Due to the various times at which merger ratios were being announced and finalised, this study has used the above period as an 'event window' to determine the cumulative abnormal returns for each of the companies.

Table A19 summarises the merger parameters and the premium/discounts based on the Normandy share price prior to the announcement event window.

Table A19. Merger parameters.

PosGold	
Bid Price (157 NDY for 100 PGO shares)	$2.67
Bid premium over 30 day average share price	12.2%
Offer Value ($m)	$1,537
Date	14-Nov-95
Initial target director response	Recommended
Independent Valuation: low value	$2.40
Independent Valuation: high value	$2.82
Independent Valuation range (increase on low value)	17.5%
Final bid over Independent Valuation mid point	102.3%
GMK	
Bid Price (71 NDY for 100 GMK shares)	$1.21
Bid premium over initial 30 day average share price	7.8%
Offer Value ($m)	$1,153
Date	14-Nov-95
Initial target director response	Recommended
Independent Valuation: low value	$1.26
Independent Valuation: high value	$1.38
Independent Valuation range (increase on low value)	9.5%
Final bid over Independent Valuation mid point	91.4%
North Flinders Mines (excl. Tanami Options)	
Bid Price (425 NDY for 100 NFM shares)	$7.23
Bid premium over initial 30 day average share price	-3.9%
Offer Value ($m)	$536
Date	14-Nov-95
Initial target director response	Recommended
Independent Valuation: low value	$6.54
Independent Valuation: high value	$8.72
Independent Valuation range (increase on low value)	33.3%
Final bid over Independent Valuation mid point	94.7%
Target director recommended acceptance	na
Takeover Completion	2H CY 1996

The various sizes of the companies relative to Normandy are presented in Table A20. It is evident that the merger provided a significant increase in the size of Normandy.

Table A20. The relative sizes of the companies and offers.

Company Size Data	Market Capitalisation prior to bid (A$m)
PosGold	$1,428
GMK	$1,069
North Flinders Mines	$548
Normandy	$904
PosGold: Offer (final) value as percentage of Bidder	169.9%
GMK: Offer (final) value as percentage of Bidder	127.4%
NFM: Offer (final) value as percentage of Bidder	59.2%
PosGold size as percentage of Bidder	17.9%
GMK size as percentage of Bidder	118.3%
NFM size as percentage of Bidder	60.6%

Table A21 outlines the results from regression analysis for all companies. All companies had a greater sensitivity to the US$ gold price than the A$ gold price. The ASX Gold Index has been used in the regression for all companies except North Flinders Mines which displayed a greater sensitivity to the Philadelphia Gold and Silver Index although this may be a coincidence given North Flinders Mines represented an exploration-focused company with a greater domestic shareholder base. This is also highlighted in its low R^2 factor below.

Table A21. Regression analysis on the companies.

Target	PosGold	
	Estimation window (days)	252
Regression analysis		
Spot Gold Price (US$/oz)	*observed t-result*	9.56
ASX Gold Index	*observed t-result*	17.65
Intercept	*observed t-result*	11.43
Factors of significance used (>5%)		
Spot Gold Price (US$/oz)	Slope	0.02076
ASX Gold Index	Slope	0.00267
	Intercept	-8.55819
	R^2	0.77
	Standard error	0.127
	F-statistic	426.4
	$SS_{regression}$	13.68
	$SS_{residual}$	3.99
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.02295
Bidder	**GMK**	
	Estimation window (days)	252
Regression analysis		
ASX Gold Index	*observed t-result*	12.02
Spot Gold Price (US$/oz)	*observed t-result*	15.73
Intercept	*observed t-result*	17.40
Factors of significance (>5%)		
ASX Gold Index	Slope	0.00091
Spot Gold Price (US$/oz)	Slope	0.01703
	Intercept	-6.49740
	R^2	0.78
	Standard error (reflects high gold values in Rand)	0.06
	F-statistic	434.8
	$SS_{regression}$	3
	$SS_{residual}$	1
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.02144
Bidder	**North Flinders Mines**	
	Estimation window (days)	252
Regression analysis		
Philadelphia Gold & Silver Index	*observed t-result*	2.58
Spot Gold Price (US$/oz)	*observed t-result*	2.86
Intercept	*observed t-result*	0.52
Factors of significance (>5%)		
Philadelphia Gold & Silver Index	Slope	-0.00877
Spot Gold Price (US$/oz)	Slope	0.01964
	R^2	0.03
	Standard error (reflects high gold values in Rand)	0.32
	F-statistic	4.3
	$SS_{regression}$	1
	$SS_{residual}$	26
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	-0.03528
Bidder	**Normandy Mining**	
	Estimation window (days)	252
Regression analysis		
Spot Gold Price (A$/oz)	*observed t-result*	5.94
ASX Gold Index	*observed t-result*	12.72
Intercept	*observed t-result*	7.58
Factors of significance (>5%)		
Spot Gold Price (A$/oz)	Slope	-0.00213
ASX Gold Index	Slope	0.00114
	Intercept	1.48561
	R^2	0.41
	Standard error (reflects high gold values in Rand)	0.09
	F-statistic	87.7
	$SS_{regression}$	1
	$SS_{residual}$	2
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.02155

The cumulative abnormal returns for the extended ‘event window’ from 14 November 1995 to 29 February 1996 are presented in Table A22 and with PosGold achieving the largest value increase following by Normandy Mining.

Table A22. Cumulative abnormal returns for targets and bidder during the announcement and lead up to merger.

	CAR	**Share Price prior to event**	**Shares on Issue (m)**	**Change in value (A$m)**
PosGold	10.2%	$2.48	576	$146.2
GMK	4.4%	$1.12	955	$47.0
North Flinders Mines	4.8%	$7.40	74	$26.5
Normandy	10.0%	$1.70	532	$90.8

In a 252-day post-merger event window, Normandy Mining’s sensitivity to the ASX Gold Index increased and which would be expected given the larger gold index weighting after the merger (Table A23). However it is not clear why its share price movements experienced less sensitivity to movements in the US$ gold price relative to the estimation window.

Table A23. Post event window regression analysis.

	Estimation window (days)	76		
Regression analysis		New Result	Old Result	Change
ASX Gold Index	*observed t-result*	14.42	12.02	20.0%
Spot Gold Price (US$/oz)	*observed t-result*	4.07	15.73	-74.1%

References

Bartrop, S. 1996 *Normandy Group, Charting a Safe Passage*. Macquarie Equities Limited Research Report, dated February 1996, Sydney.

Grant Samuel 1995 *Proposed Terms for Merger of Normandy Mining Limited, PosGold Limited, Gold Mines of Kalgoorlie Limited and North Flinders Mines Limited.* 7 December 1995, Grant Samuel & Associates, Sydney.

Normandy Mining Limited 1996 *Offer by Normandy Mining Limited to Acquire Your Ordinary Shares in North Flinders Mines Limited*. Unpublished Report to North Flinders Mines shareholders dated August 7, 1996.

M.I.M. Holdings: Xstrata takeover

This case study has been outlined earlier in Chapter 4. Recapping, on the 21 November 2002, MIM Holdings Limited (MIM) announced that it was in discussions with Xstrata plc (Xstrata) in relation to a transaction that could lead to a change in control of MIM. Later, on the 26 March 2003, MIM announced that it was still continuing the discussions with Xstrata (MIM ASX Releases, 2002, 2003).

On the 7 April 2003, MIM and Xstrata announced a proposed transaction under which Xstrata, through a wholly-owned subsidiary, would acquire all the shares in MIM for $1.72 cash per share (Xstrata 2003). This valued MIM at $3.4b or $4.9b including MIM's net debt position.

In this thesis, the time period from the 21 November 2002 until the formal offer was announced on the 7 April 2003 is referred to as the 'discussion period'. This period corresponds with the period of greatest uncertainty given that Xstrata indicated that it sought to acquire MIM but did not indicate the price or terms of the potential acquisition.

MIM stated that a scheme approach was required by Xstrata to enable Xstrata to secure the funding necessary to offer MIM shareholders cash for their shares.

The scheme required approval by a majority in number of the MIM shareholders who voted at the scheme meeting (in person or by proxy) and at least 75% of the total number of shares had to register a vote at the scheme meeting (in person or by proxy). It then required approval by the Supreme Court of Queensland.

The Board resolved by a 6:1 majority that the scheme was in the best interests of shareholders, and the majority of the directors recommended that shareholders vote in favour of the scheme in the absence of a superior competitive bid. The dissenting director (Managing Director Vince Gauci) was also the only executive director on the Board.

In summary, the majority of the Board was attracted to the premium offered over the share price prior to the announcement of Xstrata's approach and the fact that the bid was a cash payment. While the bid was close to the low end of the independent expert's valuation range, it concluded that alternative increased value would only be realised in the medium to longer term. Therefore the certainty associated with accepting a bid was preferred.

These views are crystallised with the Majority Directors stating that in the absence of the Xstrata's offer or any superior offer, 'it is unlikely that MIM shares will trade at levels materially in excess of $1.72 through this and the next financial year (year ending June 2004) and it is more likely that MIM shares will, during this period, trade at significantly lower levels.'(page 9 MIM 2003a). As evident with the resources rally occurring several months later, this assumption was incorrect.

MIM's Main Assets

MIM was involved in the production of copper, coal, lead-zinc-silver and gold. MIM's major assets listed by the independent expert (MIM, 2003) were:

- 75% interests in the Oaky Creek (coking) and NCA (steaming and coking) coal projects, which are located in the Bowen Basin and a 100% interest in the Rolleston coal project. The NCA project comprises the Newlands and Collinsville mines.
- The Mount Isa mining and processing complex and related facilities, which incorporate the X41 and Enterprise copper mines, the Isa Lead mine and nearby George Fisher lead-zinc-silver mine, concentrator and smelting facilities at Mount Isa for copper and lead-zinc-silver, the Townsville copper refinery and port facilities and Britannia Refined Metals for refining lead in England,
- The Ernest Henry copper-gold mine
- A 75% interest in the McArthur River lead-zinc project
- A 50% interest in the Alumbrera copper project in Argentina
- The Ravenswood gold mine

- A number of proprietary technologies in its base metals business including the Albion process, ISAPROCESS, ISASMET and MIMDAS.

Xstrata Funding Arrangements

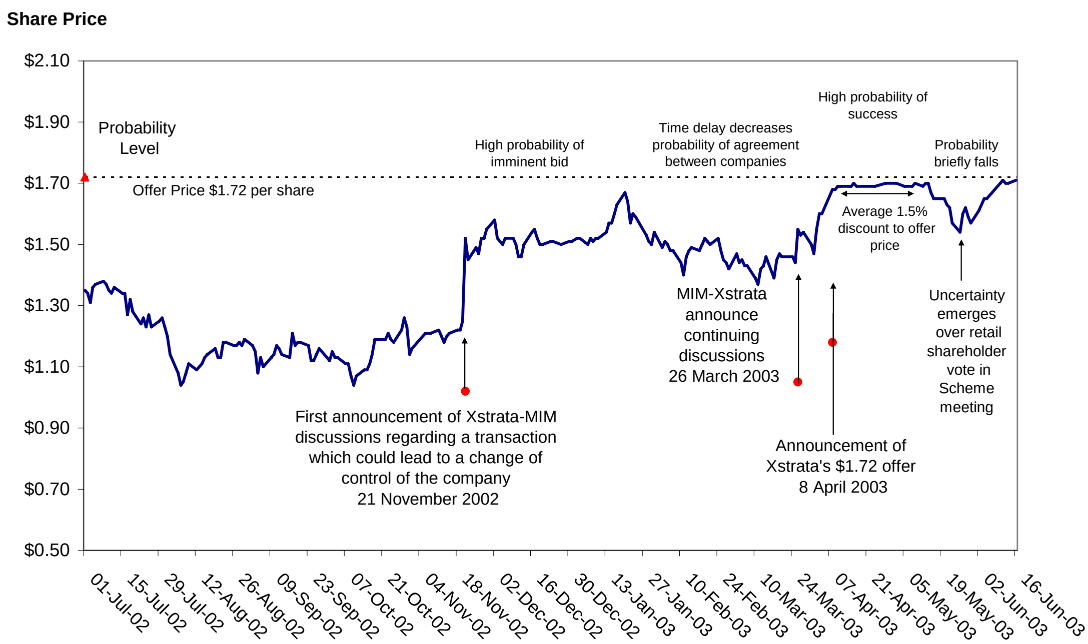
The consideration payable by Xstrata for the MIM shares was to be financed in part by way of a rights issue by Xstrata to qualifying Xstrata plc shareholders of convertible unsecured loan stock. Xstrata stated at the time that except for stock units that the Xstrata plc Directors and Glencore International AG had irrevocably undertaken to subscribe (or procure the subscription of), the Rights Issue which was fully underwritten by Deutsche Bank and JP Morgan to raise approximately GBP 901 million (approximately US$1,406 million, A$2,340 million) net of expenses. The balance of the consideration payable by Xstrata was to be satisfied by bank debt.

The rights issue of convertible unsecured loan stock meant that Xstrata shareholders committed the funds to proceed with the scheme of arrangement. As the scheme was successful, they received Xstrata shares, but if it wasn't successful, they would have received their loan funds. This funding arrangement requires a degree of certainty over the acquisition cost and hence Xstrata's preference for a scheme of arrangement with MIM. The fact that the rights issue was fully underwritten provides support to Xstrata shareholders that if the acquisition is successful, its funding is secure. The structure was clever in that the funds were only raised and stock issued if the offer was successful, therefore derisking the commitment of Xstrata shareholders.

MIM Share Price Reaction

The MIM share price reaction has been analysed in Chapter 4 (Section 4.1.1.1) and Figure 69 has been reproduced in Figure A1 to highlight the share price performance during the lead up to the announcement of the scheme of arrangement.

Figure A1. The MIM share price and interpreted changing bid probabilities.



Data sourced from Bloomberg, MIM ASX releases, 2002, 2003.

Given the staged disclosure of the Xstrata offer to MIM shareholder via the scheme of arrangement, this thesis has investigated three different times of abnormal returns. Nevertheless, the opening and final successful offer was $1.72 as outlined in Table A24. The bid premium appears high at 46.4% but this reflects the $1.72 premium over the 30 day average MIM share price prior to the announcement that MIM was in discussions on the 21 November 2002 and there is a likelihood that the MIM share price would have risen in these four months. However, once MIM was deemed to be ‘in play’, then normal market movements became less relevant.

Figure. A24. Xstrata and MIM scheme of arrangement parameters.

Takeover Parameters	
Bid Price	$1.72
Bid premium over 30 day average share price	46.4%
Offer Value ($m)	$3,436
Date	7-Apr-03
Initial target director response	Acceptance
Independent Valuation Range	$1.70 - $2.24
Target director recommended acceptance	7-Apr-03
Takeover Completion	1H CY 2003

Table A25 indicates that the offer for MIM was of similar size to Xstrata and hence, would double the size of the company.

Table A25. Bidder, offer and target sizes.

Company Size Data	**Market Capitalisation prior to bid (A$m)**
MIM	$2,437
Xstrata (converted at CY2003 average FX rates)	$3,280
Offer value as percentage of Bidder	104.8%
Target size as percentage of Bidder	74.3%

Table A26 outlines the main commodity exposures of MIM and Xstrata. MIM contributed further coal exposure as well as adding base metals and gold to the previous Xstrata portfolio.

Table A26. The main commodity exposure of the Target and Bidders.

	Promoted Commodity Exposure	**Other Commodity Exposure**
MIM	Cu, Coal	Zn, Pb, Ag, Au
Xstrata	Coal	Ferrochrome

Regression analysis over a 252 day period estimation window was carried out for MIM while due to the short listing period prior to the bid, the estimation window is reduced to 176 days. As a separate line of investigation, regression was estimated on both the spot LME copper price and the three month forward LME copper price. Interestingly, the MIM share price was estimated to be more slightly more sensitive to the three month forward copper price than the spot copper price while the reverse was evident for Xstrata (see Table A27).

The regression was rerun using the three month forward LME copper price and the S&P/ASX 200 Resources Index for MIM as the more sensitivity parameters to its share price. Similarly, in the case of Xstrata, the regression was rerun using FTSE Mining Index and the LME spot copper price.

Table A27. Estimation window parameters

Target	MIM	
	Estimation window (days)	252
Regression analysis		
S&P/ASX 200 Resources Index	*observed t-result*	13.58
Other metals index	*observed t-result*	9.77
3mth forward copper price	*observed t-result*	7.91
LME Spot Copper Price (offset by one day)	*observed t-result*	7.15
Intercept	*observed t-result*	14.19
Factors of significance used (>5%)		
S&P/ASX 200 Resources Index	Slope	0.00041
3mth forward LME copper price (offset by one day)	Slope	1.53053
	Intercept	-0.50148
	R^2	0.74
	Standard error	0.045
	F-statistic	356.7
	$SS_{regression}$	1.47
	$SS_{residual}$	0.51
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.02062
Bidder	**Xstrata**	
	Estimation window (days)	176
Regression analysis		
FTSE 350 Mining Index	*observed t-result*	11.48
MSCI Metals & Mining - Local Currency	*observed t-result*	2.71
3mth forward copper price	*observed t-result*	2.96
LME Spot Copper Price	*observed t-result*	3.31
Intercept	*observed t-result*	0.02
Factors of significance (>5%)		
FTSE 350 Mining Index	Slope	0.08377
LME Spot Copper Price	Slope	-331.39975
	R^2	0.91
	Standard error	15.94
	F-statistic	918.7
	$SS_{regression}$	466,925.37
	$SS_{residual}$	43,961.94
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.02641

Table A28 outlines the cumulative abnormal returns for the target and bidders over the three deemed events, namely, the first announcement on 21 November 2002 that the companies were in discussions, on the 26 March 2003 when MIM announced that it was still continuing the discussions with Xstrata, and lastly, on the 7 April 2003 when both companies announced a proposed transaction under which Xstrata, through a wholly owned subsidiary, would acquire all the shares in MIM for $1.72 cash per share.

The cumulative abnormal returns total 18.6% for MIM and which comprise 11.9% in the event window at the first announcement around the 21 November 2002 and with the remainder in a second and third event window around the announcement of ongoing discussions (MIM 2003) and then the final offer announcement (Xstrata 2003). Xstrata experience no abnormal returns during any of the events.

Table A28. Cumulative abnormal returns over a 3-day event window over the three events.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Target	18.6%	$1.22	**1,998**	$454.3
Bidder (after rights issue)	-7.0%	£2.06	**632**	-$230.7

In the 252-day post event period Xstrata experienced strong cumulative abnormal returns of 34.7% and which represented around 30% of the acquisition cost (Table A29).

Table A29. Cumulative abnormal returns for Xstrata in a 252-day post event period.

Days in post-event window	Number of days of AR	Annualised AR	Change in value (A$m)
252	16	34.7%	$1,137.29

The success of Xstrata in what is now (and at the time) considered a relatively cheap takeover is a credit to Xstrata management who probably took advantage of a naïve and ‘sleepy’ MIM Board who hadn’t recovered from the lack of interest in resource companies during the Tech Boom.

The overall transaction also highlighted the fact that the presence of short term traders which can provide support to an impending transaction (see Chapter 2, Section 2.4.2). This is because they allow existing shareholders to exit early at a slight discount to the offer price but then earn this margin by accepting the bid.

While Xstrata didn't receive any post event abnormal returns, its sensitivity to both the FTSE 350 Mining Index and the LME Spot copper price increased (Table A30). While this is a natural consequence of Xstrata's increase in size and newly found copper production, they are nevertheless positive outcomes and could justify the acquisition.

Table A30. .Regression analysis in the post event window for Xstrata.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
FTSE 350 Mining Index	*observed t-result*	25.23	26.79	-5.8%
LME Spot Copper Price	*observed t-result*	23.21	4.57	407.9%

References

MIM Holdings Limited. 2002 Announcement. ASX Releases dated 21 November 2002.

MIM Holdings Limited (MIM) 2003 Continuing discussions with Xstrata plc Announcement. ASX Release dated 26 March 2003.

MIM Holdings Limited. 2003a *Information Memorandum*. Reported dated May 1, 2003, Brisbane pp361.

Xstrata plc 2003 Recommended Acquisition of M.I.M. Holdings Limited for US$2,959 million and Rights Issue. Xstrata announcement dated April 7 2003, Available at: http://www.xstrata.com/assets/acquisition/mim/pdf/XTA_MIM_Acquisition_Rights_Issue_07_04_03.pdf, (Accessed March 2, 2005).

QNI: Billiton plc merger and takeover

On 18 June 1997 QNI Limited and Gencor Limited announced that QNI would acquire 100% o Gencor's nickel business ('Billiton Nickel') in exchange for the issue of shares in QNI. Billiton Nickel was a division of Billiton plc (Billiton) which itself had recently demerged from Gencor and floated as a major independent mining company. The transaction was to effect a merger between QNI and Billiton Nickel (QNI 1997).

On the 4 August 1997 the Directors of QNI and Billiton announced that they had agreed to alter the terms on which QNI would acquire Billiton Nickel. The revised terms would result in QNI issuing 455.802 million new full paid ordinary shares to Billiton, equivalent to 52.5% of the expanded capital of QNI (QNI 1997).

QNI and Billiton's independent expert for the scheme regarded the proposed acquisition as fair and reasonable although warned that QNI shareholders should recognize that the acquisition had the commercial effect of a reverse takeover of QNI by Billiton. QNI would become a subsidiary of Billiton and would be subject to the direction and control of Billiton. Billiton would also not pay a premium for this control. The acquisition would also lead to a dilution in earnings per share and cash flow per share in the short term for QNI shareholders. In addition, a major part of QNI's assets would now be located in Colombia and which involved both currency and country risks (Grant Samuel & Associates Report p2 in QNI 1997).

Billiton announced 90 cent takeover offer for the minority shareholders of QNI on the 8 September 1998. This was increased to $1.05 on the 27 October 1998 and was successful.

Assets

QNI's primary asset is the Yabulu nickel refinery near Townsville, Queensland. It is one of the largest laterite nickel refining plants in the world, capable of processing up to 2.3 million tones of dry nickel ore per annum from which approximately 29,000 tonnes of nickel and 1,900 tones of cobalt can be extracted (QNI 1997).

The assets of Billiton Nickel to be acquired by QNI include:

- 98.88% shareholding in Cerro Matoso SA, a Colombian company which owns and operates a laterite nickel mine and ferronickel smelter in northern Colombia;
- 50% interest in the Lake Johnston Joint Venture, an undeveloped nickel project in WA encompassing 100% of the Maggie Hays deposit;
- 37.5% interest in the Roundtop Joint Venture, an undeveloped nickel project in WA encompassing 100% of the Emily Ann deposit;
- A 4.7% interest in Capricorn Resources Australian NL, a minerals exploration company with a 25% interest in the Roundtop JV;
- Rights in relation to Billiton's proprietary nickel processing technologies including BioNIC, GenNIC and Plasma smelting; and
- Rights in relation to Billiton Nickel's exploration interests and international database

The demerger of Billiton was approved by Gencor shareholders on 17 July 1997. Its shares were listed on the London Stock Exchange on 28 July 1997 and the company had a market capitalization of approximately £4.7 billion (QNI 1997).

Key Parameters

As part of the scheme booklet (QNI 1997) the companies' commissioned Grant Samuel and associates as independent experts to provide a valuation of QNI. The high and low valuations estimated by the independent expert are included Table A31 which also summarise the key parameters of the merger and later, Billiton takeover offer. To estimate the offer price, this thesis has used the independent expert's mid point value of the combined entity and then divided the portion (47.5%) which would then be attributable to QNI shareholders by the new QNI shares on issue.

Table A31. Key Parameters and dates of the takeover.

Takeover Parameters	
Merger offer	
Independent Valuation of merged entity: low value (A$m)	$1,920
Independent Valuation of merged entity: high value (A$m)	$2,304
New value per diluted QNI share	$2.31
Bid premium over 30 day average share price	7.0%
Offer Value (47.5% of combined valuation) ($m)	$1,003
Date	18-Jun-97
Initial target director response	Acceptance
Initial takeover offer	$0.90
Bid premium over initial 30 day average share price	-58.3%
Offer Value (value of minority holding) ($m)	$372
Date	8-Sep-98
Initial target director response	Hold
Offer increased	$1.05
Bid Price	$1.05
Bid premium over initial 30 day average share price	-51.4%
Offer Value (value of minority holding) ($m)	$434
Date	27-Oct-98
Initial target director response	Recommended
Independent Valuation: low value (from initial valuation)	2.22
Independent Valuation: high value (from initial valuation)	2.66
Independent Valuation range (increase on low value)	19.8%
Final bid over Independent Valuation mid point	43.0%
Target director recommended acceptance	na
Takeover Completion	1H CY 1999

As evident above, there were very modest premiums in both transaction offers with the second low offer premium justified because the takeover was not incurring a change of control given that this had already occurred with the first transaction.

Table A32 highlights that the merger offer for QNI was relatively small compared to the newly demerged Billiton plc.

Table A32. Bidder, offer and target sizes.

Company Size Data	Market Capitalisation prior to bid (A$m)
QNI (at merger)	$856
Billiton plc	$9,527
Offer (final) value as percentage of Bidder	8.1%
Target size as percentage of Bidder	9.0%

Table A33 reiterates that the main commodity exposure of both companies was nickel.

Table A33. The main commodity exposure of the target and bidders.

	Promoted Commodity Exposure	Other Commodity Exposure
QNI	Ni	Co
Billiton plc	Ni	Co

Regression analysis over a 252-day period estimation window was carried out prior to the merger event window for the target but given Billiton was only recently listed, the event window for Billiton is estimated in the 252-day period prior to its final bid for QNI (Table A34).

In the case of QNI, the major share price sensitivity factor is the ASX Other Metals Index followed by the ASX Accumulation All-Resources Index. Interestingly, in terms of nickel price the sensitivities in decreasing order are: the 3-month forward LME nickel price, the LME spot nickel price and lastly, the spot nickel price in Australian dollar terms. In the latter case, lack of sensitivity tends to support a lack of relevance of the A$/US$ exchange rate in the pricing of many Australian resource stocks.

In the case of Billiton, out of the factors tested the only factor exhibiting sensitivity to the share price is the HSBC Global Mining Index (at a 5% level) and hence, a single factor model has been used for the theoretical pricing.

Table A34. Estimation window parameters

Target	QNI	
	Estimation window (days)	252
Regression analysis		
ASX Accumulation All Resources Index	*observed t-result*	5.16
ASX Other Metals Index	*observed t-result*	17.60
LME spot in A$ terms	*observed t-result*	0.20
LME spot nickel price	*observed t-result*	2.26
3 Month forward LME nickel price	*observed t-result*	2.42
Intercept	*observed t-result*	0.02
Factors of significance used (>5%)		
ASX Other Metals Index	Slope	0.00222
ASX Accumulation All Resources Index	Slope	-0.00017
	R^2	0.60
	Standard error	0.070
	F-statistic	123.5
	$SS_{regression}$	1.79
	$SS_{residual}$	1.20
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.01426
Bidder	**Billiton plc**	
	Estimation window (days)	252
Regression analysis		
HSBC Global Mining Index	*observed t-result*	23.61
LME spot nickel price	*observed t-result*	0.96
3 Month forward LME nickel price	*observed t-result*	1.44
Intercept	*observed t-result*	2.76
Factors of significance (>5%)		
HSBC Global Mining Index	Slope	0.68207
	Intercept	-11.05108
	R^2	0.85
	Standard error	6.42
	F-statistic	476.5
	$SS_{regression}$	58,922.69
	$SS_{residual}$	10,221.36
Model	Single factor	
Actual versus Theoretical Returns regression error	Steyx	-0.00885

Table A35 outlines the cumulative abnormal returns for the target and bidders which are both zero. This is not surprising given the structure and lack of material premium in the merger as well as the significant size difference in the companies.

Table A35. Cumulative abnormal returns over a 3-day event window.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Merger	6.7%	$2.08	412	$27.8
Target (first offer)	19.6%	$0.68	870	$171.0
Target (increased offer)	13.4%	$0.93	870	$116.8
Bidder	0.0%	£1.37	2,258	$0.0

Table A36 summarises that there were no abnormal returns to Billiton plc following its successful takeover offer in the subsequent 252 day period.

Table A36. Bidder abnormal returns in a 252-day post-event window.

Days in post-event window	Number of days of AR	CAR over period	Change in value (A$m)
252	4	0.0%	$0.0

In summary, the QNI merger and then takeover was well executed by Billiton plc and with a deteriorating nickel price, involved a final takeover at a discount to the original valuation. QNI shareholders received no abnormal returns and lost control of the company through a merger which ultimately derided their ability to extract a significant premium in the final takeover offer.

The following post event regression analysis indicates that the Billiton plc share price became more sensitive to nickel price movements and which was expected (Table A37).

Table A37. Regression analysis in the post-event period.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
HSBC Global Mining Index	*observed t-result*	24.93	23.61	5.6%
LME spot nickel price	*observed t-result*	3.58	0.96	271.1%
3 Month forward LME nickel price	*observed t-result*	3.10	1.44	115.8%

References

QNI 2007 Independent Expert's Report. Merger between QNI Limited and the Nickel Division of Billiton plc. 5 August 1997.

QNI Limited (QNI). Available at: http://www.delisted.com.au/Company/6813/QNI%20LIMITED, (accessed March 3, 2008).

RGC: Merger with Westralian Sands

On 24 July 1998, RGC and Westralian Sands Limited (Westralian) announced their intention to merge through a scheme of arrangement. Under the proposed scheme, RGC shareholders would receive 0.65556249 Westralian shares plus an RGC Gold Unsecured Note (RGC Limited and Westralian Sands Limited 1998).

RGC's 56% interest in Goldfields was not included in the merger and hence the RGC Gold Unsecured Note would represent the pro-rata share of the economic interest in this stake less an amount of debt, which as at the 30 June 1998 was $76.2 million along with certain costs. The independent expert (Grant Samuel) valued the RGC Gold Unsecured Notes at 65.6 cents (RGC Limited and Westralian Sands Limited 1998).

The merged company was to be the second largest producer of titanium dioxide minerals (rutile, synthetic rutile, ilmenite and leucoxene) in the world. It would also be the largest zircon producer in the world. It was expected that RGC shareholders would end up owning 62% of the shares in Westralian Sands.

A successful Scheme Meeting was held on the 11 December 1998 and RGC was delisted on the 15 January 1999 (Delisted 2009). Westralian Sands was later renamed Iluka Resources while Goldfields merged with Delta Gold to become AurionGold.

Assets

RGC owned the Eneabba mine, the Narngulu synthetic rutile operation and the Capel mine in WA as well as the Green Cove Springs mine in Florida, USA. It also held a 43.1% interest in Consolidated Rutile (a separately listed company) and prospective tenement in the Murray Basin. Non-mineral sands assets included PT Koba Tin in Indonesia, Thalanga base metal mine in Queensland, the Renison Tin mine in Tasmania and a 50% interest in the Narama coal joint venture in the Hunter Valley.

Westralian's main asset was the Capel Vale mineral sands project and it also owned Westlime (WA) Limited which was a lime production and distribution business.

Takeover and Event Analysis

Table A38 outlines the merger parameters which involved RGC shareholders accepting Westralian Sands scrip. The separate gold note with an assessed value of 65.5 cents is included in the bid price to establish the 30-day premium but is not included in the offer price.

Table A38. Merger details.

Bid Price (0.65556249 Westralian for each RGC share; plus 65.5 cents for gold note)	$2.89
Bid premium over 30 day average share price	63.9%
Offer Value ($m)	$470
Date	24-Jul-98
Initial target director response	Recommended
Independent Valuation: low value (includes 65.6 cents for gold note)	$2.35
Independent Valuation: high value (includes 65.6 cents for gold note)	$3.23
Independent Valuation range (increase on low value)	37.7%
Final bid over Independent Valuation mid point	103.6%
Takeover Completion	1H CY 1999

Table A39 below outlines the bidder (Westralian Sands) and target (RGC) sizes indicating that the merger was in effect a reverse takeover.

Table A39. Comparison of Bidder and Target sizes.

Company Size Data	Market Capitalisation prior to bid (A$m)
RGC	$484
Westralian Sands	$288
Offer (final) value as percentage of Bidder	163.0%
Target size as percentage of Bidder	167.8%

Table A40 highlights the main commodity exposures of the companies and reiterates the diversity in the RGC portfolio.

Table A40. Bidder and target commodity exposure.

	Promoted Commodity Exposure	Other Commodity Exposure
RGC	Minerals Sands	Au, Sn, Ag, Zn, Pb, Coal
Westralian Sands	Minerals Sands	

The regression analysis against the ASX Accumulation All Resources Index and the ASX Other Metals Index is presented Table A41. The lower R^2 for Westralian Sands is likely to reflect the fact that it was a relatively pure mineral sands 'play' as well as its smaller size.

Table A41. Regression analysis for bidder and target.

Target	**RGC**	
	Estimation window (days)	252
Regression analysis		
ASX Accumulation All Resources Index	*observed t-result*	7.74
ASX Other Metals Index	*observed t-result*	21.00
Intercept	*observed t-result*	1.88
Factors of significance used (>5%)		
ASX Accumulation All Resources Index	Slope	-0.00136
ASX Other Metals Index	Slope	0.00799
	R^2	0.88
	Standard error	0.277
	F-statistic	892.5
	$SS_{regression}$	136.67
	$SS_{residual}$	19.06
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.03371
Bidder	**Westralian Sands**	
	Estimation window (days)	252
Regression analysis		
ASX Accumulation All Resources Index	*observed t-result*	12.84
ASX Other Metals Index	*observed t-result*	15.11
Intercept	*observed t-result*	21.30
Factors of significance (>5%)		
ASX Accumulation All Resources Index	Slope	-0.00167
ASX Other Metals Index	Slope	0.00426
	Intercept	5.82232
	R^2	0.50
	Standard error	0.20
	F-statistic	123.3
	$SS_{regression}$	10.35
	$SS_{residual}$	10.45
Model	Three factor	
Actual versus Theoretical Returns regression error	Steyx	0.01786

Table A42 outlines the cumulative returns at the merger announcement and in the subsequent period until merger completion (event window extends to 14 December 1998). While initially the merger was viewed as positive for RGC, reflecting the offer premium, in the period to completion both companies experienced negative abnormal returns.

Table A42. Cumulative abnormal returns at the merger announcement and subsequent period to merger completion.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
RGC (at announcement)	11.5%	$2.30	210	$55.8
RGC (to completion)	-13.7%	$2.30	210	-$66.5
Westralian Sands (at announcement)	0.0%	$3.41	85	$0.0
Westralian Sands (to completion)	-16.6%	$3.41	85	-$47.8

However in the 252-day post event window after merger completion, Westralian Sands did recover abnormal returns of around 24% (Table A43).

Table A43. Abnormal returns in the 252-day post event period.

Days in post-event window	Number of days of AR	CAR over period	Change in value (A$m)
252	46	23.9%	$69.0

Lastly, Westralian Sands appears to have experienced a decreased sensitivity to both indices and perhaps reflects an uncertain period with the rationalisation of the various assets from the merger (Table A44).

Table A44. Regression analysis in the post event period.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
ASX Accumulation All Resources Index	*observed t-result*	9.57	12.84	-25.5%
ASX Other Metals Index	*observed t-result*	7.13	15.11	-52.8%

References

Delisted 2009 RGC Limited. Available at: http://www.delisted.com.au/Company/7031/RENISON%20GOLDFIELDS%20CONSOLIDATED%20LIMITED, (accessed November 14, 2009).

RGC Limited and Westralian Sands Limited 1998 Information Memorandum in relation to a recommended Merger by Scheme of Arrangement between RGC

Limited and Westralian Sands Limited. ASX Report dated 30 October 1998, Sydney.

Oxiana: Zinifex merger

On 3 March 2008, both Zinifex Limited (Zinifex) and Oxiana Limited (Oxiana) announced that they had reached an agreement for the merger of both companies to be implemented by way of a Scheme of Arrangement between Zinifex and its shareholders (Oxiana 2008).

As evident in the company descriptions below, Zinifex was predominantly a zinc producer with assets in Australian while Oxiana was a gold and copper producer with its main assets in Laos (Sepon) but it was also developing the Prominent Hill copper gold mine in South Australia.

Under the terms of the merger, Zinifex shareholders would receive 3.1931 Oxiana ordinary shares for each Zinifex ordinary share held. With the approval of the merger Zinifex shareholders received ordinary shares in Oxiana equivalent to approximately a 50% interest in the merged company (Oxiana 2008).

An independent expert's report was commissioned to outline the benefit of the merger for Zinifex shareholders in relation to the scheme. Oxiana shareholders were not required to vote on the scheme (Zinifex 2008).

Overall, the merger met with mixed market sentiment, particularly from Oxiana shareholders who felt that the deal was too generous to Zinifex shareholders. They also believed that Zinifex's assets were of lower quality than their existing copper/gold exposure.

Readers will recall that the renamed merged entity (Oz Minerals) had difficulties in refinancing its debt in November 2008 and after subsequently being suspended for approximately two months on the ASX, eventually structured a deal which involved selling its main zinc assets to China's Minmetals to reduce its debt.

Give the rapid demise of Oz Minerals in the 2H CY 2008 as concerns regarding the debt emerged in the market after August 2008 and short sellers were prevalent in the stock through to the time of its suspension, this analysis is restricted to the period from the merger announcement through to its completion with Zinifex ceasing to trade as a separate company on the 20 June 2008.

In the post event period Oz Minerals certainly underperformed the market but is confounded with the overriding debt refinancing issues.

Assets

Zinifex 's main operating assets were:

- the Century zinc mine located in Queensland
- the Rosebery zinc/lead mine located in Tasmania
- a number of development projects and exploration interests in Australia, Canada, China, Mexico, Sweden and Tunisia.
- At time it owned 97% of the shares in Allegiance Mining N.L. which itself owned the Avebury nickel project in Tasmania

For the year ended 30 June 2007, Zinifex produced 584,976 tonnes of zinc and 61,335 tonnes of lead (Zinifex 2008).

Oxiana's main assets were:

- The Sepon gold and copper mines in Laos
- The Golden Grove base and precious metals mine in Western Australia
- It was constructing the Prominent Hill copper-gold project in South Australia and which was expected to commence production during the fourth quarter of 2008.
- It had recently announced the decision to develop the Martabe gold project in Indonesia.

For the year ended 31 December 2007, Oxiana produced 77,945 tonnes of copper (cathode and concentrate), 131,954 tonnes of zinc, 8,119 tonnes of lead, 151,197 ounces of gold and 3,310,056 ounces of silver (Zinifex 2008).

Merger Event Analysis

The merger parameters are outlined in Table 45A below.

Table 45A. Merger Parameters.

Takeover Parameters	
Bid Price (3.1931 OXR shares for 1 ZFX share)	$12.42
Bid premium over 30 day average share price	26.9%
Offer Value ($m) (based on $1.40)	$6,048
Date	3-Mar-08
Initial target director response	Recommended
Independent Valuation: low value (from initial valuation)	$12.72
Independent Valuation: high value (from initial valuation)	$14.25
Independent Valuation range (increase on low value)	12.0%
Final bid over Independent Valuation mid point	92.1%
Target director recommended acceptance	na
Takeover Completion	1H CY 2008

As evident in Table 46A, both companies were relatively similar in size.

Table 46A. Bidder and target relative sizes.

Company Size Data	Market Capitalisation prior to merger announcement (A$m)
Zinifex	$5,122
Oxiana	$6,011
Offer (final) value as percentage of Bidder	100.6%
Target size as percentage of Bidder	85.2%

In the regression analysis testing of commodity prices, Zinifex was found to be more sensitive to the spot LME zinc prices in A$ terms while Oxiana was found to be most sensitive to A$ gold prices (compared to US$ gold prices and US$ and A$ copper prices) despite having its main gold project in Laos.

The regression analysis in Table 47A outlines the parameters used in the analysis.

Table 47A. Regression analysis for Zinifex and Oxiana.

Target	Zinifex	
	Estimation window (days)	252
Regression analysis		
S&P/ASX 300 Resources Index	*observed t-result*	15.26
Spot LME zinc price (offset by one day) (A$/lb)	*observed t-result*	27.29
Intercept	*observed t-result*	12.16
Factors of significance used (>5%)		
S&P/ASX 300 Resources Index	Slope	0.00353
Spot LME zinc price (offset by one day) (A$/lb)	Slope	11.36635
	Intercept	-22.20430
	R^2	0.76
	Standard error	1.514
	F-statistic	389.0
	$SS_{regression}$	1784.12
	$SS_{residual}$	570.97
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.02479
Bidder	**Oxiana**	
	Estimation window (days)	252
Regression analysis		
S&P/ASX 300 Resources Index	*observed t-result*	35.27
Spot Gold (A$/oz)	*observed t-result*	16.41
Intercept	*observed t-result*	16.61
Factors of significance (>5%)		
S&P/ASX 300 Resources Index	Slope	0.00062
Spot Gold (A$/oz)	Slope	-0.00207
	Intercept	1.83656
	R^2	0.83
	Standard error	0.15
	F-statistic	622.8
	$SS_{regression}$	26.87
	$SS_{residual}$	5.37
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.05004

Table 48A outlines the cumulative annual returns for Zinifex and Oxiana at the time of the announcement and in the subsequent time period through to merger completion at 20 June 2008. It is evident that there was value transfer from Oxiana to Zinifex with the merger and which aligns with market sentiment at the time.

Table 48A. Cumulative abnormal returns for Zinifex and Oxiana at the time of the announcement and in the subsequent 78 days to the 20 June 2008.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Zinifex (announcement)	-0.4%	$10.52	487	-$1.9
Zinifex (time to merger completion)	10.2%	$10.52	487	$49.9
Oxiana	-9.6%	$3.89	1,545	-$148.7
Oxiana (time to merger completion)	-9.4%	$3.89	1,545	-$562.1

References

Oxiana 2008 Oxiana and Zinifex to Merger to Create a Major Diversified Mining Company. ASX release dated 3 March 2008.

Zinifex 2008 Scheme Booklet Supplement for the Scheme of Arrangement in Relation to the Proposed Merger of Zinifex Limited and Oxiana Limited. ASX release dated May 6, 2008.

Aberfoyle: Western Metals takeover

On 28 April 1998 Western Metals Limited announced its intention to make a takeover offer for all the issued ordinary shares in Aberfoyle that it did not already own. The offer was priced at $2.85 cash (Aberfoyle 1998).

The takeover was acrimonious and litigation led to Western Metals providing an undertaking to the Court to dispose of 8.38 million shares purchased prior to the announcement of the offer. Western Metals was also restrained from despatching its takeover offer to Aberfoyle shareholders until the 28 August 1998,

On the 14 July 1998, the offer was increase to $3.00 cash per share and was successful.

Unfortunately the share price data for Western Metal is unavailable and hence determining abnormal returns has been limited to the target only. However, the bid was largely funded by a convertible note which caused immense shareholder dilution in later years. This occurred as the Western Metals share price fell, the conversion rate had a fixed dollar value and hence involved the company having to issue an increasing amount of shares to repay the convertible notes This is known as a classic ‘death spiral’ because as more and more shares are issued, the share price falls further due to the increased dilution, and therefore requiring more and more shares to be issued, and so on. In later years, convertible notes issued by other companies included dilution caps to prevent this re-occurring.

Assets

Aberfoyle had three major assets:

- Gunpowder copper mine in the process of being developed in NW Queensland
- Hellyer copper and zinc mine which had limited remaining reserves (two year life) in Tasmania
- Khartoum, an undeveloped one million ounce gold project in WA

With limited reserves at Hellyer, the development of Gunpowder was designed to deliver the company's future cash flow. However, the company had been 'sitting' on significant cash reserves for some years and which had irked many shareholders. This cash was now being directed at developing Gunpowder.

Western Metals was primarily a zinc producer with mines (Cadjebut, Pillara) in the Kimberley region, WA.

Key Parameters

Aberfoyle's Part B statement provides an independent valuation range for Aberfoyle. The high and low valuations along with other key parameters are outlined in Table 49A.

Table 49A. Key Parameters and dates of the takeover

Takeover Parameters	
Initial bid	
Bid Price	$2.85
Bid premium over 30 day average share price	26.6%
Offer Value ($m)	$269
Date	28-Apr-98
Initial target director response	Rejection
Increased bid	
Bid Price	$3.00
Bid premium over initial 30 day average share price	33.2%
Offer Value ($m)	$284
Date	14-Jul-98
Initial target director response	na
Independent Valuation: low value	3.74
Independent Valuation: high value	4.56
Independent Valuation range (increase on low value)	21.9%
Final bid over Independent Valuation mid point	72.3%
Target director recommended acceptance	na
Takeover Completion	2H CY 1998

As evident above, the initial and final premium was 26.6% and 33.2% respectively over the initial 30-day average price for Aberfoyle shares.

Table 50A highlights that the bidder and target were of similar sizes.

Table 50A. Bidder, offer and target sizes.

Company Size Data	Market Capitalisation prior to bid (A$m)
Aberfoyle	$231
Western Metals	$264
Offer (final) value as percentage of Bidder	107.6%
Target size as percentage of Bidder	87.5%

Table 51A reiterates that the main commodity exposure of both companies was zinc and lead with Aberfoyle also having significant copper exposure.

Table 51A. The main commodity exposure of the Target and Bidders.

	Promoted Commodity Exposure	Other Commodity Exposure
Aberfoyle	Cu, Zn	Pb, Ag
Western Metals	Zn	Pb, Ag

Regression analysis over a 252-day period estimation window was carried out prior to the merger event window for Aberfoyle but as mentioned above, the share price data series was not available for Western Metals. The Aberfoyle share price shows key sensitivities to the three month forward copper price, the spot copper price (US$ price is more sensitive than the A$ price), the spot zinc price (in this case slightly higher to the A$ zinc price), and the ASX Accumulation All-Resources Index as well as the ASX Other Metals Index (Table 52A).

Table 52A. Estimation window parameters

Target	Aberfoyle	
	Estimation window (days)	252
Regression analysis		
ASX Accumulation All Resources Index	*observed t-result*	3.00
ASX Other Metals Index	*observed t-result*	2.89
3 month forward LME copper price	*observed t-result*	2.98
LME spot zinc price (offset by one day)	*observed t-result*	1.30
A$ LME spot zinc price (offset by one day)	*observed t-result*	1.62
LME spot copper price (offset by one day)	*observed t-result*	2.73
A$ LME spot copper Price (offset by one day)	*observed t-result*	2.23
Factors of significance used (>5%)		
ASX Accumulation All Resources Index	Slope	-0.00027
Spot LME Zinc Price (offset by one day)	Slope	2.82134
Spot LME Copper Price (offset by one day)	Slope	3.44592
	Intercept	-0.75038
	R^2	0.89
	Standard error	0.225
	F-statistic	651.4
	$SS_{regression}$	98.85
	$SS_{residual}$	12.55
Model	Three factor	
Actual versus Theoretical Returns regression error	Steyx	0.02485

Table 53A outlines the cumulative abnormal returns for Aberfoyle which are zero. This highlights that the daily return of 17.2% on the 28 April 1998 when the first bid was announced is not deemed significant at a 5% level in the regression analysis.

Table 53A. Cumulative abnormal returns for target and bidder.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Target	17.2%	$2.44	95	$39.7
Bidder	na	$0.84	314	na

Overall, the Western Metals bid met with mixed views with some shareholders frustrated with the performance of Aberfoyle prior to the bid while other shareholders were disappointed at the loss of Aberfoyle given its longevity in the market. From the Western Metals perspective, it signaled the start of the demise of the company with the dilutive convertible notes, greater than expected commissioning problems at Gunpowder and a falling A$/US$ exchange rate generating significant hedging losses.

References

Aberfoyle Limited 1998 Part B Statement. Reported dated July 6, 1998. pp82. Melbourne.

Acacia Resources: Anglo Gold takeover

On 3 September 1999 Delta Gold launched a scrip takeover bid for Acacia Resources in an attempt to become Australia's second largest gold mining company, with annual production nearing one million ounces. The Acacia board immediately rejected the offer which was comprised of one ex-dividend Delta share for each Acacia share and valued the company at $570 million (Financial Express 1999).

On 5 October 1999 Acacia was granted an injunction preventing Delta sending its Part A documents to its shareholders. The Victorian Supreme Court agreed with Acacis's concerns that there were 'serious issues' or deficiencies in the Part A takeover documents (Reflections 1999).

On 11 October 1999 AngloGold Limited announced its intention to make a takeover offer for all the shares in Acacia, offering 3.5 of its shares for every 100 Acacia shares held. The Acacia Board recommended that Acacia shareholders accept AngloGold’s offer in the absence of a higher offer (Reflections 1999).

Delta announcing it was withdrawing its takeover bid for Acacia on the 22 October 1999 (Reflections 1999).

With effect from 31 December 1999 AngloGold reported that it had acquired control of Acacia Resources (AngloAshanti 2009). Acacia was delisted on 11 January 2000 (Delisted 2009).

Assets

Acacia was listed on the ASX in 1994 when Shell Australia floated its mineral assets. Its gold assets include four operations producing more than 500,000 ounces a year. These are Sunrise Dam (100% owned) and Boddington (33.33%) in Western Australia and Pine Creek (100%) and Tanami (40%) in the Northern Territory. In October 1999, the company had 3.8 million ounces of reserves and 11.4 million ounces of resources. It also had extensive exploration tenements in Australia including interests in bauxite and magnesite resources (AngloAshanti 2009a).

Takeover and Event Analysis

Table 54A summarises the two bids and premia to the 30-day average price prior to the first bid. The Acacia price increased in the lead to the Delta Gold bid announcement and hence the premia is greater than in the commentary at the time of the offer.

Anglo Gold share prices have been converted at spot exchange rates prevailing immediately prior to the announcement of its offer.

Table 54A. Takeover parameters.

Initial bid - Delta Gold	
Bid Price (1 Delta for 1 Acacia share)	$2.26
Bid premium over 30 day average share price	22.0%
Offer Value ($m)	$570
Date	3-Sep-99
Initial target director response	Rejection
Counter bid - Anglo Gold	
Bid Price (3.5 AngloGold for 100 Acacia shares)	$3.30
Bid premium over initial 30 day average share price	78.1%
Offer Value ($m)	$833
Date	11-Oct-99
Initial target director response	Recommended
Takeover Completion	2H CY 1999

Table 55A compares the size of Acacia with the successful bidder, Anglo Gold.

Table 55A. Relative bidder and target sizes.

Company Size Data	Market Capitalisation prior to bid (A$m)
Acacia Resources	$492
AngloGold	$4,448
Offer (final) value as percentage of Bidder	18.7%
Target size as percentage of Bidder	11.1%

The results of regression analysis for the three companies against the gold price and gold indices are presented in Table 56A. Interestingly, the Acacia share price was found to more sensitive to the A$ gold price while Delta Gold was found to be more sensitive to the US$ gold price. Similarly, the AngloGold share price was more sensitive to the US$ gold price in comparison to the Rand gold price.

Table 56A. Regression analysis for the bidders and target.

Target	Acacia Resources	
	Estimation window (days)	252
Regression analysis		
Spot gold price (A$/oz)	*observed t-result*	10.02
ASX Gold Index	*observed t-result*	14.13
Intercept	*observed t-result*	16.86
Factors of significance used (>5%)		
Spot gold price (A$/oz)	Slope	0.00408
ASX Gold Index	Slope	0.00315
	Intercept	-2.46837
	R^2	0.79873
	Standard error	0.150
	F-statistic	494.1
	$SS_{regression}$	22.18
	$SS_{residual}$	5.59
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.02203

Target	Delta Gold	
	Estimation window (days)	252
Regression analysis		
Spot gold price (US$/oz)	*observed t-result*	6.82
ASX Gold Index	*observed t-result*	15.34
Intercept	*observed t-result*	9.36
Factors of significance used (>5%)		
Spot gold price (US$/oz)	Slope	-0.00552
ASX Gold Index	Slope	0.00303
	Intercept	1.13441
	R^2	0.60
	Standard error	0.099
	F-statistic	186.6
	$SS_{regression}$	3.64
	$SS_{residual}$	2.43
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.02209

Bidder	Anglo Gold	
	Estimation window (days)	252
Regression analysis		
Philadelphia gold and silver index	*observed t-result*	17.75
Spot gold price (US$/oz)	*observed t-result*	7.31
Intercept	*observed t-result*	8.89
Factors of significance (>5%)		
Philadelphia gold and silver index	Slope	179.59881
Spot gold price (US$/oz)	Slope	-30.77467
	Intercept	8881.77453
	R^2	0.56
	Standard error	821.05
	F-statistic	160.8
	$SS_{regression}$	216,830,622
	$SS_{residual}$	167,857,734
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.02728435

The cumulative abnormal returns for the target and two bidders are presented in Table 57A. While Delta's low bid probably negated it experiencing negative abnormal returns at the time of the bid, Anglo Gold did experience some modest negative abnormal returns.

Table 57A. Cumulative abnormal returns for the bidders and target.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Target (Delta bid)	11.7%	$1.95	252	$57.7
Target (Anglo Gold bid)	6.6%	$1.95	252	$32.3
Bidder (Delta Gold)	0.0%	$2.26	270	$0.0
Bidder (Anglo Ashanti)	-3.8%	R 181.15	98	-$168.9

However, in the 252-day post-event period after the effective completion of takeover (31 December 1999) Anglo Gold experienced significant cumulative abnormal returns and well in excess of the offer value (Table 58A).

Table 58A. Cumulative abnormal returns in the post-event window.

Days in post-event window	Number of days of AR	CAR over period	Change in value (A$m)
252	10	43.8%	$1,946.3

References

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Reflections 1999 Company News October 1999. Available at: http://www.reflections.com.au/MiningandExploration/Companies/NewsOct99.html, (accessed October 10, 2009).

AurionGold: Placer Dome takeover

On the 27 May 2002 Canadian Placer Dome announced a $2 billion scrip-based takeover bid for AurionGold. The offer was 17.5 Placer Dome shares for every 100 AurionGold shares.

However, after the initial takeover offer announcement a fall in the Placer Dome share price reduced the value of the bid from A$4.51 to A3.83 per AurionGold share (Australian Business Intelligence 2002). The offer was increased on the 30 July 2002 by a cash component of A$0.35 cash per AurionGold share. (Asian Wall Street Journal 2002)

Later in 2002 AurionGold declared a 7 cents fully franked dividend but which was not considered part of Placer Dome's takeover consideration as the AurionGold directors continued to reject Placer Dome's offer (AurionGold 2002).

On the 31 December 2001 AurionGold was formed from the merger of Delta Gold and Goldfields. The assets of both of these companies were dominantly WA gold mines and reserves at 30 June 2002 were 7.6 million ounces.

Placer Dome reported that AurionGold's assets would comprise some 30 per cent of the combined company with Placer Dome but AurionGold shareholders would have only 20 per cent of the total equity of Placer Dome (Sykes 2002). However, Sykes (2002) noted that AurionGold shareholders who accept the bid might be well advised to hang onto their Placer Dome shares because there was a chance that Placer itself could become a takeover target.

On the 14 October 2002 AurionGold Board recommended the Placer Dome offer (AsiaPulse News 2002). On the 31 December 2002, Placer Dome announced that through compulsory acquisition, it now owned 100% of AurionGold (PR Newswire 2003).

Assets

The AurionGold acquisition increased Placer Dome's interest in the Granny Smith mine in Western Australia from 60% to 100%. It also increased the company's interest in the Porgera mine in Papua New Guinea as well as providing exposure to other WA gold operations.

Takeover and Event Analysis

The takeover parameters in outlined in Table 59A. It shows that with the decreasing Placer Dome share price, the bid value decreased despite the additional 35 cents added to the offer on the 30 July 2002. An independent valuation was not commissioned by the target. Placer Dome share price conversions are estimated on spot rates immediately prior to the event window for the initial bid.

Table 59A. Takeover parameters.

Bid Price (17.5 Placer Dome for 100 AurionGold shares)	$4.55
Bid premium over initial 30 day average share price	68.3%
Offer Value ($m)	$2,026
Date	27-May-02
Initial target director response	Rejection
Final bid premium (based on 17.5 Placer Dome for 100 AurionGold shares plus 35 cents)	1.0%
Final offer value ($m)	$1,319
Independent Valuation: low value	na
Independent Valuation: high value	na
Independent Valuation range (increase on low value)	na
Final bid over Independent Valuation mid point	na
Target director recommended acceptance	14-Oct-02
Takeover Completion	2H CY 2002

Table 60A details the company sizes relative to the size of the offer.

Table 60A. Bidder and target sizes.

Company Size Data	Market Capitalisation prior to bid (A$m)
AurionGold	$1,432
Placer Dome (converted at spot exchange rates at time of bid)	$7,784
Offer (final) value as percentage of Bidder	11.3%
Target size as percentage of Bidder	18.4%

The regression analysis is outlined in Table 61A. Initial testing with the A$ and US$ gold price indicate that at that time, AurionGold was more sensitive to A$ gold price than US $ gold price.

Table 61A. Regression analysis for the target and bidder.

Target	**AurionGold**	
	Estimation window (days)	252
Regression analysis		
Spot gold price (A$/oz)	*observed t-result*	7.41
ASX Gold Index	*observed t-result*	41.47
Intercept	*observed t-result*	4.76
Factors of significance used (>5%)		
Spot gold price (A$/oz)	Slope	0.00116
ASX Gold Index	Slope	0.00190
	Intercept	-0.50502
	R^2	0.92
	Standard error	0.128
	F-statistic	1392.3
	$SS_{regression}$	45.54
	$SS_{residual}$	4.07
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.02105
Bidder	**Placer Dome**	
	Estimation window (days)	252
Regression analysis		
Philadelphia Gold and Silver index	*observed t-result*	5.59
Spot gold price (US$/oz)	*observed t-result*	13.81
Intercept	*observed t-result*	8.71
Factors of significance (>5%)		
Philadelphia Gold and Silver index	Slope	-0.10065
Spot gold price (US$/oz)	Slope	0.14967
	Intercept	-18.57740
	R^2	0.68
	Standard error	0.89
	F-statistic	262.1
	$SS_{regression}$	419.72
	$SS_{residual}$	199.34
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.02074

Table 62A shows the cumulative abnormal returns for the target and bidder at the time of the initial announcement and during an event window at the time of the increase in the offer on the 30 July 2002. In both cases the bulk of the returns were recorded at the initial announcement of the takeover.

Table 62A. Cumulative abnormal returns for the target and bidder at the time of the initial bid and subsequent increase in the offer.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Aurion Gold	20.7%	$3.22	445	$296.7
Placer Dome	-7.4%	$19.02	349	-$491.7

The post event window returns for the bidder are listed in Table 63A with the post-event window extending 252 days from the increase in the offer price.

Table 63A. Post event returns for the bidder.

Days in post-event window	Number of days of AR	CAR over period	Change in value (A$m)
252	74	-12.3%	-$959.5

Lastly the regression analysis in the post event window indicates an increased sensitivity of the Placer Dome share price to the Philadelphia Gold and Silver Index but decreasing sensitivity to the spot gold price – potentially in response to the inherited hedging from AurionGold (Table 64A).

Table 64A. Post event period regression analysis.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
Philadelphia Gold and Silver index	*observed t-result*	24.07	5.59	330.5%
Spot gold price (US$/oz)	*observed t-result*	6.42	13.81	-53.5%

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Austral Coal: Centennial takeover

On the 23 February 2005 Centennial Coal Limited (Centennial) announced a scrip offer for Austral Coal Limited (Austral) on the basis of 37 Centennial shares for 100 Austral shares. At that time Austral had been under pressure due to financing issues associated with the expansion of its Tahmoor colliery. The attraction of Austral to Centennial was that Austral offered diversification into coking coal (Centennial was primarily a thermal coal producer) as well as the attraction of maintaining an asset portfolio largely in the Sydney basin.

Centennial announced that its offer was unconditional on the 23 March 2005 (Centennial Coal 2005). The company attained an 80.0% interest in Austral Coal by the 21 April, 2005 (Centennial Coal 2005a).

Austral was suspended from trading on the ASX on the 16 February 2007 (Austral Coal, 2007).

Unfortunately Centennial could not gain a greater than a 90% interest to proceed to compulsory acquisition and ended up holding a 85.85% interest in Austral. This was primarily due to Glencore International A.G. which had accumulated 13.72% interest in Austral and refused to accept Centennial's offer.

Over the period 2006 and 2007 Centennial Coal came under financial pressure due to its debt levels ($161.3 million with Austral as part of the Tahmoor expansion) *inter alia* as well operational problems at its Newstan colliery which reduced cash flow. Most of Centennial coal sales were also in A$ denominated contracts to domestic power stations in a regime where export coal prices were increasing along with operating costs and creating a margin squeeze.

As part of a rationalisation programme, Centennial Coal decided to sell its Austral Coal stake to Xstrata via a takeover bid by Xstrata at $1.83 per share and which was announced on 17 September 2007. Centennial also announced it had entered into an agreement to sell its Anvil Hill project for $425 million to Xstrata on the same date (Xstrata Coal 2007).

On l5 October 2007 Xstrata plc through its subsidiary, Helios Australia Pty Limited, released a bidder's statement offering $1.83 per share with Austral directors recommending shareholders accept the offer in the absence of a superior proposal (Xstrata Coal 2007). This offer was successful.

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Assets

Austral's principal activities were mining and marketing of coal from its Tahmoor Colliery located 75 kilometres southwest of Sydney. It primarily produced export coal with raw coal production in 2007 at 2.3 million tonnes (Xstrata Coal 2007).

Takeover and Event Analysis

This research has focused on the time of the initial offer for Austral Coal by Centennial Coal. While the later sale to Xstrata Coal was for a profit, this sale was unlikely to have eventuated if Centennial had not been under financial stress and most market analysts believed that Centennial could have delivered greater value to its shareholders out of retaining a combined group.

Table 65A summarises the details of the bid. While the independent valuation was conducted later with the Xstrata Coal takeover offer, it nevertheless provides a useful comparison to the offer by Centennial two years earlier. Major differences largely reflect changing (higher) coal price expectations over the intervening period so the valuations are likely to be higher than in 2005.

Table 65A. Takeover parameters.

Bid Price (37 AUO for 10 CEY shares)	$1.25
Bid premium over 30 day average share price	39.9%
Offer Value ($m)	$381
Date	23-Feb-05
Initial target director response	Recommended
Independent Valuation: low value (from Xstrata sale valuation)	$1.20
Independent Valuation: high value (from Xstrata sale valuation)	$1.60
Independent Valuation range (increase on low value)	33.3%
Final bid over Independent Valuation mid point	89.4%
Target director recommended acceptance (Xstrata Coal)	17-Sep-07
Takeover Completion	1H CY 2008

As evident in Table 66A, Austral was almost double the size of Centennial .

Table 66A. Bidder and target sizes.

Company Size Data	Market Capitalisation prior to bid (A$m)
Austral Coal	$311
Centennial Coal	$161
Offer (final) value as percentage of Bidder	237.4%
Target size as percentage of Bidder	193.5%

The regression analysis conducted in Table 67A indicates a low R^2 relative to the S&P/ASX 300 Resources Index for Austral Coal and is likely to reflect the financial difficulties faced by the company during the estimation period.

Table 67A. Regression analysis for both Bidder and Target.

Target	**Austral Coal**	
	Estimation window (days)	252
Regression analysis		
S&P/ASX 300 Resources Index	*observed t-result*	12.48
Intercept	*observed t-result*	1.81
Factors of significance used (>5%)		
S&P/ASX 300 Resources Index	Slope	0.00037
	Intercept	-0.12
	R^2	0.38
	Standard error	0.11
	F-statistic	155.66
	$SS_{regression}$	1.75
	$SS_{residual}$	2.81
Model	One Factor	
Actual versus Theoretical Returns regression error	Steyx	0.03950
Bidder	**Centennial Coal**	
	Estimation window (days)	252
Regression analysis		
S&P/ASX 300 Resources Index	*observed t-result*	27.86
Intercept	*observed t-result*	3.66
Factors of significance (>5%)		
S&P/ASX 300 Resources Index	Slope	0.00117
	Intercept	-0.34
	R^2	0.76
	Standard error (reflects high gold values in Rand)	0.15
	F-statistic	776.2
	$SS_{regression}$	17.39
	$SS_{residual}$	5.60
Model	One Factor	
Actual versus Theoretical Returns regression error	Steyx	0.01779

Table 68A outlines the cumulative abnormal returns over the event window of the bid announcement.

Table 68A. Cumulative abnormal returns at the time of takeover announcement.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Target	10.0%	$1.02	305	$31.2
Bidder	0.0%	$4.63	35	$0.0

Table 69A outlines the cumulative abnormal returns for Centennial Coal and which approximate the returns for Austral Coal at the time of the announcement outlined above and suggesting the takeover was viewed as positive for both companies.

Table 69A. Post event cumulative abnormal returns for Centennial Coal

Days in post-event windows	Number of days of AR	CAR over period	Change in value (A$m)
252	24	11.5%	$18.4

Lastly the decline in the sensitivity of the Centennial Coal share price to movements in the S&P/ASX 300 Resources Index is likely to reflect both the company's financial and operational issues as well as new coal entrants to the market, e.g. Excel Coal, Resource Pacific Holdings (Table 70A).

Table 70A. Regression in the post-event period.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
S&P/ASX 300 Resources Index	*observed t-result*	12.85	27.86	-53.9%

References

Austral Coal 2007 Notice of Removal the Company's Shares from the Official List of the ASX. ASX release dated 13 February 2007.

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Centennial Coal 2005a Centennial gains 80% of Austral. ASX release dated April 21 2005, http://www.centennialcoal.com.au/index.php?option=com_content&view=article&id=123:centennial-gains-80-of-austral&catid=44:april-june&Itemid=100 (accessed December 20, 2009).

Xstrata Coal 2007 Bidder's Statement. ASX release dated 15 October 2007.

Aztec Resources: Mt Gibson takeover

On the 24 July 2006 Mount Gibson Iron Limited (Mt Gibson) announced a takeover bid for Aztec Resources Limited (Aztec). The scrip offer was 1 new Mount Gibson share for every 3 shares held in Aztec and which were reported to value each Aztec share at $0.263 based on the Mt Gibson volume weighted average price on 21 July 2006 of $0.789, being the last trading day before announcement of the offer (Mt Gibson 2006).

Previously Mt Gibson had secured an option agreement with Aztec's major shareholder, Cambrian Mining Plc for its Aztec shares and which were equivalent to 19.9% of Aztec's issued capital (Mt Gibson 2006).

Mt Gibson stated that the rationale for the merger was to create a substantial pure-play iron ore producer on a world scale, and with potential to produce up to 9.5 million tonnes per annum of hematite by 2009. The company would hold three high quality hematite projects in Western Australia: Tallering Peak (Mount Gibson – in production), Extension Hill (Mount Gibson – near-term production) and Koolan Island (Aztec – near-term production) (Mt Gibson 2006).

The bid was considered hostile by the Board of Aztec Resources and an acrimonious battle ensued over a number of months involving submissions to ASIC. Aztec Resources did not commission an independent expert's valuation of the company which itself met with some market cynicism.

Mt Gibson announced that the bid was unconditional on the 26 October 2006 (Mt Gibson 2006a) when it had attained a 31% interest in Aztec. On 21 December 2006, Mt Gibson announced that it had attained 90.06% and that the takeover was closing on the 22 December 2006 (Mt Gibson 2006b).

Assets

Aztec was the owner of the Koolan Island iron ore project located 130 kilometres north of Derby off the West Australian Kimberley coast. Koolan Island has remnant resources and previously produced 68 million tonnes of high grade (Fe @ 67%) and low impurity iron ore.

In August 2005, Aztec announced the successful completion of a Bankable Feasibility Study with capital costs estimated at $125 million, inclusive of mine development costs. This was to support an annual production rate of approximately 4 million tonnes.

Mount Gibson was established as a specialist iron ore exploration company in 1996 to undertake the progressive development of iron ore hematite deposits in the Midwest region of Western Australia. Mount Gibson's first mine at Tallering Peak commenced exporting direct shipping grade hematite to China in February 2004 and at that time, was expanding its direct shipping grade hematite operations to 3.0 million tonnes per annum (Mt Gibson 2006)..

The company had recently entered into agreement to sell its 73% shareholding in Asia Iron Holdings Limited, for $52.5 million. The funds were to be held in escrow until receiving EPA approval for the Extension Hill magnetite project which was expected by December 2006. The funds from this sale were used in the development of Mount Gibson's Extension Hill DSO hematite project (Mt Gibson 2006).

Takeover and Event Analysis

The details of the takeover are presented in Table 71A.

Table 71A. Takeover parameters.

Bid Price	$0.26
Bid premium over 30 day average share price	36.7%
Offer Value ($m)	$269
Date	24-Jul-06
Initial target director response	Rejection
Independent Valuation: low value	na
Independent Valuation: high value	na
Independent Valuation range (increase on low value)	na
Final bid over Independent Valuation mid point	na
Target director recommended acceptance	na
Takeover Completion	2H CY 2006

Table 72A below highlights that Aztec Resources was around 65% the size of Mt Gibson Iron prior to the bid.

Table 72A. Bidder and target company sizes.

Company Size Data	**Market Capitalisation prior to bid (A$m)**
Aztec Resources	$198
Mt Gibson Iron	$312
Offer (final) value as percentage of Bidder	86.5%
Target size as percentage of Bidder	63.6%

Table 73A details a single parameter regression analysis using the S&P/ASX 300 Resources Index. This is due to the nature of the annual contract pricing of iron ore and its irrelevance in many day-to-day share price movements. R^2 factors are low reflecting the growth of iron ore demand and the desirability of iron ore companies to investors relative to some of the other constituents of the S&P/ASX 300 Resources Index.

Table 73A. Regression analysis of the Bidder and Target.

Target	Aztec Resources	
	Estimation window (days)	252
Regression analysis		
S&P/ASX 300 Resources Index	*observed t-result*	13.38
Intercept	*observed t-result*	16.26
Factors of significance used (>5%)		
S&P/ASX 300 Resources Index	Slope	0.00002
	Intercept	0.10030
	R^2	0.42
	Standard error	0.012
	F-statistic	179.0
	$SS_{regression}$	0.03
	$SS_{residual}$	0.04
Model	One factor	
Actual versus Theoretical Returns regression error	Steyx	0.03429
Bidder	**Mt Gibson Iron**	
	Estimation window (days)	252
Regression analysis		
S&P/ASX 300 Resources Index	*observed t-result*	7.98
Intercept	*observed t-result*	12.31
Factors of significance (>5%)		
S&P/ASX 300 Resources Index	Slope	0.00008
	Intercept	0.47221
	R^2	0.20
	Standard error	0.07
	F-statistic	63.6
	$SS_{regression}$	0.36
	$SS_{residual}$	1.40
Model	One factor	
Actual versus Theoretical Returns regression error	Steyx	0.02489

Table 74A outlines the cumulative abnormal returns for both Aztec Resources and Mt Gibson, firstly over a 4-day event window at the time of the announcement, and secondly, during the period until bid closure. Interestingly, over both periods the change in value was similar with Aztec generating abnormal returns at the time of the initial announcement while Mt Gibson benefited during the subsequent period.

Table 74A. Cumulative abnormal returns for both the Bidder and Target at the time of the announcement and in the subsequent period before the bid closed.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Aztec Resources (at announcement)	20.1%	$0.19	1,043	$39.9
Aztec Resources (to bid closure)	6.3%	$0.19	1,043	$12.5
Mt Gibson Iron (at announcement)	0.0%	$0.78	402	$0.0
Mt Gibson Iron (to bid closure)	16.4%	$0.78	402	$51.2

In the 252-day period following the bid closure, Mt Gibson generated cumulative abnormal returns of 81.5% with a value of $254 million. This was a period during strong grow in the resource sector (Table 75A).

Table 75A. Bidder abnormal returns in post event window.

Days in post-event window	Number of days of AR	CAR over period	Change in value (A$m)
252	31	81.5%	$254.1

Finally Table 76A highlights the increase sensitivity of the Mt Gibson share price to the S&P/ASX 300 Resources Index which is expected given the greater weighting of the combined company following bid closure.

Table 76A. Mt Gibson sensitivity to the S&P/ASX 300 Resources Index in the 252-day period after closure of the bid.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
S&P/ASX 300 Resources Index	*observed t-result*	41.62	7.98	421.9%

References

Mt Gibson Iron Limited 2006 Mt Gibson Announces Scrip Takeover Offer for Aztec to Create $600 miillion Australian Iron Ore Producer. ASX Release dated July 24, 2006.

Mt Gibson Iron Limited 2006a Offer by Mount Gibson Iron Limited for Aztec Resources Limited now Unconditional. ASX Release dated October 26, 2006.

Mt Gibson Iron Limited 2006b Takeover bid by Mount Gibson Iron Limited for Aztec Resources Limited 90.06% acceptance achieved. ASX Release dated December 21, 2006.

Comalco: Rio Tinto takeover

On the 25 February 2000, Rio Tinto announced a long-expected takeover offer for the minority interests in Comalco Limited (Comalco). The offer price was $9.50 per share and shareholders had an option to take $9.50 cash or one Rio Tinto Limited share for every three Comalco shares or one Rio Tinto plc (UK scrip) share for every three Comalco shares; or any combination of the above (Howarth, 2000).

The offer valued Comalco at $5.326 billion although Rio Tinto was effectively purchasing only the 27.6% interest in Comalco that it did not already own, given Rio Tinto already controlled the company with a 72.43 per cent interest.

In supporting its bid, Rio Tinto argued that the cash offer represented a substantial premium to the historical prices of Comalco shares. The offer price of $9.50 per share was at a 17.3% premium to the closing price on 24 February 2000 when the offer was announced and a 21.7% premium to the average Comalco share price over the preceding month. The cash offer was also reported as being the highest price ever offered or paid for Comalco shares prior to the announcement, either by Rio Tinto or in general market trading.

It also noted that the share alternative being offered for Comalco provided its shareholders with the opportunity to take advantage of capital gains tax roll-over relief, by selecting to receive Rio Tinto Limited shares.

Rio Tinto also argued that its offer addressed Comalco investor concerns arising from the reduced public float and the reduction in the ASX index weighting of Comalco shares.

Comalco Assets

Comalco prided itself as being Australia’s first fully-integrated aluminium producer. The company was established more than 40 years ago following the discovery of bauxite deposits at Weipa on Cape York Peninsula (Comalco 2001).

The company operates three smelters (Boyne Smelters, Queensland; Bell Bay, Tasmania; New Zealand Aluminium Smelters, New Zealand) and the Weipa bauxite mine. It also has interests in Queensland Alumina Limited at Gladstone, Queensland (38.6 per cent), the Gladstone Power Station (42 per cent), Eurallumina alumina refinery in Italy (56 per cent) and Boké bauxite mine in Guinea (4 per cent).

Comalco was headquartered in Brisbane and operates a research and technology facility at Thomastown in Victoria. Comalco New Zealand is managed from an office in Wellington.

In 1999 Comalco produced 678,000 tonnes of primary aluminium from its three wholly owned or majority controlled smelters in Australia and New Zealand and 1.65 million tonnes of alumina. For the 2000 year, Comalco reported a $308 million operating profit, a result significantly enhanced by increased metal production and a major reduction in operating costs (Howarth, 2000).

Australian Aluminium Industry

Howarth (2000) notes that the Rio Tinto bid for Comalco compounds a volatile period for the Australian aluminium industry, a large part of which was under takeover or up for sale including Capral Kurri Kurri smelter in the Hunter Valley in NSW and CSR seeking to divest its stake in the nearby Tomago smelter.

Meanwhile, Rio Tinto had been using the ``creep" provisions of the Corporation Law to steadily increase its stake in Comalco in the previous two years (see Chapter 2, Section 2.2.6).

Bid Progress

Independent expert, Grant Samuel concluded that the offer made by Rio Tinto was not fair but reasonable in its review (Business Wire, 2000a).

On 5 May 2000, Rio Tinto declared that its offer price was final and that it would not be increased. The offer was declared unconditional on the 9 May 2000 (Business Wire, 2000). On the 5 June 2000 the offer closed with Rio Tinto having acquired

98.45% of Comalco. Rio Tinto then moved to compulsory acquisition of the remaining shares (Business Wire, 2000a).

Based on the acceptances received as at the close of the offer, Rio Tinto was expected to issue 5.9 million ordinary shares and pay $1,217.7 million in cash for the Comalco shares it had acquired (Business Wire, 2000b). Table 77A indicates that 88.3% of Comalco shares were paid for in cash and this could have reflected a lack of further investment appeal in Rio Tinto during the Tech Boom and the diversion of cash to non-resource sector investments. It also suggested that the offer of tax relief through the scrip offer was not a significant incentive for shareholders to accept scrip over cash.

Table 77A. Comalco acceptance split between scrip and cash offers.

Consideration	Number of Comalco Shares accepted	Cash/Shares issued, or to be issued by Rio Tinto
$9.50 cash	128.2 million	A$1,217.7 million
Rio Tinto Limited Shares	9.0 million	3.0 million
Rio Tinto plc Shares	8.7 million	2.9 million

From Business Wire, (2000b)

The bid details are presented in Table 78A

Table 78A. Key Parameters and dates of the takeover

Takeover Parameters	
Bid Price	$9.50
Bid premium over 30 day average share price	17.7%
Offer Value ($m)*	$1,468
Date	25-Feb-00
Initial target director response	Review
Independent Valuation Range	na
Target director recommended acceptance	5-May-00
Takeover Completion	1H CY 2000

*Prior to bid, Rio Tinto had a 72.43% interest in Comalco

Table 79A outlines the bidder and target sizes immediately prior to the bid announcement and the percentage sizes of the target and offer value relative to the bidder. Both the offer value and the market capitalisation of Comalco were less than 15% of the size of Rio Tinto prior to the bid.

Table 79A. Offer size and target size

Company Size Data	Market Capitalisation prior to bid (A$m)
Comalco	$4,485
Rio Tinto	$30,274
Offer value as percentage of Bidder	4.9%
Target size as percentage of Bidder	14.8%

Table 80A reiterates that Comalco was contributing increased aluminium and alumina exposure to the diversified production base of Rio Tinto..

Table 80A. The main commodity exposure of the Target and Bidder.

	Promoted Commodity Exposure	Other Commodity Exposure
Comalco	Al	Alumina
Rio Tinto	Fe, Cu	Al, U, Au, Ti, Industrial minerals

Multiple Regression analysis over a 252-day period estimation window has highlighted that the 3-month forward aluminium price, ASX Accumulation All-Resources Index and the ASX Other Metals Index as factors of significance (at a 5% level) for the target as outlined in Table 81A.

Table 81A. Estimation window parameters.

Target	**Comalco Resources**	
	Estimation window (days)	252
Regression analysis		
3mth forward aluminium price (offset by one day)	*observed t-result*	4.65
ASX Accumulation All Resources Index	*observed t-result*	7.58
ASX Other Metals Index	*observed t-result*	16.97
Intercept	*observed t-result*	8.75
Factors of significance (>5%)		
3mth forward aluminium price (offset by one day)	Slope	-0.00180
ASX Accumulation All Resources Index	Slope	-0.00154
ASX Other Metals Index	Slope	0.01248
	Intercept	4.20507
	R^2	0.90
	Standard error	0.345
	F-statistic	710.1
	$SS_{regression}$	253.11
	$SS_{residual}$	29.46
Model	Three factor	
Actual versus Theoretical Returns regression error	Steyx	0.01882
Bidder	**Rio Tinto**	
	Estimation window (days)	252
Regression analysis		
3mth forward aluminium price	*observed t-result*	2.35
HSBC Global Mining Index	*observed t-result*	1.01
ASX Accumulation All Resources Index	*observed t-result*	9.94
Intercept	*observed t-result*	1.68
Factors of significance (>5%)		
3mth forward aluminium price	Slope	-0.00211
ASX Accumulation All Resources Index	Slope	0.00502
	R^2	0.87
	F-statistic	535.8
	$SS_{regression}$	1064.06
	$SS_{residual}$	164.17
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.01221

With the international status of Rio Tinto and aluminium exposure of Comalco, regression has been tested with the 3 month forward aluminium price (not offset by one day given the London pricing of Rio Tinto plc and its direct impact on the share price of Rio Tinto Limited), HSBC Global Mining Index and the ASX Accumulation All-Resources Index. Interestingly, only the aluminium price and the ASX Accumulation All-Resources Index are significant at a 5% confidence level.

As outlined in Table 82A, interestingly there were no recorded abnormal returns for Comalco (and Rio Tinto) over the event window.

Table 82A. Cumulative abnormal returns over a 3-day event window.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Target	15.2%	$8.00	561	$681.7
Bidder	-3.4%	$19.38	1,562	-$1,030.4

Table 83A summarises the abnormal returns to the bidder in the subsequence 252 day period and which were estimated at zero for Rio Tinto.

Table 83A. Bidder abnormal returns in a 252-day post-event window.

Days in post-event window	Number of days of AR	CAR over period	Change in value (A$m)
252	16	-5.2%	-$1,580

Overall it would appear that Rio Tinto acquired the minority shareholding in Comalco at a time of weakness and uncertainty in the Australian aluminium industry. Rio Tinto's existing shareholding gave it significant advantage in the takeover and the lack of abnormal returns offered to the minority shareholders is in accordance with the independent expert's view that the offer is fair but not reasonable.

It is difficult to identify value to Rio Tinto but this may partly reflect the relative small size of Comalco and other events occurring in the subsequent period (e.g. Norths takeover.) Interestingly, the post event window highlights that the Rio Tinto share price became more aligned with the HSBC Global Mining Index although this will be influenced to a greater extent with Rio Tinto's bid for Norths and which was announced on the 23 June 2000 (Table 84A).

Table 84A. Post event observed t-results for the parameters tested in the estimation window.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
3mth forward aluminium price	*observed t-result*	0.95	2.35	-59.5%
HSBC Global Mining Index	*observed t-result*	4.90	1.01	384.5%
ASX Accumulation All Resources Index	*observed t-result*	9.81	9.94	-1.3%

References

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Business Wire, 2000a *Independent Expert's Report in Relation to Rio Tinto's Offer for Comalco Limited*. Report dated April 27, 2000. Available at: http://findarticles.com/p/articles/mi_m0EIN/is_2000_April_27/ai_61758133/, (accessed March 3, 2008).

Howarth, I. 2000 Rio in $1.5bn bid to take out Comalco. Reported dated February 2000. *Australian Financial Review*, p 52.

Consolidated Minerals: Palmary Enterprises takeover

On the 23 February 2007 the Chairman of Consolidated Minerals wrote to its shareholders outlining a deal that would create a new company by way of 3 schemes of arrangement. It was proposed that the new company would be 60% owned by an investment vehicle of Pallinghurst Resources Fund LP and AMCI and 40% owned by the existing Consolidated Minerals shareholders.

Under the proposal, Consolidated Minerals shareholders would receive what was considered by the Board as an attractive cash and scrip package comprising:

- A$1.38 cash for each Consolidated Minerals share they hold; and
- 2 shares in the new company for every 5 Consolidated Minerals shares they hold.

The letter stated that the deal valued Consolidated Minerals shares at $2.28 representing a 32.6% premium to the Consolidated Minerals share price of $1.72 (being the price prior to the takeover speculation in October 2006) (Consolidated Minerals 2007).

The proposed complicated transaction attracted criticism from shareholders but also started one of the most competitive and colourful bidding wars in the history of the Australian resources sector. There were three bidders with a series of counter bids extending over a period of 10 months and included:

- Pallinghurst Resources which was run by former BHP CEO, Mr Brian Gilbertson
- Territory Resources run by former Consolidated Minerals CEO Mr Michael Kiernan
- Palmary Enterprises Ltd run by Ukrainian billionaire Mr Gennadiy Bogolyubov.

The bidding was finally won by Palmary Enterprises which offered a $5.00 per share cash offer on 4 December 2007 and managed to achieve greater than 90% interest in the target on 3 January 2008 (Wai-yin Kwok 2008).

Assets

Consolidated Minerals owns and operates the Woodie Woodie Manganese operation, located approximately 400km south east of Port Hedland in the Pilbara, WA. It also has a 50% interest in the Mindy Mindy Iron Ore Project, located 60km northwest of Newman, also in the Pilbara region.

It also has a 27.6% strategic interest in Jabiru Metals Limited which owns the Jaguar Zinc/Copper Project, located at the Teutonic Bore base metals mine, around 60km north of Leonora, WA.

Merger and Event Analysis

This thesis has not recorded each counter offer but rather assessed the cumulative abnormal returns between the initial offer and the 3 January 2008 when Palmary moved to compulsory acquisition. The first offer outlined in Table 85A is the Pallinghurst and AMCI deal while the final offer is from Palmary Enterprises.

Table 85A. Takeover parameters.

Bid Price	$2.28
Bid premium over 30 day average share price	2.7%
Offer Value ($m)	$496
Date	23-Feb-07
Initial target director response	Recommended
Final bid price	$5.00
Bid premium over 30 day average share price	125.2%
Offer Value ($m)	$1,088
Date	4-Dec-07
Takeover Completion	1H CY 1998

The regression analysis is presented in Table 86A and the R^2 is low but which may reflect the takeover speculation in the share price prior to the first offer announcement.

Table 86A. Regression analysis.

Target	Consolidated Minerals	
	Estimation window (days)	252
Regression analysis		
S&P/ASX 300 Resources Index	*observed t-result*	9.49
Intercept	*observed t-result*	3.25
Factors of significance used (>5%)		
S&P/ASX 300 Resources Index	Slope	0.00078
	R^2	0.26
	Standard error	0.269
	F-statistic	90.1
	$SS_{regression}$	6.54
	$SS_{residual}$	18.15
Model	One factor	
Actual versus Theoretical Returns regression error	Steyx	0.00067

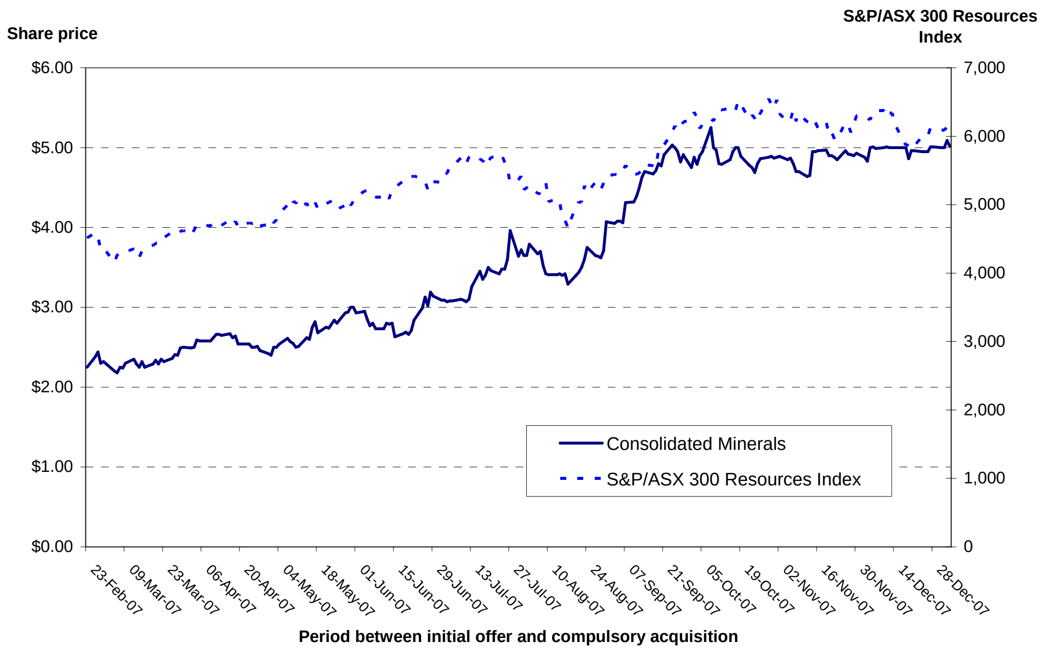
However, the cumulative abnormal returns are presented in Table 87A and appear quite low in comparison to the bidder and final offer price.

Table 87A. Bidder cumulative abnormal returns.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Consolidated Minerals (at announcement)	0.7%	$2.25	218	$3.2
Consolidated Minerals (to >90% acceptance)	11.0%	$2.25	218	$53.9

Chart 88A plots the S&P/ASX 300 Resources Index along with the Consolidated Minerals share price and highlights that the market was generally rising during this period. Hence while the bid price almost doubled in this high profile takeover, Consolidated Minerals shareholders may not have gained the abnormal returns they appeared to receive.

Chart 88A. The S&P/ASX 300 Resources Index and the Consolidated Minerals share price between the first offer and the timing of the move to compulsory acquisition.



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Gasgoyne: Sons of Gwalia takeover of Orion, Gasgoyne and Burmine

As part of a proposed amalgamation, Sons of Gwalia sought to substantially consolidate the mining tenement holdings in the Marvel Loch/Southern Cross region of WA through a series of merger/takeovers of Burmine (Burmine), Orion Resources (Orion) and Gascoyne Gold Mines (Gasgoyne). This was considered by the company to be one of the major gold producing provinces and greenstone belts in WA. The area encompassed the original mining centres of Bullfinch, Southern Cross and Marvel Loch (Sons of Gwalia, 1996).

The activity appeared stimulated by the corporate manoeuvring of US Coeur d'Alene Mines Corporation (Coeur d'Alene) which took a strategic position in both Orion and Gascoyne.

On the 17 January 1996, Sons of Gwalia and Burmine announced a proposed merger and at the same time, Sons of Gwalia announced a takeover bid for Gasgoyne (Sons of Gwalia, 1996). A later bid for Orion represented the last step in Sons of Gwalia's amalgamation strategy.

All three transactions involved scrip offers with the focus of this analysis on the Gasgoyne transactions as representative of the three transactions. The offer to Gasgoyne comprised one Sons of Gwalia share for every three Gasgoyne shares. The offer was based on a Sons of Gwalia share price of $8.50 and was equivalent to approximately $2.80 per Gascoyne share at the time of the announcement. As the Sons of Gwalia share price increased over the ensuing months, the value of the bid increased and became more attractive to Gascoyne shareholders.

Coeur d'Alene Activities

The following summarises the activities of Coeur d'Alene during this period:

- On 21 December 1995 Gasgoyne announced to the ASX that its directors had received a letter from Coeur d'Alene Mines Corporation of the US advising of its intentions to make a conditional takeover offer for the issued ordinary shares of Gasgoyne on the basis of 7 fully paid ordinary shares in Coeur d'Alene and A$60.00 for every 100 Gasgoyne shares.

- On the 22 December 1995 Coeur d'Alene lodged with Gasgoyne a Notice of Interest of Substantial Shareholder in which it advised that it and its associates held relevant interests in 19.9% of Gasgoyne shares.
- On the 31 January 1996 Coeur d'Alene served Gasgoyne with a Part A Statement but Sons of Gwalia commenced proceedings in the Federal Court where, *inter alia*, Sons of Gwalia sought declaration that the Coeur d'Alene's Part A Statement did not comply with the Corporations Law.

To also thwart Coeur d'Alene's efforts, on the 21 February 1996, Burmine lodged with Gasgoyne a Notice of Change in Interest of Substantial Shareholder in which it advised that it and its associates held relevant interests in 19.32% of Gasgoyne shares.

Orion

On the 24 January 1996 Coeur d'Alene announced to the ASX that it had acquired Homestake Mining Company's 5.5 million shareholding and 5 million options in Orion Resources for a total consideration of A$14.5m. Coeur d'Alene stated that when added to its existing Orion shareholding of 3.33 million shares, it would hold 13.1% of Orion's undiluted issued share capital and upon exercise of options, 19.2% on a fully diluted basis.

Later in 1996, Sons of Gwalia announced a $1.80 per share takeover offer for Orion Resources, declaring the bid with a total value of $130 million as final and unconditional on 23 September 1996 (Dixon 1996a). Orion's independent expert, Price Waterhouse, had estimated a low and high value for Orion at $1.92 and $2.14 per share respectively.

While the bid was rejected by the Orion directors, it was ultimately successful and Orion was delisted on the 12 November 1996 (Delisted 2009).

Burmine

On the 17 January 1996, Sons of Gwalia and Burmine announced to the ASX a proposal to merge by way of a scheme of arrangement. Sons of Gwalia would issue one Sons of Gwalia share for every two Burmine shares which would then be cancelled and extinguished under the scheme of arrangement (Sons of Gwalia, 1996).

Sons of Gwalia held approximately 9% of Burmine's issued share capital prior to the implementation of the scheme.

As at 26 February 1996, Burmine had strategic shareholdings of approximately 10% of the ordinary shares of Orion and approximately 19% of the ordinary shares of Gasgoyne.

Burmine was delisted on the 15 May 1996 following the completion of the scheme of arrangement (Delisted 2009a).

Assets

The major attraction of Gasgoyne and Orion were their 50% and 45% respective interests in the Yilgarn Star gold mine. Orion was the operator of the mine and which produced 110,000 oz in FY 1995 at low cash costs of A$269/oz. The companies also held a substantial tenement position in the Marvel Loch area (Sons of Gwalia, 1996).

Gasgoyne also had a 45% share in the Awak Mas gold project in South Sulawesi, Indonesia. Lone Star Exploration NL also owned 45% of this project and the remaining 10% was held by an Indonesia company. A total resource of 1.8 million ounces grading 2.02g/t was announced by Gasgoyne on the 11 January 1996 for the Awak Mas gold project (Sons of Gwalia, 1996).

Burmine's assets include three producing gold mines located near Southern Cross, namely: Copperhead, Golden Pig and Frasers. All mine production was processed through the Copperhead mill, approximately 35 kilometres north of Southern Cross and which had recent undergone an expansion in capacity to 1.2 million tonnes per annum (Sons of Gwalia, 1996).

Sons of Gwalia

Dixon (1997) reports that in 1997 Sons of Gwalia was one of the most aggressive corporate entities in Western Australia, mounting a successful $164 million takeover bid for Gasgoyne and merging with Burmine Ltd and Orion Resources NL, to emerge as a dominant player in the Yilgarn goldfield as well as in its own right in the Leonora region.

However, he also noted that Perth analysts had expressed concerns about the company's debt position after these manoeuvres, despite the company's forecasts of producing around 500,000 oz per year at a profit margin of around A$280/oz.

To address the debt position, Sons of Gwalia had agreed to sell its interest in the Awak Mas gold project to Lone Star for US$15 million, 10 million Lone Star shares and a royalty on future production. It also planned to sell a 13.8 per cent stake in Gasgoyne to Coeur d'Alene for $22.7 million. (Dixon, 1997). It also entered an in-principle agreement with Citibank for a $120 million facility to consolidate and refinance its current debt that arose from these acquisitions.

Dixon (1996) reports that Sons of Gwalia's director, Mr Chris Lalor, said he was comfortable with a cost per ounce through acquisition at about $80 per oz for Gascoygne. Sons of Gwalia had extensive hedging programs in place, and which at that time, returned an average of around $600 per oz.

In respect of Gascoyne, Delisted (2009b) reports that shareholders approved a selective reduction of capital to privatise Gasgoyne, with the result that the company became wholly-owned by Coeur d'Alene Mines Corporation and Sons of Gwalia. Gascoyne was delisted on the 14 February 1997.

Data Limitations

Unfortunately the share price series for Orion and Burmine are not available, primarily from the re-use of their ASX codes by more recent companies. Hence, this analysis has focused on Gascoyne as a target and the impact of the takeover on the Sons of Gwalia share price returns. It also analyses the Sons of Gwalia share price returns from the mergers with Orion and Burmine. Given 1996 was a year of corporate activity for Sons of Gwalia, a second event 252-day window has been included to highlight returns from a 252-day period from the 8 January 1997.

With regards to the Gascoyne takeover, Table 89A summarises the main parameters.

Table 89A. Takeover parameters for Gasgoyne bid.

Gasgoyne bid	
Bid Price (scrip: one SGW for three GGM)	$2.81
Bid premium over 30 day average share price	29.3%
Offer Value ($m)	$153
Date	17-Jan-96
Initial target director response	na
Takeover Completion	2H CY 1996

As evident in Table 90A, Sons of Gwalia was substantially larger than Gascoyne (and Burmine and Orion).

Table 90A. Relative bidder and target sizes.

Company Size Data	**Market Capitalisation prior to bid (A$m)**
Gasgoyne	$131
Sons of Gwalia	$556
Offer (final) value as percentage of Bidder	27.5%
Target size as percentage of Bidder	23.6%

Regression analysis has been carried out for the bidder and target to movements in the gold price (US$/oz or A$/oz). This indicated weak sensitivity for Gasgoyne during the estimation period to either gold price while Sons of Gwalia was more sensitive to the A$ gold price. Both share prices are sensitive to movements in the ASX Gold Index (Table 91A).

Table 91A. Regression analysis of the target and bidder.

Target	Gasgoyne	
	Estimation window (days)	252
Regression analysis		
ASX Gold Index	*observed t-result*	9.41
Spot Gold Price (A$/oz)	*observed t-result*	1.16
Spot Gold Price (US$/oz)	*observed t-result*	2.00
Intercept	*observed t-result*	3.13
Factors of significance used (>5%)		
ASX Gold Index	Slope	0.00252
	Intercept	-1.45976
	R^2	0.45
	Steyx	0.182
Model	Single factor	10.81
Actual versus Theoretical Returns regression error	Steyx	0.02564
Bidder	**Sons of Gwalia**	
	Estimation window (days)	252
Regression analysis		
ASX Gold Index	*observed t-result*	12.88
Spot Gold Price (A$/oz)	*observed t-result*	2.63
Spot Gold Price (US$/oz)	*observed t-result*	0.78
Intercept	*observed t-result*	3.55
Factors of significance (>5%)		
Spot Gold Price (A$/oz)	Slope	0.01126
ASX Gold Index	Slope	0.00849
	Intercept	-10.03614
	R^2	0.61
	Standard error	0.49
	F-statistic	196.9
	$SS_{regression}$	95.38
	$SS_{residual}$	60.33
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.01351

Table 92A outlines the cumulative abnormal returns at the time of the bid announcement and with the positive abnormal returns suggesting that the market believed that the consolidation of the Southern Cross area as a positive move.

Table 92A. Cumulative abnormal returns at the time of the offer announcement.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Target	5.9%	$2.41	54	$7.7
Bidder	0.9%	$7.74	72	$4.8

Table 93A outlines the cumulative abnormal returns for two post events windows; namely, Window 1 is following the Gasgoyne offer (22 January 1996 to 7 January

1997) while Window 2 is later from 7 January 1997 to 25 December 1997 to reflect the full effects of the consolidation of the three way merger.

Table 93A. Cumulative abnormal returns for two periods following the Gasgoyne bid.

Window	Days in post-event windows	Number of days of AR	CAR over period	Change in value (A$m)
1	252	18	18.0%	$100.0
2	252	42	23.9%	$133.0

Table 94A outlines the results of regression analysis in the Window 2 period for Sons of Gwalia. Interestingly the share price displays a greater sensitivity to the US$ gold price perhaps reflecting dilution of the company's large hedge book across a larger production and reserve base. It is not clear why there is diminished sensitivity to the ASX Gold Index during this period and it is perhaps reflecting company specific issues such as debt management problems.

Table 94A. Regression analysis in the post event period for Sons of Gwalia.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
ASX Gold Index	*observed t-result*	9.13	12.88	-29.1%
Spot Gold Price (A$/oz)	*observed t-result*	7.58	2.63	188.9%
Spot Gold Price (US$/oz)	*observed t-result*	7.63	0.78	880.1%

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Hill 50: Takeover by Harmony Gold Mining

On the 11 December 2001, Harmony Gold Mining Company of South Africa (Harmony) announced that it intended to make a cash offer of $1.35 for each Hill 50 Limited (Hill 50) share and 65 cents for each of its listed options. Harmony also stated that it would pay a further five cents in cash for each share, listed and unlisted options if the offer was accepted by holders of at least 90% of Hill 50's shares and options (Ferret, 2001)

Ferret (2001) report that Harmony had been advised that the Board of Hill 50 intended to recommend Harmony's offer in the absence of a higher offer, and to accept Harmony's offer in respect of their own shares and options. Harmony had also entered into pre-bid acceptance agreements with Hill 50's largest shareholder, Robert Pittorino, and an associated company.

Harmony reported that the acquisition of Hill 50 would represent an important step in the development of Harmony's Australian gold mining business and allowed the company to create a substantial integrated business with the potential to produce in excess of 1 million ounces of gold per annum in Australia. Harmony operated the Big Bell and Jubilee operations in Western Australia and which are near to Hill 50's major operations (Ferret, 2001).

On 8 March 2002, Harmony gained control of Hill 50 after its holding reached 53.1% (Ferret, 2001a). The company was delisted following compulsory acquisition on the 21 June 2002 (delisted, 2009).

Assets

Hill 50's main assets are the Mt Magnet operations n the Murchison Belt and the New Celebration operation south of Kalgoorlie, both in Western Australia, and the Maud Creek advanced exploration project in the Northern Territory.

Takeover details are summarised in Table 95A.

Table 95A. Takeover Parameters.

Bid Price ($1.35 but increased to $1.40 on 90% acceptance)	$1.40
Bid premium over 30 day average share price ($1.35)	24.0%
Bid premium over 30 day average share price ($1.40)	28.6%
Offer Value ($m) (based on $1.40)	$201
Date	11-Dec-01
Initial target director response	Recommend
Independent Valuation Range	na
Target director recommended acceptance	8-Mar-02
Takeover Completion	1H CY 2002

As evident in Table 96A, Hill 50 was around 10% the size of Harmony prior to the takeover announcement.

Table 96A. Bidder and target relative sizes.

Company Size Data	**Market Capitalisation prior to bid (A$m)**
Hill 50 Gold	$172
Harmony Gold Mining	$1,791
Offer (final) value as percentage of Bidder	11.2%
Target size as percentage of Bidder	9.6%

The regression analysis outlined in Table 97A indicates that the Hill 50 share price was sensitive to ASX Gold Index movements and the A$ gold price relative to the US$ gold price.

The Harmony share price was sensitive to all parameters tested with the gold price in Rand the most sensitive factor.

Table 97A. Regression analysis for both bidder and target.

Target	Hill 50	
	Estimation window (days)	252
Regression analysis		
ASX Gold Index	*observed t-result*	26.57
Spot Gold Price (A$/oz)	*observed t-result*	2.26
Spot Gold Price (US$/oz)	*observed t-result*	1.80
Intercept	*observed t-result*	1.31
Factors of significance used (>5%)		
ASX Gold Index	Slope	0.00152
Spot Gold Price (A$/oz)	Slope	-0.00041
	R^2	0.83
	Standard error	0.049
	F-statistic	412.6
	$SS_{regression}$	2.94
	$SS_{residual}$	0.59
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.02583695
Bidder	**Harmony Gold Mining**	
	Estimation window (days)	252
Regression analysis		
Philadelphia gold and silver index	*observed t-result*	9.32
Spot Gold Price (Rand/oz)	*observed t-result*	27.62
Spot Gold Price (US$/oz)	*observed t-result*	6.37
Intercept	*observed t-result*	1.58
Factors of significance (>5%)		
Philadelphia gold and silver index	Slope	56.01577
Spot Gold Price (Rand/oz)	Slope	2.94946
Spot Gold Price (US$/oz)	Slope	-23.91647
	R^2	0.86
	Standard error (reflects high gold values in Rand)	263.83
	F-statistic	490.2
	$SS_{regression}$	102,363,478
	$SS_{residual}$	17,262,903
Model	Three factor	
Actual versus Theoretical Returns regression error	Steyx	0.03174

Table 98A summarises the cumulative abnormal returns for the target at 12.4% and generating value of $21.4m for Hill 50 shareholders. There were no cumulative abnormal returns for Harmony.

Table 98A. Cumulative Abnormal Returns for the bidder and target over the 3-day event window.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Target	12.4%	$1.20	143	$21.4
Bidder (after rights issue)	0.0%	R 6,700	154	$0.0

However in the post event 252 day period Harmony is estimated to have experienced 48 days of abnormal returns with total cumulative abnormal returns of 43.1% over this period (Table 99A). This corresponded to a value increase of $773m to Harmony shareholders and while this exceeds the value of the Hill 50 offer, it is likely to be partly attributable to other acquisitions and the growth of the company at that time.

Table 99A. Post event window abnormal returns for Harmony.

Days in post-event windows	Number of days of AR	CAR over period	Change in value (A$m)
252	48	43.1%	$772.5

Interestingly, as highlighted in the regression analysis of Harmony, there is a significant increase in the sensitivity of the Harmony share price to the US$ gold price and a decrease in the sensitivity to the Rand gold price (Table 100A).

Table 100A. Regression analysis in the post event period.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
Philadelphia gold and silver index	*observed t-result*	9.84	9.32	5.5%
Spot Gold Price (Rand/oz)	*observed t-result*	5.24	27.62	-81.0%
Spot Gold Price (US$/oz)	*observed t-result*	21.70	6.37	240.5%

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Homestake Gold of Australia: Homestake Mining takeover

On the 14 August 1995, Homestake Mining (Homestake) announced that it would make a formal and unconditional takeover offer for Homestake Gold of Australia Limited (HGAL). The offer was either scrip (0.089 Homestake Mining shares for each share Homestake Gold share) or $1.90 cash per share (Business Wire 1995).

Homestake Mining previously owned 81.5% of HGAL and the time of the proposed transaction had a market value of approximately US$162 million for the HGAL minority interests (Business Wire 1995).

HGAL's main asset was a 50% ownership of the Kalgoorlie Super Pit and Mt Charlotte mines. The company's policy was not to hedge gold production.

The Offer document was sent to shareholders in late October 1995 and Homestake was required to include forecasts of future net income and cash flow which projected 1996 net income at US$38.5 million (Business Wire 1995a).

At December 31, 1995 a total of 38.9 million HGAL shares were acquired at a cost of US$59.1 million and leading to Homestake owning 88.1% of the shares of HGAL. The acquisition was completed in the first quarter of 1996 when the remaining 70.7 million publicly held HGAL shares were acquired at a cost of US$105.8 million, including $99.3 million for 6 million newly issued shares of the company, $5 million in cash and $1.5 million of transaction expenses. The total purchase price to acquire all of the 18.5% of HGAL held by minority shareholders was US$164.9 million, including US$141.7 million for 8.5 million newly issued shares of the company, US$19.5 million in cash and US$3.7 million of transaction expenses (SEC Info 1997). This indicates that only 12% of the final shareholders accepted cash and hence investors seeking cash are likely to have sold earlier on-market. Acquiring investors (funds) are likely to have sought to arbitrage any price differential and then accept Homestake Mining scrip as part of a longer term investment.

The company was delisted on the 26 February 1996 (Delisted 2009).

Takeover and Event Analysis

Table 101A summarises the takeover offer. The cash offer price has been used to determine the bid premium.

Table 101A. Takeover parameters.

Bid Price (A$1.90 or 0.089 HomeStake Mining for 1 Hometake Australia share)	$1.90
Bid premium over 30 day average share price (cash offer)	17.8%
Offer Value (A$m) (based on cash offer but for 18.5% interest not owned)	$208
Date	14-Aug-95
Initial target director response	Review
Independent Valuation Range	na
Target director recommended acceptance	na
Takeover Completion	1H CY 1996

The relative size of the companies is outlined in Table 102A. The offer has been scaled back to reflect the value to the minority interests in HGAL.

Table 102A. Relative bidder and target sizes.

Company Size Data	Market Capitalisation prior to bid (A$m)
Homestake Gold Australia	$923
Homestake Mining Company	$2,438
Offer (final) value as percentage of Bidder (outside equity interests only)	1.6%
Target size as percentage of Bidder (outside equity interest only)	7.0%

The regression analysis for both the bidder and target are outlined in Table 103A. With Homestake's no gold hedging policy, HGAL share price movements were more sensitive to the US$ gold price than A$ gold price over the 252-day estimation window.

It is unclear why Homestake Mining had a low sensitivity to the Philadephia Gold and Silver Index during this period.

Table 103A. Regression analysis for bidder and target.

Target	**HGAL**	
	Estimation window (days)	252
Regression analysis		
Spot gold price (US$/oz)	*observed t-result*	9.08
ASX Gold Index	*observed t-result*	40.24
Intercept	*observed t-result*	10.78
Factors of significance used (>5%)		
Spot gold price (US$/oz)	Slope	0.00752
ASX Gold Index	Slope	0.00146
	Intercept	-3.14264
	R^2	0.94
	Standard error	0.053
	F-statistic	1949.0
	$SS_{regression}$	10.82
	$SS_{residual}$	0.69
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.02693
Bidder	**Homestake Mining Company**	
	Estimation window (days)	252
Regression analysis		
Spot gold price (US$/oz)	*observed t-result*	7.51
Philadelphia Gold and Silver index	*observed t-result*	1.42
Intercept	*observed t-result*	6.97
Factors of significance (>5%)		
Spot gold price (US$/oz)	Slope	0.18804
	Intercept	-57.26979
	R^2	0.58
	Standard error	1.01
	F-statistic	171.1
	$SS_{regression}$	349.22
	$SS_{residual}$	254.09
Model	One factor	
Actual versus Theoretical Returns regression error	Steyx	0.01749

The cumulative abnormal returns for the target are presented in Table 104A for the event window around the bid announcement.

Table 104A. Cumulative abnormal returns in the bid event window.

	CAR	**Share Price prior to event**	**Shares on Issue (m)**	**Change in value (A$m)**
HGAL (A$m)	17.1%	$1.56	592	$158.2
Homestake Mining Company (US$m)	0.0%	$16.63	147	$0.0

The post event cumulative abnormal returns for the bidder are presented in Table 105A and like the zero returns above, are likely to reflect the significant ownership of the target prior to the bid announcement.

Table 105A. Cumulative abnormal returns in the 252-day post event window.

Days in post-event window	Number of days of AR	CAR over period	Change in value (US$m)
252	11	1.4%	$33.3

Lastly, Table 106A outlines a dramatic change in the sensitivity of the Homestake Mining share price to movements in the Philadelphia Gold and Silver Index and which appear unrelated to the takeover.

Table 106A. Regression analysis in the post-event window.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
Spot gold price (US$/oz)	*observed t-result*	5.77	7.51	-23.2%
Philadelphia Gold and Silver index	*observed t-result*	44.15	1.42	3001.5%

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Jubilee Mines: Xstrata plc takeover

On the 29 October 2007 Xstrata plc (Xstrata) and Jubilee Mines NL (Jubilee) announced that they had entered into a Bidding Agreement for an all-cash offer for a wholly owned subsidiary of Xstrata plc to acquire all of the issued and outstanding shares of Jubilee by way of a recommended off-market takeover offer.

The offer price was A$23.00 per share, valuing Jubilee at approximately $3.1 billion (US$2.9 billion). The offer price represented a 35% premium over the closing price of A$17.10 per Jubilee share on the ASX on 26 October 2007, a 36% premium over the volume weighted average price of Jubilee shares over the previous 30 trading days on the ASX and a 25% premium to Jubilee's all time record high share price (Xstrata, 2007).

Executive Chairman of Jubilee, Mr Kerry Harmanis and certain other shareholders, including the other directors and senior management of Jubilee had agreed to sell all of their Jubilee shares to Xstrata and no other party for $23.00 per share (Xstrata, 2007).

At the time, the $23 per share was considered a generous offer, particularly as Jubilee's main asset was the Cosmos nickel mine and which had a relatively short mine life based on the high grade ore associated with the first few production years.

The Xstrata offer received FIRB approval on the 7 November 2007 (Xstrata 2007a) and it declared the offer unconditional on the 31 January 2008 after it had attained a 61.66% relevant interest (Xstrata, 2008). The bid was closed on the 21 February 2008 (Xstrata, 2008a).

Assets

Jubilee owned and operated the Cosmos Nickel Project in the Mt Keith-Leinster region of WA. At the time of the bid, Jubilee had discovered eight high grade massive nickel sulphide deposits within the vicinity of the Cosmos Nickel Project, namely Cosmos, Cosmos Deeps, Alec Mairs (AM) 1, 2 and AM5, Prospero, Tapinos and Sinclair along with the large low grade Anomaly 1 deposit (Xstrata, 2007).

The company had also announced approval to develop its wholly owned Sinclair Nickel Project located 100km to the south of Cosmos with a new A$90 million standalone mine and processing facility (Xstrata, 2007).

An updated targeted production profile provided by Jubilee forecast high-grade production of nickel-in-concentrate increasing from 12,000 tonnes in 2007/08 to approximately 17,000 tonnes in 2008/09 and then to 22,000 tonnes in 2010/11 followed by around 30,000 tonnes per annum thereafter (Xstrata, 2007).

Takeover details are summarised in Table 107A.

Table 107A. Takeover Parameters.

Bid Price	$23.00
Bid premium over 30 day average share price	36.3%
Offer Value ($m)	$3,100
Date	29-Oct-07
Initial target director response	Recommended
Independent Valuation: low value	na
Independent Valuation: high value	na
Independent Valuation range (increase on low value)	na
Final bid over Independent Valuation mid point	na
Target director recommended acceptance	29-Oct-07
Takeover Completion	1H CY 2008

As evident in Table 108A, Jubilee was around 5% the size of Xstrata prior to the takeover announcement.

Table 108A. Bidder and target relative sizes.

Company Size Data	**Market Capitalisation prior to bid (A$m)**
Jubilee Mines	$2,170
Xstrata plc	$44,695
Offer (final) value as percentage of Bidder	6.9%
Target size as percentage of Bidder	4.9%

As outlined earlier, Jubilee was a nickel producer and contributed additional nickel exposure to Xstrata's then recent acquisition of Canadian Falconbridge (Table 109A).

Table 109A. Bidder and target main commodity exposures

	Promoted Commodity Exposure	Other Commodity Exposure
Jubilee Mines	Ni	
Xstrata	Cu, Ni, Coal	Zn, Pb, Ferrochrome, V

The regression analysis outlined in Table 110A indicates that the Jubilee share price was sensitive to S&P/ASX 300 Resources Index movements and the US$ spot LME nickel price. The sensitivity to the A$ nickel price was marginally lower than the US$ nickel price.

The Xstrata share price was sensitive to MSCI Metals and Mining and the FTSE 350 Mining Indices as well as the spot LME nickel price.

Table 110A. Regression analysis for both bidder and target.

Target	Jubilee Mines	
	Estimation window (days)	252
Regression analysis		
S&P/ASX 300 Resources Index	*observed t-result*	19.17
Spot LME nickel price (US$/lb)	*observed t-result*	24.75
Intercept	*observed t-result*	6.02
Factors of significance used (>5%)		
S&P/ASX 300 Resources Index	Slope	0.00145
Spot LME nickel price (US$/lb)	Slope	0.34115
	Intercept	2.98121
	R^2	0.76
	Standard error	0.781
	F-statistic	387.8
	$SS_{regression}$	473.03
	$SS_{residual}$	152.48
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.02402822
Bidder	**Xstrata plc**	
	Estimation window (days)	252
Regression analysis		
MSCI Metals & Mining	*observed t-result*	7.01
FTSE 350 Mining Index	*observed t-result*	6.08
Spot LME nickel price (US$/lb)	*observed t-result*	3.36
Intercept	*observed t-result*	2.47
Factors of significance (>5%)		
MSCI Metals & Mining	Slope	2.33967
FTSE 350 Mining Index	Slope	0.03511
Spot LME nickel price (US$/lb)	Slope	-2.72418
	Intercept	79.59474
	R^2	0.95
	Standard error	44.98
	F-statistic	1591.5
	$SS_{regression}$	9,660,795
	$SS_{residual}$	503,829
Model	Three factor	
Actual versus Theoretical Returns regression error	Steyx	0.02710

Table 111A summarises the cumulative abnormal returns for the target at 31.5% and generating value of $709.5 million for Jubilee shareholders. There were no cumulative abnormal returns for Xstrata over the three day event window.

Table 111A. Cumulative Abnormal Returns for the bidder and target over the 3-day event window.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Target	31.5%	$16.70	135	$709.5
Bidder (after rights issue)	0.0%	£18.91	972	$0.0

However in the post event 252-day period Xstrata is estimated to have experienced 15 days of abnormal returns with total cumulative abnormal returns of 17.9% over this period (Table 112A). This corresponded to a value increase of $8,021m to Xstrata shareholders and while this exceeds the value of the Jubilee offer, it is likely to also be attributable to other acquisitions and the growth of the company at this time.

Table 112A. Post event window abnormal returns for Xstrata.

Days in post-event window	Number of days of AR	CAR over period	Change in value (A$m)
252	15	17.9%	$8,021

Interestingly, as highlighted in the post event regression analysis of Xstrata, there is a significant decrease in the sensitivity of the Xstrata share price to the MSCI Metals and Mining Index while its sensitivity to the FTSE 350 Mining Index increased slightly. There is also a greater sensitivity to the nickel price and Xstrata had a greater sensitivity to the nickel price than to the copper price at this time (US$ terms) (Table 113A).

Table 113A. Regression analysis in the post event period.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
MSCI Metals & Mining	*observed t-result*	0.85	7.01	-87.9%
FTSE 350 Mining Index	*observed t-result*	7.64	6.08	25.8%
Spot LME nickel price (US$/lb)	*observed t-result*	5.14	3.36	53.0%

Overall, the takeover was considered expensive, particularly occurring as it did near the peak of the 2002 -2008 Resources Boom.

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Normandy Mining: Newmont takeover

On the 5 September 2001, South African AngloGold Limited (Anglo Gold) announced a scrip offer for Normandy Mining Limited (Normandy) valued at approximately A$3.2 billion (Normandy 2001). The offer was for 2.15 Anglo Gold shares for every 100 Normandy shares.

In a newsletter the AngloGold CEO is reported to state that the offer would provide Normandy shareholders with the opportunity to participate in a bigger, more diverse AngloGold and that with a successful transaction, AngloGold would have a combined annual production of over 9 million ounces and reserves of 106 million ounces (Normandy 2001a).

On 14 November, Newmont announced a competing cash and scrip bid for Normandy worth A$4 billion and entered into a deed of undertaking with Normandy containing "no talk/no shop" provisions and a break fee. Newmont also announced a merger with Franco-Nevada, a Canadian precious metals royalty company, and a lock-up agreement with Franco-Nevada over its 19.9% shareholding in Normandy (Allens Arthur Robinson, 2002).

The terms of Newmont's offer were 3.85 Newmont shares for every 100 Normandy shares plus an additional 5 cents per share if it achieved acceptances for 90% of Normandy shares (Normandy 2001b).

It the transaction was successful, Newmont stated that it would rank first in the world gold industry with respect to annual production and reserves and would have one of the lowest cash cost profiles in the industry (Normandy 2001b). The concurrent offer for Franco-Nevada was to be conducted through a Plan of Arrangement and while this offer had full support of the Franco-Nevada Board, it was conditional on Newmont acquiring a minium of 50.1% of Normandy.

On the 19 November 2001, Normandy Directors announced that they unanimously recommended shareholders reject the AngloGold offer (Normandy 2001c).

Later on the 26 November 2001, AngloGold announced it was challenging Newmont's offer, particularly believing it contravened Australian corporate law with the complications involving the Franco-Nevada deal and the anti-competitive nature of a 'break fee' ($38.33 million) with Normandy (Allens Arthur Robinson, 2002).

On the 29 November AngloGold announced an increase in its takeover offer by adding a cash payment of 20 cents per Normandy share. On the 10 December 2001 Newmont announced it would increase its offer by a cash payment of 35 cents per Normandy share and increasing the total cash payment to 40 cents per share (Normandy 2001f).

On 27 December 2001 AngloGold announced it had revised its unconditional offer (at that time) by adding a further unconditional cash payment of 10 cents per Normandy share to its current offer. The revised offer was 2.15 AngloGold shares for every 100 Normandy shares as well as 30 cents per Normandy share (Normandy 2001e). The increased offer loosely related to the ability for AngloGold to rationalise (sell) some Western Australian Normandy assets with Canadian Barrick Gold.

On the 3 January 2002 Newmont announced an increase in its offer by 10 cents cash per Normandy shares with the offer then standing at 3.85 Newmont shares and 50 cents cash (Normandy 2002). This bid was successful and Normandy Mining was eventually delisted on 1 July 2002 (Delisted 2009).

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An independent expert (Grant Samuel and Associates) was commissioned to provide a valuation Normandy in response to AngloGold's initial offer. The expert estimated a valuation range of $1.48 to $1.88 per Normandy share (Normandy 2001f).

Takeover Offers and Event Analysis

Details of the competing offers for Normandy are outlined in Table 114A and which indicate three rounds of bidding.

Table 114A. Key Parameters and dates of the takeover

Initial bid 1 - Anglo Gold	
Bid Price (2.15 Anglo shares for 100 NDY shares)	$1.42
Bid premium over 30 day average share price	25.6%
Offer Value ($m)	$3,169
Date	5-Sep-01
Initial target director response	Review
Counter bid 1 - Newmont	
Bid Price (0.0385 NEM shares per NDY share plus 5 cents per share for 90% acceptance)	$1.70
Bid premium over 30 day average share price	50.4%
Offer Value ($m)	$3,794
Date	14-Nov-01
Initial target director response	Recommended
Increased bid 2 - Anglo Gold	
Bid Price (2.15 Anglo shares for 100 NDY shares plus 20 cents per share)	$1.70
Bid premium over 30 day average share price	50.4%
Offer Value ($m)	$3,794
Date	29-Nov-01
Initial target director response	Rejection
Counter bid 2 - Newmont	
Bid Price (0.0385 NEM shares per NDY share plus 40 cents per share)	$1.83
Bid premium over 30 day average share price	61.89%
Offer Value ($m)	$4,084
Date	10-Dec-01
Increased bid 3 - Anglo Gold	
Bid Price (2.15 Anglo shares for 100 NDY shares plus 30 cents per share)	$1.84
Bid premium over 30 day average share price	62.77%
Offer Value ($m)	$4,106
Date	27-Dec-01
Initial target director response	Review
Counter bid 3 - Newmont (successful offer)	
Bid Price (0.0385 NEM shares per NDY share plus 50 cents per share)	$1.93
Bid premium over 30 day average share price	70.74%
Offer Value ($m)	$4,307
Date	3-Jan-02
Initial target director response	Recommended
Independent Valuation: low value (from initial valuation)	1.48
Independent Valuation: high value (from initial valuation)	1.88
Independent Valuation range (increase on low value)	27.0%
Final bid over Independent Valuation mid point	114.9%
Target director recommended acceptance	14-Nov-01
Takeover Completion	mid CY 2002

The size of Normandy relative to AngloGold and Newmont is outlined in Table 115A with Newmont being substantially larger than both the other companies.

Table 115A. Bidder, offer and target sizes.

Company Size Data	Market Capitalisation prior to bid (A$m)
Normandy Mining	$2,366
Anglo Gold	$3,366
Newmont	$8,620
Offer (final) value as percentage of Bidder (Newmont)	50.0%
Target size as percentage of Bidder (Newmont)	70.3%

Regression analysis has been carried out with the gold price in US$ terms except in the case of AngloGold where the share price exhibited a greater sensitivity to the Rand gold price. Normandy was regressed against the Australian Gold Index (now defunct) while both the international companies were regressed against the Philadelphia Gold and Silver Index (Table 116A).

Table 116A. Estimation window parameters.

Target	Normandy	
	Estimation window (days)	252
Regression analysis		
Australian gold index	*observed t-result*	35.10
Spot gold price (US/oz)	*observed t-result*	2.86
Intercept	*observed t-result*	4.92
Factors of significance used (>5%)		
Australian gold index	Slope	0.00165
Spot gold price (US/oz)	Slope	0.00132
	Intercept	-0.54086
	R^2	0.88
	Standard error	0.034
	F-statistic	906.8
	$SS_{regression}$	2.12
	$SS_{residual}$	0.29
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.01406

Bidder	Anglo Gold	
	Estimation window (days)	252
Regression analysis		
Philadelphia gold and silver index	*observed t-result*	12.79
Spot gold price (Rand/oz)	*observed t-result*	5.15
Intercept	*observed t-result*	6.75
Factors of significance (>5%)		
Philadelphia gold and silver index	Slope	229.26014
Spot gold price (Rand/oz)	Slope	5.30241
	Intercept	-10932.56
	R^2	0.72
	Standard error	941.77
	F-statistic	313.1
	$SS_{regression}$	555,392,901
	$SS_{residual}$	220,845,236
Model	Three factor	
Actual versus Theoretical Returns regression error	Steyx	0.02375

Bidder	Newmont	
	Estimation window (days)	252
Regression analysis		
Philadelphia Gold and Silver index	*observed t-result*	54.14
Spot gold price (US/oz)	*observed t-result*	5.73
Intercept	*observed t-result*	9.77
Factors of significance (>5%)		
Philadelphia Gold and Silver index	Slope	0.47208
Spot gold price (US/oz)	Slope	0.04483
	Intercept	-18.78724
	R^2	0.94
	Standard error	0.59
	F-statistic	2130.5
	$SS_{regression}$	1,493.92
	$SS_{residual}$	87.30
Model	Three factor	
Actual versus Theoretical Returns regression error	Steyx	0.01251

Table 117A summarises the cumulative abnormal returns for the target at only 10.3% and generating value of $244m for Normandy shareholders. There were negative cumulative returns for both AngloGold and Newmont at each successive bid except for the final offer by AngloGold. The negative cumulative abnormal returns did decrease at the announcement of each successive offer for each bidder.

Table 117A. Cumulative Abnormal Returns for the bidder and target over the 3-day event window.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Target: Initial bid 1 - Anglo Gold	10.3%	$1.06	2,232	$244.0
Target: Counter bid 1 - Newmont	0.0%	$1.44	2,232	$0.0
Target: Increased bid 2 - Anglo Gold	0.0%	$1.51	2,232	$0.0
Target: Counter bid 2 - Newmont	0.0%	$1.68	2,232	$0.0
Target: Increased bid 3 - Anglo Gold	0.0%	$1.82	2,232	$0.0
Target: Counter bid 3 - Newmont (successful offer)	0.0%	$1.82	2,232	$0.0
Initial bid 1 - Anglo Gold (Rand)	-7.6%	R 13,949	108	-$257.4
Counter bid 1 - Newmont (US$)	-5.4%	$23.30	195	-$469.7
Increased bid 2 - Anglo Gold (Rand)	-6.6%	R 2,315	108	-$36.6
Counter bid 2 - Newmont (US$)	-3.4%	$20.28	195	-$252.2
Increased bid 3 - Anglo Gold (Rand)	0.0%	R 2,310	108	$0.0
Counter bid 3 - Newmont (US$)	-2.5%	$19.02	195	-$177.6

The Normandy takeover highlights one of the limitations of event analysis where there is a lack of significance with the relatively small but competitive bidding and AngloGold more or less matching the Newmont bids. Thus the total cumulative abnormal returns were estimated at 10.3% from the initial bid to the last event window at the time of the winning Newmont bid and these abnormal returns were generated on the 5 September 2001 at 10.3%. This is despite the final Newmont offer being at a 71% premium to the 30 day average share price prior to the initial bid on the 5 September 2001.

In a 252-day post event period, Newmont did gain cumulative abnormal returns of 5.1% (Table 118A).

Table 118A. Cumulative abnormal gains for Newmont in a 252-day post event period.

Days in post-event windows	Number of days of AR	CAR over period	Change in value (A$m)
252	27	5.1%	231

Table 119A highlights a general decline in the sensitivity of Newmont's share price to the Philadelphia Gold and Silver Index and the US$ gold price, perhaps reflecting inherited hedging from Normandy.

Table 119A. Regression analysis in the post event period for Newmont.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
Philadelphia Gold and Silver index	*observed t-result*	27.96	54.14	-48.3%
Spot gold price (US/oz)	*observed t-result*	4.45	5.73	-22.2%

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North: Rio Tinto takeover

The competitive bidding for North Limited (Norths) has been previously discussed in Chapter 4 as a case study. Recapping, on 23 June 2000, Rio Tinto announced its intention to make a takeover offer for all the listed shares of Norths that it did not already own for cash of $3.80 per share. The offer was made by Rio Tinto Investments Pty. Limited, a wholly owned subsidiary of Rio Tinto and valued Norths at A$2.80 billion (Rio Tinto 2000).

Rio Tinto also announced that it had acquired a 14.5% interest (106,894,910 shares) in Norths through on-market purchases with a maximum price of $3.80 per share.

During the takeover process, Rio Tinto announced it had received approval for the acquisition from FIRB on the 24 July 2000 (Rio Tinto 2000a) and in the following month it received approval from the European Commission and the ACCC (Rio Tinto 2000b). These approvals were key conditions of the bid.

As also mentioned in Chapter 4, Rio Tinto's bid for Norths was targeting potential synergies between both companies' iron ore operations in the Pilbara of Western Australia (RIO 2000, Wisenthal, 2000, Counsel, 2000). It followed a breakdown in negotiations between the companies over access to Rio Tinto's extensive railway infrastructure near the North's controlled Robe River iron ore operations. On behalf of the Robe River Associates, Norths had been seeking access to Rio Tinto's Hamersley's rail facilities. This was estimated to save around $350 million of the total $1 billion cost of developing the 20 million tonnes per annum West Angelas mine. Hamersley Iron also had limited capacity at its port facilities in Dampier and the economics of expanding this capacity were not as attractive as expanding North's Cape Lambert port. (Counsel, 2000).

The takeover also diversifid Rio Tinto's iron ore production into a mix of pellets and lump ore and also provided the company with a strategic entry into North America. Norths was rumoured at the time to be bidding for Brazil's second largest iron ore producer, Caemi (Counsel, 2000).

The importance of North’s iron ore assets were underlined by Rio Tinto’s CEO when he stated that ``By combining our companies' iron ore businesses, we will become the world's second largest producer with diversified resources, products and markets," (Rio Tinto 2000).

On 22 July 2000, Anglo American plc (Anglo) announced it was preparing a competing offer for Norths with a cash bid of $4.20 per share. The sum would be payable after a 5 cent dividend and was unanimously recommended by North directors "in the absence of a higher offer". As with the earlier Rio Tinto $3.80 bid, it was focused on the value of North’s iron ore businesses (North 2000).

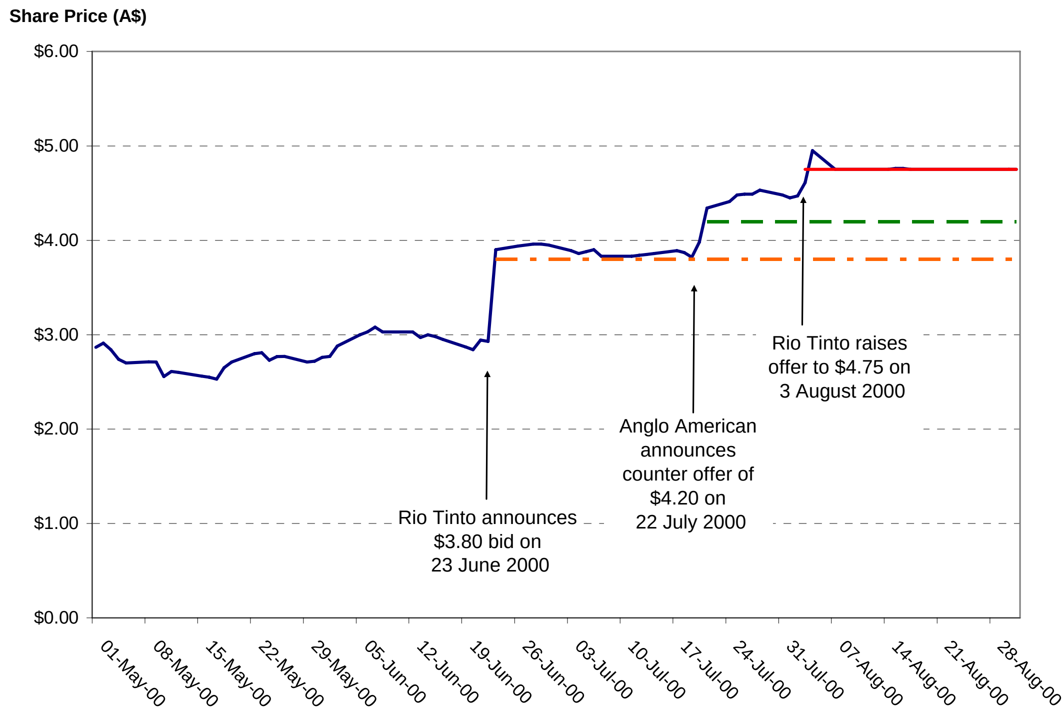
In response to the competing offer from Anglo American, Rio Tinto announced that it was increasing its bid to $4.75 on 3 August 2000 and declared that this bid was unconditional (Rio Tinto 2000c). It also stated that it would shorten payment terms to within three business days of valid acceptances being received (Rio Tinto 2000c).

Rio Tinto’s increased offer was made prior to the lodgement of Anglo's offer documentation. As Anglo’s offer still remained subject to a number of conditions, including FIRB approval, it was never formally submitted to shareholders.

The increased bid was successful and Rio Tinto announced that it had completed compulsory acquisition of minority interests in Norths on 10 October 2000 (Rio Tinto 2000d).

North’s share price and bid levels as presented in Figure 70 (Chapter 4) and are also presented in Figure 2A.

Figure 2A. North’s share price and bid levels. Note the successive over running by the share price at each announced bid price before trending towards that bid price.



(Share price data sourced from Stock Resource, bids from Norths, Rio Tinto & Anglo American announcements).

Target Board Recommendation.

On the advice from the independent expert (Grant Samuel), the Board rejected the first offer of $3.80 per share as undervaluing the company and not being fair and reasonable.

However North’s directors unanimously recommended Anglo’s competing cash bid of $4.20 per share "in the absence of a higher offer" with Anglo appearing as a ‘white knight’. This offer forced Rio Tinto to increase its offer to $4.75 per share and declare this offer unconditional.

North’s Assets

Norths was an international mining group with interests in iron ore, base metals, uranium and wood fibre. Its major business interests comprised:

- An effective 53% interest in Robe River iron Associates (Robe River) in Western Australia, a joint venture that produces approximately 30 milliont tonnes per annum of sinter feed and lump ore from its Pannawonica operations. Robe River had announced that it intended to proceed with the development of a major new iron ore project at West Angelas;

- A 56.1% shareholding in the Iron Ore Company of Canada Limited (IOC), which produced approximately 12.5 million tonnes per annum of pellets and 4.5 million tonnes per annum of iron concentrates at its Carol Lake operations in the province of Labrador and Newfoundland, Canada. At that time IOC had recently announced the re-activation and expansion of additional pellet production capacity at Sept-Iles, Quebec;
- Ownership (100%) of the Zinkgruvan zinc mine in Sweden, an 80% interest in the North Parkes copper-gold mine in New South Wales, and an effective 25% interest in Minera Alumbrera Limited (Minera Alumbrera), a company which operates the Alumbrera copper-gold mine in Argentina;
- A 68.4% shareholding in Energy Resources of Australia Limited (ERA), an ASX listed company which produces approximately 5,000tpa of uranium from the Ranger mine in the Northern Territory. Ranger was the second largest uranium mine in the world; and
- 100% of North Forest Products (Forest Products), a wood fibre business which had significant plantation and forest interests and operated four timber processing facilities in Tasmania. It was Australia's largest exporter of woodchips to Japan.

Norths directors commissioned an independent expert's report on the value of Norths and whether the offers were fair and reasonable. A summary of this valuation is presented in Table 120A. The independent expert (Grant Samuel) concluded that Rio Tinto's offer price of $3.80 per share undervalued Norths and the offer was not fair and reasonable.

Table 120A. Independent Valuation of North.

	Interest	Valuation Low US$	High US$	Valuation Low A$m	High A$m
Rober River Iron Associates	53%			1218	1419
Iron Ore Company of Canada	56.10%	450	510	750	850
Total iron ore assets				1968	2269
Minera Alumbrera	25%	120	140	200	233
Northparkes	80%	125	145	208	242
Zinkgruvan	100%	200	220	333	367
Lake Cowal gold project	100%			35	45
Yakabindie nickel project	100%			20	30
Regional exploration	100%			47	73
Total base metal assets				843	990
Energy Resources of Australia	68.40%			375	440
North Forest Products	100%			340	380
Hedge book				-15	-10
Corporate overheads				-85	-85
Total other businesses				615	735
Total enterprise value				3427	3994
Cash at 30 June 2000				97	97
Loans and amounts receivable (net)				116	116
External borrowings at 30 June 2000				-94	-94
US bonds		-200	-200	-333	-333
Net debt				-214	-214
Value of net assets				3213	3780
Shares on issue (millions)				737.2	737.2
Net value per share				4.56	5.13
Net value per share - diluted for options				4.34	5.09

From Norths (2000)

Rio Tinto's Intentions

RIO publicly indicated that once it gained control of North, it would sell most of the other assets, including its majority-owned ERA, forestry and woodchipping and zinc operations. It would keep the copper-gold mining interests, including the North Parkes mine in NSW (Counsel, 2000).

Event Analysis

Details of the two offers by RIO and the proposed offer by Anglo American are outlined in Table 121A.

Table 121A. Key Parameters and dates of the takeover.

Takeover Parameters	
Initial bid - Rio Tinto	
Bid Price	$3.80
Bid premium over 30 day average share price	34.6%
Offer Value ($m)	$2,801
Date	23-Jun-00
Initial target director response	Rejection
Counter bid - Anglo American	
Bid Price	$4.20
Bid premium over initial 30 day average share price	48.8%
Offer Value ($m)	$3,096
Date	22-Jul-00
Initial target director response	Recommended
Increased bid - Rio Tinto	
Bid Price	$4.75
Bid premium over initial 30 day average share price	68.3%
Offer Value ($m)	$3,502
Date	3-Aug-00
Initial target director response	Recommended
Independent Valuation: low value	4.34
Independent Valuation: high value	5.09
Independent Valuation range (increase on low value)	17.3%
Final bid over Independent Valuation mid point	100.7%
Target director recommended acceptance	7-Aug-00
Takeover Completion	2H CY 2000

As the Anglo bid was never formalised and was unsuccessful, this analysis has focused on impacts of the successive bids on Norths and Rio Tinto share prices only. Table 122A outlines the Bidder and Target sizes immediately prior to the first bid announcement. The total value of the final Norths bid still only represented less than 12% of the size of Rio Tinto. Norths was also just over 7% of the size of Rio Tinto prior to the initial offer (see Table 123A).

Table 123A. Bidder, offer and target sizes.

Company Size Data	Market Capitalisation prior to bid (A$m)
North	$2,170
Rio Tinto	$29,713
Offer (final) value as percentage of Bidder	11.8%
Target size as percentage of Bidder	7.3%

Table 124A outlines the main commodity exposure of Norths as well as Rio Tinto. As mentioned earlier, the WA iron ore synergies were attractive to Rio Tinto with the other assets considered as 'non-core'. However it is likely Anglo was more interested in the total portfolio given it also has forestry interests and it was keen to build its presence in Australia.

Table 124A. The main commodity exposure of the Target and Bidder.

	Promoted Commodity Exposure	Other Commodity Exposure
Norths	Fe, Cu, U	Forestry, Zn, Au
Rio Tinto	Fe, Cu, Al	U, Au, Ti, Industrial minerals

Regression analysis for a number of parameters was conducted over a 252-day estimation window for both Norths and Rio Tinto. Unfortunately, annual contract prices for iron fines or Indian spot iron ore prices (INWPIRON Index from Bloomberg) which change in periods of a month or longer provided no statistical significance to movements in the Norths share price. However, the spot LME copper price was found to be more significant than the LME three month forward copper price while the ASX Accumulation All-Resources Index was found to be more sensitive than the ASX Other Metals Index. Hence a regression analysis was rerun using these parameters as outlined in Table 125A.

Similarly, regression analysis was conducted over a 252-day estimation window for Rio Tinto. Factors of significance were the MSCI Metals and Mining Index, the ASX Accumulation All-Resources Index and both the spot and three-month forward copper prices. Regression was rerun using the MSCI Metals and Mining Index, the ASX Accumulation All-Resources Index and the three-month forward LME copper price. The international MSCI Metals and Mining Index was included to diversify the analysis from the ASX given the influence of both Rio Tinto and Norths on ASX indices. However, this was deemed unnecessary in analysis of the Rio Tinto takeover of Comalco given Rio Tinto already owned 72.43% of Comalco prior to its Comalco bid.

Table 125A. Estimation window parameters

Target	**Norths**	
	Estimation window (days)	252
Regression analysis		
Fines contract pricing	*observed t-result*	na
LME Spot Copper Price (offset by one day)	*observed t-result*	7.29
3mth forward LME copper price (offset by one day)	*observed t-result*	6.10
ASX Acumulation All Resources Index	*observed t-result*	5.71
Other Metals	*observed t-result*	3.32
Intercept	*observed t-result*	6.45
Factors of significance used (>5%)		
LME Spot Copper Price (offset by one day)	Slope	-4.86136
ASX Acumulation All Resources Index	Slope	0.00113
	Intercept	1.88193
	R^2	0.60
	Standard error	0.208
	F-statistic	186.3
	$SS_{regression}$	16.17
	$SS_{residual}$	10.81
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.02171
Bidder	**Rio Tinto**	
	Estimation window (days)	252
Regression analysis		
HSBC Global Mining Index	*observed t-result*	0.64
MSCI	*observed t-result*	11.72
LME Spot Copper Price	*observed t-result*	6.85
3mth forward LME copper price	*observed t-result*	7.02
ASX Acumulation All Resources Index	*observed t-result*	11.07
Intercept	*observed t-result*	7.55
Factors of significance (>5%)		
ASX Acumulation All Resources Index	Slope	0.00418
MSCI Metals & Mining Index	Slope	0.10480
3mth forward LME copper price	Slope	-4.99495
	Intercept	-7.97818
	R^2	0.90
	Standard error	0.01
	F-statistic	726.3
	$SS_{regression}$	723.35
	$SS_{residual}$	82.33
Model	Three factor	
Actual versus Theoretical Returns regression error	Steyx	0.01514

Table 126A, outlines the cumulative abnormal returns for Norths and Rio Tinto and uses three event windows; namely, Rio Tinto's first bid on the 23 June 2000, Anglo's purported bid around the 22 July 2000 and then Rio Tinto's increased bid on 3 August 2000. With the uncertainty associated with the exact timing of the Anglo offer, this event window has been increased to five days with the others remaining at three days.

The cumulative abnormal returns (CAR) for Norths is zero and reflects the relatively high standard error in the regression compared to the 34.6% first bid premium over the previous 30-day average. During the event window a raw premium of 28.6% on the 23 June 2000 reduces to 25.8% after adjusting for theoretical pricing movements and dividing this by the standard error (0.208) leaves a non-significant abnormal return at the 5% confidence level.

In the case of Rio Tinto, it experienced negative abnormal returns during the events (Tables 126A).

Table 126A. Cumulative abnormal returns over a 3-day event window.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Norths	38.9%	$2.94	737	$844.4
Rio Tinto	-8.3%	$19.02	1,562	-$2,476.1

However, in the post event period Rio Tinto gained cumulative abnormal returns of 15.9% which offsets a large proportion of the cost of bid and leaving a net deficit of $1.2 billion from an acquisition cost of $3.5 billion (Table 127A).

Table 127A. Bidder abnormal returns in a 252-day post-event window.

Days in post-event window	Number of days of AR	CAR over period	Change in value (A$m)
252	8	15.9%	$4,727.4

In the post-event window for Rio Tinto, the level of significance of both indices to share price movements fell but particularly to the ASX Accumulation All-Resources

Index. However, the significance of the copper price did markedly increase (Table 128A).

Table 128A. Post event window analysis

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
ASX Acumulation All Resources Index	*observed t-result*	5.59	14.06	-60.2%
MSCI Metals & Mining Index	*observed t-result*	10.42	12.01	-13.2%
3mth forward LME copper price	*observed t-result*	7.17	3.69	94.2%

In summary, Rio Tinto's acquisition of Norths is likely to be regarded as successful given the cumulative abnormal returns during the post-event window offset a significant proportion of the value of the negative abnormal returns at the time of the announcement of offers and the overall cost of the acquisition. The final offer was also at the mid point of the independent expert's valuation despite the competitive nature of the bid. However, the reduced level of significance of the ASX Accumulation All-Resources Index and the MSCI Metals & Mining Index remains unclear, perhaps reflecting greater leverage to iron ore and annual contract pricing as evident five years earlier in the RTZ-CRA dual listing.

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Placer Pacific: Placer Dome takeover

On the 28 November 1996 Canadian Placer Dome announced that it was offering one of its shares for every 15 shares in Placer Pacific and which valued Placer Pacific at $2.03 per share (New York Times 1996).

Placer Dome previously held 75.2% of Placer Pacific and the offer was to purchase the 24.8% minority interest of Placer Pacific Limited. The takeover was completed on April 11, 1997 (Placer Dome 2000).

At the same time Placer Dome also proposed to buy Highlands Gold Limited with Highlands Gold directors rejecting the offer. The acquisitions were designed to give Placer Dome control of the Porgera gold mine in Papua New Guinea (New York Times 1996). Placer Pacific held a 25 percent interest in the Porgera mine and had an 80 percent interest in the Misima silver-gold mine, which was also in Papua New Guinea. It had interests in the Kidston and Granny Smith gold mines and the Osborne copper-gold mine in Australia.

The bid was successful with no complicating factors and Placer Pacific was delisted on the 12 May 1997 (Delisted 2009).

Takeover and Event Analysis

Details of the takeover are presented in Table 129A. There are no available reports on the recommendation by the independent directors and an independent valuation was not commissioned.

Table 129A. Takeover parameters.

Bid Price (1 Placer Dome for 15 Placer Pacific shares)	$2.04
Bid premium over initial 30 day average share price	35.4%
Offer Value (A$m) (adjusted for initial Placer Dome interest)	$317
Date	28-Nov-96
Initial target director response	na
Independent Valuation: low value	na
Independent Valuation: high value	na
Independent Valuation range (increase on low value)	na
Final bid over Independent Valuation mid point	na
Target director recommended acceptance	na
Takeover Completion	1H CY 1997

Table 130A compares the size of the target and bidder. The low offer size as a percentage of the bidder reflects the prior interest in Placer Pacific which was owned by Placer Dome.

Table 130A. Size of target and bidder.

Company Size Data	**Market Capitalisation prior to bid (A$m)**
Placer Pacific	$852
Placer Dome	$9,540
Offer (final) value as percentage of Bidder	3.3%
Target size as percentage of Bidder	8.9%

The regression analysis of the target and bidder are presented in Table 131A. Share price movements in Placer Pacific were found to be more sensitive to the A$ gold price than the US$ gold price during the estimation window.

Table 131A. Regresssion analysis of bidder and target.

Target	Placer Pacific	
	Estimation window (days)	252
Regression analysis		
ASX Gold Index	*observed t-result*	13.19
Spot Gold price in (A$/oz)	*observed t-result*	23.28
Spot Gold Price (US$/oz)	*observed t-result*	7.75
Factors of significance used (>5%)		
ASX Gold Index	Slope	0.00169
Spot Gold price in (A$/oz)	Slope	0.01877
	Intercept	35.09807
	R^2	0.89
	Standard error	0.181
	F-statistic	969.9
	$SS_{regression}$	63.47
	$SS_{residual}$	8.15
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.02397
Bidder	**Placer Dome**	
	Estimation window (days)	252
Regression analysis		
Philadelphia gold and silver index	*observed t-result*	30.35
Spot Gold Price (US$/oz)	*observed t-result*	5.37
Factors of significance (>5%)		
Philadelphia gold and silver index	Slope	0.24901
Spot Gold Price (US$/oz)	Slope	0.00944
	Intercept	-0.80715
	R^2	0.92
	Standard error	0.81
	F-statistic	1451.4
	$SS_{regression}$	1,886.70
	$SS_{residual}$	162.49
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.00855

Table 132 presents the cumulative abnormal returns for the target and bidder. The relatively generous bid, albeit 'foreign scrip', generated a strong abnormal return.

Table 132A. Cumulative abnormal returns for the bidder and target.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Target	37.8%	$1.36	627	$322.4
Bidder	0.0%	$33.30	312	$0.0

In the 252-day post event window, Placer Dome did not gain significant abnormal returns (Table 133A).

Table 133A. Post event cumulative abnormal returns for the bidder.

Days in post-event window	Number of days of AR	CAR over period	Change in value (A$m)
252	20	1.4%	$4.5

Lastly, Placer Dome demonstrated a greater sensitivity to the spot US$ gold price in the post event period (Table 134A).

Table 134A. Post event regression analysis.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
Philadelphia gold and silver index	*observed t-result*	30.35	31.23	-2.8%
Spot Gold Price (US$/oz)	*observed t-result*	5.37	0.88	509.6%

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Plutonic: Homestake takeover

On the 23 December 1997 Homestake Mining Company of the US (Homestake) announced a takeover bid for Plutonic Resources in a scrip deal which offered 34 Homestake shares for 100 Plutonic shares. It was regarded as a generous offer that provided Plutonic shareholders with a 30 per stake in Homestake. As a consequence of the takeover, Homestake would also become the third-largest gold producer in North America.

The announcement of the bid is reported to have triggered widespread investment in what was considered a depressed gold sector at that time (Salmons 1997). The increase in the Plutonic share price was also seen as an endorsement by institutional investors by Salmons (1997), particularly given the deal valued Plutonic shares at $5.20 when the deal was announced relative to the $2.80 share price that the company was trading at prior to the announcement of the offer.

However, increasing confidence of the likely success of the bid led to some selling pressure on Homestake as investors switched out of Homestake and into Plutonic to participate in an arbitrage opportunity from different market valuations. This arbitrage was typically in the 5 – 8% per cent range (Hextal, 1997).

Overall, the timing (close to Christmas), and the attractiveness of the offer which itself was to partly to compensate for payment in US scrip, led to a low key and relatively quick takeover. No independent expert's report was prepared and the company was delisted on the 26 June 1998 (Delisted, 2009).

Lastly Hextal (1998b) reports that Plutonic announced a large but expected A$62.29 million net loss for the year ending 31 December 1997 and which included $84.3 million of abnormal losses, largely made during the first half of CY 2007 when the company decided to write down the carrying value of most of its projects to reflect lower gold prices. The company reported a $40.7 million net profit in the previous year.

While there is likely to be an element of ‘cleaning the balance sheet’ prior to completion of the Homestake takeover, Hextal (1998a) cites that Plutonic’s CEO, Mr Ron Hawkes said that the Australian gold industry remained a tough business despite record 1997 production. He noted capital raising was extremely difficult and led to a drying-up of exploration funding which was reducing support for the entrepreneurial spirit which had provided the impetus for the industry's rapid growth in the previous 15 years.

This commentary is interesting as it reiterates a subdued industry at this time.

Assets

The main assets of Plutonic were the three WA gold mines, namely:

- Plutonic project, now in underground production
- Darlot project
- Lawlers project.

However, the flagship project was the Plutonic mine. The company also owned the higher-cost and smaller Peak Hill and Mount Morgans mines which were expected to close during 1998 (Hextal 1998).

Takeover Parameters and Event Analysis

Table 135A outlines the broad takeover parameters for the Plutonic takeover.

Table 135A. Takeover parameters.

Bid Price (34 Homestake US for 100 PLU shares)	$5.31
Bid premium over initial 30 day average share price	127.4%
Offer Value ($m)	$999
Date	23-Dec-97
Initial target director response	Recommended
Independent Valuation: low value	na
Independent Valuation: high value	na
Independent Valuation range (increase on low value)	na
Final bid over Independent Valuation mid point	na
Target director recommended acceptance	7-Aug-00
Takeover Completion	2H CY 2000

The size of the companies is presented in Table 136A. The market capitalisation of Homestake is converted to A$ at the prevailing exchange rates immediately before the event window of the offer announcement. It is evident Plutonic was only around 13% of the size of Homestake prior to the bid announcement.

Table 136A. Company size comparisons.

Company Size Data	Market Capitalisation prior to bid (A$m)
Plutonic Resources	$527
Homestake Mining Company	$4,112
Offer (final) value as percentage of Bidder	24.3%
Target size as percentage of Bidder	12.8%

The US$ spot gold price and a relevant gold index have been used in the regression analysis of each company as outlined in Table 137A.

Table 137A. Regression analysis of Plutonic and Homestake Mining Company.

Target	Plutonic Resources	
	Estimation window (days)	252
Regression analysis		
Spot Gold Price (US$/oz)	*observed t-result*	5.15
ASX Gold Index	*observed t-result*	13.13
Intercept	*observed t-result*	7.77
Factors of significance used (>5%)		
Spot Gold Price (US$/oz)	Slope	0.01422
ASX Gold Index	Slope	0.00421
	Intercept	-4.79866
	R^2	0.94
	Standard error	0.233
	F-statistic	1995.8
	$SS_{regression}$	217.50
	$SS_{residual}$	13.57
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.02923259

Bidder	Homestake Mining Company	
	Estimation window (days)	252
Regression analysis		
Spot Gold Price (US$/oz)	*observed t-result*	3.43
Philadelphia Gold and Silver index	*observed t-result*	22.47
Intercept	*observed t-result*	7.11
Factors of significance (>5%)		
Spot Gold Price (US$/oz)	Slope	-0.01282
Philadelphia Gold and Silver index	Slope	0.12420
	Intercept	5.58978
	R^2	0.89
	Standard error	0.48
	F-statistic	1012.8
	$SS_{regression}$	457.91
	$SS_{residual}$	56.29
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.01244

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QCT Resources: takeover by BHP and Mitsubishi

On the 28 August 2000 BHP Billiton and Mitsubishi Development Pty. Ltd. (Mitsubishi) announced a joint cash offer of A$1.20 per share for all of the ordinary shares in QCT Resources Limited (QCT). The offer by the 50/50-owned bidding vehicle, MetCoal Holdings (Qld) Pty Ltd (MetCoal), valued QCT's equity at A$830 million (BHP 2000).

The directors of QCT Resources recommended that its shareholders reject the offer and commissioned an independent expert valuation to be carried out by Grant Samuel. The independent expert estimated a low and high valuation for QCT of $1.57 and $1.89 per share respectively (Highbeam, 2000).

BHP (2000) reported at that time that QCT Resources' major shareholder, Santos, had announced that its 36.4% shareholding in the company was considered non-core to the company's future. It therefore believed that it was the appropriate time for BHP and Mitsubishi to address the ownership of the Bowen Basin assets. As existing joint venture partners, BHP and Mitsubishi considered themselves the natural buyers of QCT.

On 16 October, 2000, MetCoal announced it would increase the offer price for all the shares in QCT to $1.30. All shareholders of QCT who accepted the offer would receive $1.20 cash from MetCoal. In addition, all shareholders of QCT who had acquired their shares of QCT prior to when the shares had commenced trading ex-dividend on 18 October 2000 would now receive the fully franked 10c special dividend announced by QCT on Friday 13 October, 2000. Shareholders who had acquired their QCT shares after the shares commenced trading ex-dividend would only receive the $1.20 from MetCoal and not the dividend. The offer was deemed final (BHP 2000a).

The revised offer was successfully closed on 3 November, 2000. The company was delisted on the 29 December 2000 (delisted, 2009).

Assets

QCT helds a non-operating 32.37% interest in the Central Queensland Coal Associates (CQCA) and Gregory joint ventures and 100% of the South Blackwater coal mining operation in the Bowen Basin. BHP and Mitsubishi own the remaining interests in these joint ventures. BHP manages the CQCA and Gregory joint ventures and markets all products (BHP 2000).

Takeover details are summarised in Table 138A.

Table 138A. Takeover Parameters.

Bid Price (includes special QCT 10cps ff dividend)	$1.30
Bid premium over 30 day average share price (excl special dividend)	34.6%
Bid premium over 30 day average share price	45.8%
Offer Value ($m) (based on $1.30)	$899
Date	28-Aug-00
Initial target director response	Rejected
Independent Valuation: low value	1.57
Independent Valuation: high value	1.89
Independent Valuation range (increase on low value)	20.4%
Final bid over Independent Valuation mid point	75.1%
Target director recommended acceptance	16-Oct-00
Takeover Completion	2H CY 2000

As evident in Table 139A, QCT Resources was around 4% the size of BHP prior to the takeover announcement but as the takeover is a 50:50 joint bid with Mitsuibishi, this falls to around 2%.

Table 139A. Bidder and target relative sizes.

Company Size Data	Market Capitalisation prior to bid (A$m)
QCT Resources	$631
BHP Billiton	$15,403
Offer (final) value as percentage of Bidder	2.9%
Target size as percentage of Bidder	2.0%

As noted in Table 140A, QCT Resources contributed additional coal (metallurgical) exposure to BHP's portfolio at that time.

Table 140A. Commodity exposures.

	Promoted Commodity Exposure	Other Commodity Exposure
QCT Resources	Coal	
BHP	Cu, Fe, Coal	Pb, Zn, Ag, Au

The regression analysis outlined in Table 141A uses a single factor (ASX Accumulation All-Resources Index) although R^2 is relatively low in comparison to other resource companies. As demonstrated elsewhere, annual contracts for bulk commodities such as metallurgical coal are not consistent share price drivers (e.g. iron ore in Rio Tinto-Norths analysis).

The BHP share price is sensitive to the ASX Accumulation All-Resources Index, the MSCI Metals and Mining Index and the spot LME copper price (it is less sensitive to the three month forward copper price).

Table 141A. Regression analysis for both bidder and target.

Target	**QCT Resources**	
	Estimation window (days)	252
Factors of significance used (>5%)		
ASX Accumulation All Resources Index	Slope	0.00021
	Intercept	-0.20134
	R^2	0.25
	Steyx	0.099
Model	One factor	
Actual versus Theoretical Returns regression error	Steyx	0.02955188
Bidder	**BHP**	
	Estimation window (days)	252
Regression analysis		
Spot LME copper price (US$/lb)	*observed t-result*	3.41
MSCI Metals & Mining	*observed t-result*	9.25
ASX Accumulation All Resources Index	*observed t-result*	32.38
Intercept	*observed t-result*	9.20
Factors of significance (>5%)		
Spot LME copper price (US$/lb)	Slope	-2.01490
MSCI Metals & Mining	Slope	-0.02001
ASX Accumulation All Resources Index	Slope	0.00177
	Intercept	3.77619
	R^2	0.86
	Standard error	0.18
	F-statistic	514.2
	$SS_{regression}$	50
	$SS_{residual}$	8
Model	Three factor	
Actual versus Theoretical Returns regression error	Steyx	0.01075

Table 142A summarises the cumulative abnormal returns for the target at 25.0% and generated value of $157.6m for QCT Resources' shareholders. There were no cumulative abnormal returns at the time of the special dividend for the target while the bidder experienced no cumulative abnormal returns at both times.

Table 142A. Cumulative Abnormal Returns for the bidder and target over the 3-day event window.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Target	25.0%	$0.91	692	$157.6
Bidder	0.0%	$8.71	1,769	$0.0

In the post event 252-day period BHP is estimated to have experienced 5 days of abnormal returns with total cumulative abnormal returns of -6.8% over this period (Table 143A). This is not considered significant given the relative company sizes and the fact that BHP announced a merger with Billiton plc in March 2001.

Table 143A. Post event window abnormal returns for Harmony.

Days in post-event window	Number of days of AR	CAR over period	Change in value (A$m)
252	5	-6.8%	-$1,042

Interestingly, as highlighted in the regression analysis of BHP in the 252-day post event period, its sensitivity to the MSCI Metals and Mining decreased markedly (discussed in the Billiton merger). There is an expected increase in BHP's sensitivity to the ASX Accumulation All-Resources Index given it dominates this index (Table 144A).

Table 144A. Regression analysis in the post event period.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
Spot LME copper price (US$/lb)	*observed t-result*	11.99	3.41	251.1%
MSCI Metals & Mining	*observed t-result*	3.39	9.25	-63.3%
ASX Accumulation All Resources Index	*observed t-result*	61.76	32.38	90.7%

References

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Rio Tinto: BHP takeover offer

On the 8 November 2007, the BBC News (2007) reported that that Rio Tinto had rejected a takeover approach from BHP Billiton. The proposal was an offer for three BHP Billiton shares for one Rio Tinto share. At that time, Rio Tinto stated that the proposed all-share offer significantly undervalued the company. Rio Tinto shares rose 27% on the news, while BHP Billiton shares fell by 1.3%.

The bid took the market by surprise and did raise concerns that the deal could be blocked from anti-trust regulators, particularly in relation to the consolidation of iron ore production. It also came at a time that Rio Tinto was under intense shareholder pressure due to its US$38 billion acquisition of Canadian aluminium producer, Alcan, and which had significantly increased the company's debt.

On 6 February 2008, BHP Billiton lifted the offer to 3.4 BHP Billiton shares per Rio Tinto share to create what it considered would be the world's premier diversified resources company (BHP 2008). It referred to its earlier approach on the on 1 November 2007 and which was announced on the 8 November 2007 stating that BHP Billiton had proposed combining the groups through two inter-conditional schemes of arrangement. It estimated that the offer would have given Rio Tinto shareholders:

- A 45 per cent premium (based one month average market capitalisation of both companies) which the Board of BHP Billiton believed was attractive for an equity offer in this sector;
- Ongoing participation in the world's premier diversified resources company;
- Approximately 44 per cent of the enlarged group, compared to approximately 36 per cent based on the market capitalisations prior to the approach by BHP Billiton to Rio Tinto; and
- A share of ongoing synergies not available to either company alone.

BHP Billiton (2008) also commented that it had continued to seek the support and recommendation of the Board of Rio Tinto. However, to-date, Rio Tinto had refused to enter into discussions with BHP Billiton and, as a result, BHP Billiton now believed it was appropriate to make an offer directly to Rio Tinto shareholders.

After the announcement and during 2008 there was considerable opposition from European, Chinese and Japanese steel mills to the takeover given the dominant position of a potential combined BHP Billiton and Rio Tinto group in the iron ore market and its ability to influence iron ore prices. In late October 2008 the European Commission held confidential discussions with BHP Billiton over its proposed takeover of Rio Tinto and while the conditions were never disclosed, the author expects that the required divestments were onerous.

On the 25 November 2008 BHP Billiton announced it was withdrawing its US$66 billion offer for Rio Tinto, citing the turmoil in global markets (Keenan 2008). BHP Chief Executive Officer Mr Marius Kloppers stated that buying Rio Tinto would have increased his company's debt and it would have been difficult to sell assets.

On the news of the withdrawal of the offer, the BHP Billiton share price immediately increased 106 pence, or 11 percent, to 1,086 pence in London trading. At the same time the Rio Tinto share price fell 36 percent to 1,577 pence (Keenan 2008).

Bid Summary and Event Analysis

Takeover details are summarised in Table 145A including the first offer and subsequent increase in the offer.

Table 145A. Takeover Parameters.

Bid Price (3 BHP Billiton shares for 1 Rio Tinto share)	$134.58
Bid premium over 30 day average share price	55.5%
Offer Value ($m) (based on 3 BHP: 1 RIO)	$182,699
Date	9-Nov-07
Initial target director response	Rejected
Bid Price (3.4 BHP Billiton shares for 1 Rio Tinto share)	$133.69
Bid premium over 30 day average share price	54.5%
Offer Value ($m) (based on 3.4 BHP: 1 RIO)	$181,488
Date	6-Feb-08
Initial target director response	Rejected
Independent Valuation: low value	na
Independent Valuation: high value	na
Independent Valuation range (increase on low value)	na
Final bid over Independent Valuation mid point	na
Target director recommended acceptance	na
Takeover Completion	Withdrawn

As evident in Table 146A, Rio Tinto was around half the size of BHP Billiton prior to the takeover announcement.

Table 146A. Bidder and target relative sizes.

Company Size Data	Market Capitalisation prior to bid (A$m)
Rio Tinto	$120,159
BHP Billiton	$250,744
Offer (final) value as percentage of Bidder	72.4%
Target size as percentage of Bidder	47.9%

With both companies holding substantial weightings in the various indices, positive performance in one company can exacerbate a weaker performance in the other company. In the following regression analysis outlined in Table 147A, the author has used the S&P/ASX 200 Resources Index only with BHP Billiton given its dominant position in this index but used the FTSE Mining Index for Rio Tinto given its greater influence on this index (both reflecting the stock market where the greater proportion the company's shares are domiciled; i.e., plc versus limited shares).

The broader HSBC Global Mining Index has also been used but the MSCI Metals and Mining Index has been found to be non-significant (at a 5% level) for both companies in the estimation period (Table 147A).

Both companies' share prices are sensitive to the spot LME copper price and hence, three factor models have been used.

Table 147A. Regression analysis for both bidder and target.

Target	**Rio Tinto**	
	Estimation window (days)	252
Regression analysis		
Spot LME copper price (US$/lb)	*observed t-result*	2.16923
HSBC Global Mining Index	*observed t-result*	2.00145
FTSE 350 Mining Index	*observed t-result*	12.18368
Intercept	*observed t-result*	5.23369
Factors of significance used (>5%)		
Spot LME copper price (US$/lb)	Slope	-1.04584
HSBC Global Mining Index	Slope	0.00684
FTSE 350 Mining Index	Slope	0.00319
	Intercept	5.57993
	R^2	0.97
	Standard error	1.80
	F-statistic	2438.72
	$SS_{regression}$	23748.76
	$SS_{residual}$	808.27
Model	Three Factor	
Actual versus Theoretical Returns regression error	Steyx	0.01762
Bidder	**BHP**	
	Estimation window (days)	252
Regression analysis		
HSBC Global Mining Index	*observed t-result*	7.61
Spot LME copper price (US$/lb)	*observed t-result*	3.26
S&P/ASX 200 Resources Index	*observed t-result*	23.94
Intercept	*observed t-result*	20.18
Factors of significance (>5%)		
HSBC Global Mining Index	Slope	-0.01614
Spot LME copper price (US$/lb)	Slope	-0.68022
S&P/ASX 200 Resources Index	Slope	0.00293
	Intercept	-11.02366
	R^2	0.98
	Standard error	0.80
	F-statistic	5438.7
	$SS_{regression}$	10,564
	$SS_{residual}$	161
Model	Three factor	
Actual versus Theoretical Returns regression error	Steyx	0.00755

Table 148A summarises the cumulative abnormal returns for the target at 16.7% at the time of the initial approach but there were no abnormal returns at the time BHP Billiton raised the offer, suggesting this was already expected by the market. At the time of the initial approach, BHP Billiton experienced abnormal returns of only -3.6% and similarly, no abnormal returns at the time it increased its offer.

Table 148A. Cumulative Abnormal Returns for the bidder and target over the 3-day event window.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Rio Tinto (offer periods)	16.7%	$88.51	1,358	$20,051.0
Rio Tinto (bid withdrawal)	-49.4%	$47.33	1,358	-$31,718.0
BHP Billiton (offer periods)	-3.6%	$44.86	5,589	-$8,982.7
BHP Billiton (bid withdrawal)	8.6%	$21.90	5,589	$10,493.3

However, when BHP Billiton withdrew its offer on the 25 November 2008, Rio Tinto experienced sharp negative cumulative returns over a three-day event window of -49.5%. This was exacerbated by a strong increase in the FTSE Mining Index at that time which coincided with a falling Rio Tinto share price.

Ignoring the intervening period between the raised offer and the BHP Billiton's withdrawal, Rio Tinto experienced a net 32.7% negative return or loss of almost A$12 billion. This compares to BHP Billiton which experienced an overall abnormal return of 5% or equivalent to A$1.5 billion in value.

Table 149A covers a post-event window which is defined as the 206 day period after BHP Billiton raised its offer (6 February 2008) until immediately prior to the event window around BHP Billiton withdrawing its offer (to 21 November 2008). During this time BHP Billiton gained cumulative abnormal returns of 6.5% with a value of A$16 billion while Rio Tinto experienced negative abnormal returns of 11.6% or lost value of A$14 billion. A significant proportion of these negative returns were experienced late in the period when there was considerable uncertainty over the findings of the European Commission and whether it would become a deal 'breaker'.

Table 149A. Bidder and Target cumulative abnormal returns in the 206-day period between BHP Billiton raising its offer and then withdrawing its offer.

Company	Days in post-event window	Number of days of AR	CAR over period	Change in value (A$m)
BHP Billiton	206	79	6.5%	$16,196
Rio Tinto	206	63	-11.6%	-$13,955

Netting the post-event window returns for BHP Billiton with the earlier event windows suggests shareholders received an overall gain of 11.4% or A$17.7 billion. In contrast the net position of Rio Tinto was a total negative 44.3% return amounting to lost value of A$25.6 billion.

Interestingly, as highlighted in the regression analysis of BHP Billiton during this period, there is a significant increase in the sensitivity of the BHP Billiton share price to the S&P/ASX 200 Resources Index (as expected) but an unexpected decline in the sensitivity to the HSBC Global mining Index (Table 150A).

Table 150A. Regression analysis in the post event period for BHP Billiton.

	Estimation window (days)	206		
Regression analysis		New Result	Old Result	Change
HSBC Global Mining Index	*observed t-result*	3.71	7.61	-51.2%
Spot LME copper price (US$/lb)	*observed t-result*	4.30	3.26	32.0%
S&P/ASX 200 Resources Index	*observed t-result*	37.63	23.94	57.2%

Overall, BHP Billiton's bid for Rio Tinto was courageous and at a time Rio Tinto was experiencing weakening market sentiment given its earlier and costly Alcan acquisition. The author believes that the performance of both reflects the dominant positions that both companies have in the global resources markets, and therefore a scrip offer by BHP Billiton immediately places Rio Tinto 'in play'. Hence, market expectations are then directed towards whether the bid will succeed or not, and with adverse events increasing the risk of the bid failing leading to under performance in the Rio Tinto share price. In the author's experience at this time, once the revised offer was announced and the share prices of both were more or less aligned with this offer ratio, the risk associated with the bid failing and Rio Tinto's problematic debt position led many investors to prefer investing in BHP Billiton.

From BHP Billiton's position, the exercise led to strong (+10%) abnormal returns at the expense of Rio Tinto's performance and hence was a worthwhile strategy which would have created the world's premier diversified resources company if it had been successful.

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Savage Resources: Pasminco takeover

On 20 October 1998, Pasminco Investment Pty. Limited (Pasminco), a wholly owned subsidiary of Pasminco Limited, announced a condition takeover offer for Savage Resources Limited (Savage) of $0.85 cash for each Savage share (Savage Resources 1998). The bid was considered hostile and rejected by the directors of Savage Resources.

Savage's main businesses were:

- A 100% interest in the Clarkesville zinc refinery and the Gordonsville and Clinch Valley zinc mines in Tennessee;
- A 49% interest in the producing Liddell Coal Joint Venture and a 67.5% interest in the undeveloped Glendell Joint Venture, both located in the Hunter Valley of New South Wales;
- A 33.3% interest in the Togara North Coal Project in Queensland's Bowen Basin; and
- Various interests in zinc, gold and base metal exploration and evaluation properties in Australia, Peru, Canada and the USA,

As noted by the company's independent expert's review (Savage Resources 1998), Clarksville represented the company's largest asset and which had a production rate of approximately 109,000 tonnes per annum of zinc metal. However, the company had recently completed a feasibility study to expand this refinery to a capacity of 300,000 tonnes per annum.

There was a market expectation at that time that the refinery expansion was attractive for the following reasons:

- Its presence within the North American Free Trade area (NAFTA)
- An expanded Clarksville refinery was expected to be the lowest cost producer of zinc metal in the world; and
- Because of its location, the Clarksville refinery was expected to be able to deliver metal to customers in the major US markets more cheaply and effectively than its competitors.

The view of this research based on discussions with management of both companies at that time was that the Clarksville zinc smelter was the key attraction for the takeover offer from Pasminco. This is due to:

- Clarksville providing an entry point for Pasminco into the North American market
- The expansion was economically attractive
- Clarksville required low iron zinc concentrates which Pasminco had available from its Century mine in Queensland

Pasminco's strategy was to sell the other assets to recoup part of the cost of the takeover which indeed occurred subsequent to the completion of the takeover. However, one of the surprises for Pasminco after the acquisition (T. Shard pers comm. 1998) was the extent of the negative value of the hedge book (mainly adverse AUD/USD currency hedging) and which was exacerbated due to the A$/US$ depreciation with the Asian crisis. In fact the Asian crisis had placed earnings pressure on both companies from adverse currency hedging as well as weak commodity prices.

Takeover and Event Analysis

Table 151A summarised the offer details.

Table 151A. Key Parameters and dates of the takeover

Bid Price	$0.85
Bid premium over 30 day average share price	20.2%
Offer Value ($m)	$452
Date	20-Oct-98
Initial target director response	Rejection
Independent Valuation: low value	1.02
Independent Valuation: high value	1.19
Independent Valuation range (increase on low va	16.7%
Final bid over Independent Valuation mid point	76.9%
Target director recommended acceptance	1-Feb-99
Takeover Completion	1H CY 1999

Table 152A outlines the bidder and target sizes immediately prior to the bid announcement and the percentage sizes of the target and offer value relative to the bidder. Both the offer value and the market capitalisation of Savage Resources was around one-third the size of Pasminco prior to the bid.

Table 152A. Bidder and target sizes.

Company Size Data	**Market Capitalisation prior to bid (A$m)**
Savage Resources	$399
Pasminco	$1,473
Offer value as percentage of Bidder	30.7%
Target size as percentage of Bidder	27.1%

Table 153A reiterates the main commodity exposure of the target as well as the bidder. The earlier discussion outlines that the Clarksville zinc smelter and its expansion options were deemed the main asset of Savage Resources.

Table 153A. The main commodity exposure of the target and bidder.

	Promoted Commodity Exposure	**Other Commodity Exposure**
Savage Resources	Zinc	Cu, Coal
Pasminco	Zinc	Pb, Cu

Multiple Regression analysis over a 252 day period estimation window has highlighted that the 3-month forward zinc price, the ASX Accumulation All-Resources Index and the ASX Other Metals Index are all significance (at a 5% level) for both the target and bidder share prices as outlined in Table 154A.

Table 154A. Estimation window parameters.

Target	Savage Resources	
	Estimation window (days)	252
Regression analysis		
3mth forward zinc price (offset by one day)	*observed t-result*	2.78
ASX Accumulation All Resources Index	*observed t-result*	6.23
ASX Other Metals Index	*observed t-result*	14.35
Intercept	*observed t-result*	0.60
Factors of significance (>5%)		
3mth forward zinc price (offset by one day)	Slope	0.00014
ASX Accumulation All Resources Index	Slope	-0.00012
ASX Other Metals Index	Slope	0.00131
	R^2	0.67
	Standard error	0.037
	F-statistic	171.5
	$SS_{regression}$	0.70
	$SS_{residual}$	0.34
Model	Three factor	
Actual versus Theoretical Returns regression error	Steyx	0.02805
Bidder	**Pasminco**	
	Estimation window (days)	252
Regression analysis		
3mth forward zinc price (offset by one day)	*observed t-result*	7.67
ASX Accumulation All Resources Index	*observed t-result*	5.51
ASX Other Metals Index	*observed t-result*	10.01
Intercept	*observed t-result*	16.29
Factors of significance (>5%)		
3mth forward zinc price (offset by one day)	Slope	0.00078
ASX Accumulation All Resources Index	Slope	0.00022
ASX Other Metals Index	Slope	0.00019
	Intercept	-1.622
	R^2	0.83
	F-statistic	409.9
	$SS_{regression}$	6.97
	$SS_{residual}$	1.41
Model	Three factor	
Actual versus Theoretical Returns regression error	Steyx	0.02211

Hence, a three factor model has been used to estimate abnormal returns over the three-day event window. Table 155A indicates that the bid generated a CAR for the target of 15.5% and this occurred only on the announcement day. No abnormal returns were calculated as being significant for the bidder.

Table 155A also indicates that the abnormal return was equivalent to a $61.9m value to Savage shareholders.

Table 155A. Cumulative abnormal returns over a 3-day event window.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Target	15.5%	$0.75	532	$61.9
Bidder	0.0%	$1.31	1,125	$0.0

Table 156A summarises the abnormal returns to the bidder in the subsequence 12 month period and which were zero based on the model developed in the 252-day estimation window.

Table 156A. Bidder abnormal returns in a 252-day post-event window.

Days in post-event window	Number of days of AR	CAR over period	Change in value (A$m)
252	113	-17.6%	-$259.7

However, in the regression analysis of Pasminco in a 252-day post-event window (see Table 157A), it is evident that movements in the ASX All Resources Index are more significant rather than the ASX Other Metals Index observed in the estimation window above (see Table 156A above). This is unlikely to be explained by the removal of Savage Resources from the ASX Other Metals Index given its relatively small market capitalisation ($399m) relative to either the index or the increase in size of Pasminco relative to the All-Resources index. This would be deemed a mildly positive outcome for Pasminco given the larger weighting of this index in the overall market.

Table 157A. Post event regression analysis for Pasminco.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
3mth forward zinc price (offset by one day)	*observed t-result*	1.44	7.67	-81.2%
ASX Accumulation All Resources Index	*observed t-result*	13.46	5.51	144.4%
ASX Other Metals Index	*observed t-result*	0.67	10.01	-93.3%

Summary

Savage Resources shareholders received CAR of 15.5% at time of the bid announcement. While there was expectation that the bid may be raised, this did not eventuate, particularly with increasing concern at the state of Savage's hedge book.

While Savage Resources was a strategic and logical acquisition for Pasminco, both companies were in fact recovering from the impacts of the Asian crisis. The combination of delays in the sale of the non-core Savage assets to reduce debt, the discovery of the worse than expected Savage Resources hedge book and the inability to fully capture the synergies of Clarksville zinc smelter within a short time frame probably contributed to Pasminco's inability to gain abnormal returns in the post event period. At least there were no negative abnormal returns at the time of the bid or subsequent period and greater correlation with movements in the All-Resources index is deemed a modest benefit.

References

Savage Resources 1998 *Part B Statement by Savage Resources Limited*. Dated 18 December 1998, Sydney pp76.

Shard T 1998 The author had frequent discussions with T. Shard who was with corporate development and investor relations with Pasminco at that time.

Wiluna Mines: Great Central takeover

As part of the rationalisation of the Yandal Belt in WA, Great Central Mines Limited embarked on the takeover of Wiluna Mines Limited and Eagle Mining Limited. Great Central Mines was financially supported by Normandy Mining at that time (Dixon 1997). This thesis has focused on Great Central's takeover of Wiluna Mines as representing parameters typical in these takeovers. Unfortunately the Eagle Mining share price series data appears to be unavailable.

On the 21 August 1997 Great Central Mines announced a takeover for Wiluna Mines with a 65 cents per share cash offer. The Wiluna Board rejected the bid and advised shareholders not to accept the offer. On the same day the company announced a takeover offer for Eagle Mining for $3.00 per share (PR Newswire 1997).

Earlier Plutonic Resources Limited had accumulated a strategic 19.9 per cent stake in Wiluna in 1996 and at the time of the bid announcement stated that it would maintain its support for the Wiluna board.

The first offer closed on 10 October 1997 but on the 14 October 1997 the company launched a second Part C takeover offer at a higher price of 75 cents per share. After ASIC raised some concerns that earlier accepting shareholders were disadvantaged, Great Central Mines decided to extend the new offer price to all shareholders who accepted the earlier offer (Howarth 1997).

On 7 November 1997 Kitney (1997) reported that Great Central Mines had virtually won full control of Wiluna Mines Ltd after the last remaining major shareholder, Plutonic Resources Ltd, sold its 19.9 per cent stake. This provided Great Central Mines with an 89 per cent stake in Wiluna and along with the successful takeover of Eagle Mining, significant control of the Yandal gold belt in WA.

Wiluna Mines was delisted on the 20 January 1998 (Delisted 2009)

Assets

Wiluna Mines Limited owned the Wiluna gold mine at Wiluna and also had a large surrounding exploration tenement position. Eagle Mining's Nimary gold mine and Great Central Mines' own Jundee mine were nearby and east of Wiluna.

Takeover and Event Analysis

Table 158A summaries the bid parameters and offer dates interpreted from media reports at that time.

Table 158A. Takeover parameters.

Bid Price	$0.65
Bid premium over 30 day average share price	67.0%
Offer Value ($m)	$105
Date	21-Aug-97
Initial target director response	Rejection
Increased bid	
Bid Price	$0.75
Bid premium over initial 30 day average share price	92.6%
Offer Value ($m)	$121
Date	14-Oct-97
Initial target director response	Recommended
Target director recommended acceptance	na
Takeover Completion	1H CY 1998

The company sizes relative to each other and the offer are presented in Table 159A. Wiluna Mines was only around 10% of the size of Great Central Mines.

Table 159A. Relative company sizes.

Company Size Data	Market Capitalisation prior to bid (A$m)
Wiluna Mines	$84
Great Central Mines	$769
Offer (final) value as percentage of Bidder	1.9%
Target size as percentage of Bidder	10.9%

The regression using both the gold price and the ASX Gold Index is presented in Table 160A. Both Wiluna Mines and Great Central Mines share price movements are more sensitive to US$ gold price movements relative to gold price movements in A$.

Table 160A. Regression analysis of target and bidder.

Target	**Wiluna Mines**	
	Estimation window (days)	252
Regression analysis		
Spot gold price (US$/oz)	*observed t-result*	5.58
ASX Gold Index	*observed t-result*	53.59
Intercept	*observed t-result*	15.51
Factors of significance used (>5%)		
Spot gold price (US$/oz)	Slope	0.00144
ASX Gold Index	Slope	0.00183
	Intercept	-1.84140
	R^2	0.95
	Standard error	0.040
	F-statistic	2541.8
	$SS_{regression}$	8.23
	$SS_{residual}$	0.40
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.03121
Bidder	**Great Central Mines**	
	Estimation window (days)	252
Regression analysis		
Spot gold price (US$/oz)	*observed t-result*	3.60
ASX Gold Index	*observed t-result*	15.27
Intercept	*observed t-result*	1.64
Factors of significance (>5%)		
Spot gold price (US$/oz)	Slope	-0.00612
ASX Gold Index	Slope	0.00342
	Intercept	1.28070
	R^2	0.73
	Standard error	0.26
	F-statistic	333.9
	$SS_{regression}$	46.60
	$SS_{residual}$	17.37
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.01869

Table 161A presents the cumulative abnormal returns for the two periods, namely at the announcement of the first 65 cent offer and secondly, with the new offer at 75 cents.

Table 161A. Cumulative abnormal returns for the target and bidder at the time of the announcements.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Wiluna Mines	25.7%	$0.52	161	$21.5
Great Central Mines	-9.9%	$2.49	309	-$76.3

In the case of Great Central Mines, the negative cumulative returns extended into the 252-day post event period extending after the second bid. There were complications with Great Central at this time (particularly with some control exerted by Normandy Mining) and culminated in a bid by Yandal Gold Pty Ltd for Great Central mines late 1998/early 1999 (Table 162A).

Table 162A. Cumulative abnormal returns in the post event period.

Days in post-event window	Number of days of AR	CAR over period	Change in value (A$m)
252	197	-36.5%	-$280.2

Lastly, the sensitivity of the Great Central Mines share price to both movements in the US$ gold price and the ASX Gold Index increased as expected (Table 163A).

Table 163A. Regression analysis in the post event period.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
Spot gold price (US$/oz)	*observed t-result*	11.01	3.60	205.8%
ASX Gold Index	*observed t-result*	29.39	15.27	92.4%

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WMC Resources: BHP Billiton takeover

On 28 October 2004 WMC Resources Limited (WMC) advised that it had received a conditional proposal from Xstrata to acquire WMC for $6.35 per share in cash by way of a scheme of arrangement (WMC 2004). WMC announced that after it had considered the offer, its Board had determined that the level of the offer failed to recognize the current and prospective value of WMC’s assets and the strategic benefits to Xstrata or other potential acquirers. Accordingly the Board declined the proposal to put forward a scheme of arrangement to WMC shareholders. However, the Board did advise Xstrata that it was willing to enter further discussions and that any material improvement in Xstrata’s proposal would be given due consideration in the context of alternatives available to WMC to maximize shareholder value (WMC 2004).

On the 2 February 2005 Xstrata announced an unconditional takeover offer of $7.20 per share for WMC Resources by Xstrata Capital Holdings Pty Ltd, and that this offer would be final. However, while the takeover offer was $7.20, it included the 20 cent dividend that had previously been declared by WMC Resources. Once this dividend had been paid, Xstrata’s offer was reduced to $7.00 per WMC share (WMC, 2005).

On the 8 March 2005 BHP Billiton announced a cash offer of $7.85 per share for WMC and which was unanimously recommended by the WMC Board (BHP 2005).

WMC Assets

The principal operations of WMC Resources are:

- Nickel. Nickel mining operations are located at Leinster, Mount Keith, and Kambalda in Western Australia. WMC Resources also operates a smelter at Kalgoorlie and refinery at Kwinana, Western Australia.
- Copper/Uranium. Copper ore is mined at Olympic Dam in South Australia where an adjacent complex produces refined copper, uranium oxide, gold and silver. The world class Olympic Dam deposit is the world’s largest known uranium deposit as well as holding significant copper and gold resources.

- Fertilisers. Phosphate ore is mined at Phosphate Hill south of Mt Isa and an adjacent compex produces mono- and di-ammonium phosphate for the domestic and export markets.
- Mineral sands. Corridor Sands is a large undeveloped titanium dioxide-bearing mineral sands deposit in southern Mozambique.

WMC Resources appointed Grant Samuel as an independent expert to estimate a valuation range for the company. An upper and lower valuation range was estimated at $7.17 and $8.24 per share respectively but the valuations included the declared 20 cent dividend (WMC 2005).

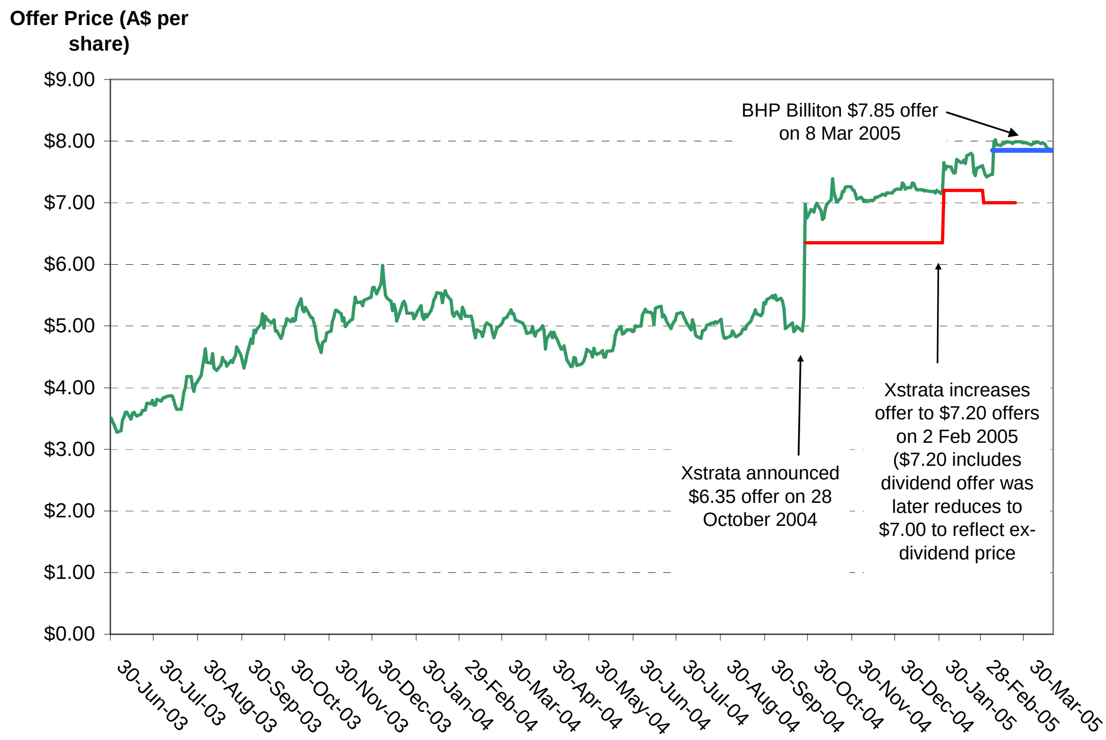
Details of the two offers by Xstrata and the trumping offer by BHP are outlined in Table 164A.

Table 164A. Key Parameters and dates of the takeover.

First Bid - Xstrata	
Bid Price (initial)	$6.35
Bid premium over initial 30 day average share price	22.5%
Offer Value ($m)	$7,458
Date	28-Oct-04
Initial target director response	Reject
Bid Price (second)	$7.20
Bid premium over initial 30 day average share price	38.9%
Offer Value ($m) (adj for 20c dividend)	$8,221
Date	2-Feb-05
Initial target director response	Reject
First Bid - BHP Billiton	
Bid Price (initial)	$7.85
Bid premium over initial 30 day average share price	51.4%
Offer Value ($m)	$9,219
Date	8-Mar-05
Initial target director response	Accept
Independent Valuation: low value	6.97
Independent Valuation: high value	8.04
Independent Valuation range (increase on low value)	15.4%
Final bid over Independent Valuation mid point	104.6%
Target director recommended acceptance	29-Mar-05
Takeover Completion	1H CY 2005

Figure 3A presents the timing of the bids and share price performance of WMC Resources at this time.

Figure 3A. The WMC Resources share price and the Xstrata and BHP Billiton offers.



Share price data from Stock Resource

Table 165A outlines the bidder and target sizes immediately prior to the first bid announcement for Xstrata while size for BHP is estimated from the share price immediately prior to its bids. The Xstrata market capitalisation is converted to Australian dollars using average GBP/USD and AUD/USD exchange rates for CY2004.

Table 165A also highlights that the offer for WMC by Xstrata was relatively aggressive given that the total value of the offer was larger than the market capitalisation of Xstrata prior to its bid.

Table 165A. Bidder, offer and target sizes.

Company Size Data	Market Capitalisation prior to bid (A$m)
WMC Resources	$5,778
Xstrata (converted at CY2004 average FX rates)	$7,089
BHP Billiton	$30,274
Offer value as percentage of Bidder 1 (first offer)	105.2%
Target size as percentage of Bidder 1	81.5%
Offer value as percentage of Bidder 2	30.5%
Target size as percentage of Bidder 2	19.1%

Table 166A outlines the main commodity exposure of the target as well as both bidders. WMC would have increased Xstrata's exposure to copper, and adding material exposure to nickel and uranium. However, a major attraction was the future expansion potential of the world class Olympic Dam project given its large resources of copper, gold and uranium ore.

Table 166A. The main commodity exposure of the target and bidders.

	Promoted Commodity Exposure	Other Commodity Exposure
WMC Resources	Ni, Cu, U	Minerals Sands, Fertiliser
Xstrata	Cu, Coal	Zinc , Ferrochrome
BHP Billiton	Fe, Cu, Oil	Al, U, Au, Minerals Sands

Multiple Regression analysis over a 252-day period estimation window was carried out prior to the event window for the target and both bidders (Table 167A). The table highlights that nickel, copper and the S&P/ASX 200 Resources are factors of significance (at a 5% level) for WMC Resources. In terms of the bidders, factors of significance for Xtrata were the MSCI Metals and Mining Index and the copper price. Interestingly, for BHP the only factor of significance was the S&P/ASX 200 Resources Index which of course, it dominates from a weighting perspective.

Table 167A. Estimation window parameters

Target	WMC Resources	
	Estimation window (days)	252
Regression analysis		
S&P/ASX 200 Resources	*observed t-result*	3.00
3mth forward copper price (offset by one day)	*observed t-result*	5.47
3mth forward nickel price (offset by one day)	*observed t-result*	20.33
Intercept	*observed t-result*	17.49
Factors of significance (>5%)		
S&P/ASX 200 Resources	Slope	0.00033
3mth forward copper price (offset by one day)	Slope	-0.58359
3mth forward nickel price (offset by one day)	Slope	20.33379
	Intercept	3.02295
	R^2	0.67
	Standard error	0.165
	F-statistic	171.0
	$SS_{regression}$	13.90
	$SS_{residual}$	6.72
Model	Three factor	
Actual versus Theoretical Returns regression error	Steyx	0.01782
Bidder 1	**Xstrata**	
	Estimation window (days)	252
Regression analysis		
FTSE 350 Mining Index	*observed t-result*	0.18
MSCI Metals & Mining Index	*observed t-result*	6.60
3mth forward copper price	*observed t-result*	13.61
Intercept	*observed t-result*	10.57
Factors of significance (>5%)		
MSCI Metals & Mining Index	Slope	3.05575
3mth forward copper price	Slope	178.76296
Intercept		-325.25388
	R^2	0.74
	F-statistic	230.9
	$SS_{regression}$	364,584.06
	$SS_{residual}$	130,506.80
Model	Two factor	
Actual versus Theoretical Returns regression error	Steyx	0.01055
Bidder 2	**BHP Billiton**	
	Estimation window (days)	252
Regression analysis		
3mth forward copper price	*observed t-result*	0.58
S&P/ASX 200 Resources	*observed t-result*	27.62
MSCI Metals & Mining Index	*observed t-result*	1.54
Intercept	*observed t-result*	7.10
Factors of significance (>5%)		
S&P/ASX 200 Resources	Slope	0.00676
	Intercept	-2.16063
	R^2	0.98
	F-statistic	4269.7
	$SS_{regression}$	812.06
	$SS_{residual}$	15.79
Model	Single factor	
Actual versus Theoretical Returns regression error	Steyx	0.00387

Table 168A summarises the cumulative abnormal returns for the target and bidders. As it highlights, there were no recorded abnormal returns during the event windows. This is despite the first bid price representing a 22.5% premium to the 30 day average pre-bid price (see Table 164A above) and reflects the size of standard error of the regression (0.165).

Table 168A. Cumulative abnormal returns over a 3-day event window.

	CAR	Share Price prior to event	Shares on Issue (m)	Change in value (A$m)
Target (initial bid - XTA)	17.4%	$4.92	1,174	$1,002.7
Target (increased bid - XTA)*	3.1%	$7.20	1,174	$259.2
Target (new bid - BHP)	3.9%	$7.46	1,174	$343.6
Bidder 1 (initial bid - XTA)	0.0%	£4.51	632	$0.0
Bidder 1 (increased bid - XTA)	0.0%	£4.67	632	$0.0
Bidder 1 (new bid - BHP)	0.0%	$19.29	6,228	$0.0

* Includes 20 cent dividend to be paid by WMC Resources

Table 169A outlines that there were no material abnormal returns to the successful bidder (BHP Billiton) in the subsequent 252 day period.

Table 169A. Bidder abnormal returns in a 252-day post-event window.

Days in post-event window	Number of days of AR	CAR over period	Change in value (A$m)
252	12	0.1%	-$1,580

In summary, this thesis views that Xstrata's hostile approach for WMC Resources was a surprise and created some public angst. In particular, there was concern that Olympic Dam being a major uranium supplier, would end up in foreign ownership. It was also recognized that MIM was probably taken over too cheaply; hence, there was an element of relief and more eager acceptance when BHP Billiton announced its higher offer.

The volatility of the WMC share price and its sensitivity to the nickel price and to a lesser degree, the copper price, leaves the regression analysis with a reasonably high standard error and potentially negating apparent abnormal returns as being non-significant. Nevertheless, in 2004 the resources boom was gaining momentum and given the course of this boom that there is no doubt that WMC Resources would have attained a share price beyond the level of any of the bids.

In the post-event window for BHP Billiton, it is not surprising that BHP Billiton's share price movement was more sensitive to the S&P/ASX 200 Resources Index given the increase in size of BHP Billiton following the takeover and combined with the loss of WMC from the index (Table 170A). It is interesting that there appears to be more sensitive relationships of the BHP Billiton share price with the copper price and MSCI Metals and Mining Index.

Table 170A. Regression analysis of BHP Billiton in the post event 252-day period.

	Estimation window (days)	252		
Regression analysis		New Result	Old Result	Change
3mth forward copper price	*observed t-result*	4.14	0.58	614.2%
S&P/ASX 200 Resources	*observed t-result*	38.23	27.62	38.4%
MSCI Metals & Mining Index	*observed t-result*	3.66	1.54	138.4%

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