The value of financial and non-financial information: Evidence from Australian mining development stage entities

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Abstract

This study addresses two research questions relating to the distinction between financial and non-financial information. First, I consider how changes in non-financial information impact stock prices using an event study approach. Second, I examine the valuation implications of accounting information pertaining to the underlying non-financial information. The setting I consider is Australian mining development stage entities (MDSEs), an ideal environment to consider the importance of financial and non-financial information owing to the pre-disposition of Australian MDSEs to capitalize exploration expenditure under grandfathering provisions in IFRS 6. MDSE exploration expenditure bears similarities with research and development expenditure in the US. After controlling for relevant confidence in geological information (i.e., *Inferred*, *Indicated*, *Measured*, *Probable* and *Proved*) under the JORC Code, I find that short-window reactions are driven by changes in lowest confidence non-financial information. In contrast, the long-term price is determined by the highest confidence geological information, with accounting book value (a close proxy for capitalized exploration expense) strongly significant using an Edwards-Bell-Ohlson approach. Overall this study supports the value of accounting information in a highly asymmetric information environment.

Keywords: Disclosure, Information Asymmetry, Extractive Industries

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1.0 Introduction

Prior studies considering the value of financial and non-financial information typically use accounting measures, along with selected industry specific non-financial information and consider the value relevance of each. Examples of such studies include Amir and Lev (1996), who examine the valuation implications of both accounting and non-financial information in the wireless telecommunications industry in the US. Other studies include Ittner and Larcker (1998) who find modest support for claims that customer satisfaction scores is a leading indicator of accounting performance. More recently, Trueman, Wong and Zhang (2001) incorporate web usage statistics as ‘other information’ when valuing internet stocks. Trueman et al. show that there is an insignificant association between bottom-line net income and market prices, however, when net income is decomposed, gross profits along with unique visitors and pageviews are associated with stock prices.

Other studies examining non-financial information consider its usefulness in predicting stock returns using event studies. For example, Chandra, Procassini and Waymire (1999) consider market reactions to semiconductor industry book-to-bill ratios. What’s obvious from each of these prior industry studies of non-financial information is that the tractability and structure of non-financial information or the precision of event identification within that industry is fundamental to the attractiveness of the research setting. I consider a new and potentially advantageous setting, mining development stage entities (MDSEs) which have a number of desirable experimental features for considering the relative merit of financial and non-financial information.

Firstly, non-financial information released by pre-production firms in the mining industry (comprising mineral resource and reserve and other technical disclosure) is highly structured and must conform to its own ‘standard’ in the form of the Joint Ore Reserve Committee (JORC) Code. In addition, the non-financial information released under the JORC Code by MDSEs must be either internally or externally validated by the ‘competent person’.[1] The competent person

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[1] The JORC (Joint Ore Reserve Committee) code governs the resource disclosure in Australia and requires that resource categories are arrayed in terms of increasing geological confidence (i.e., information quality), with *Inferred* resources comprising the lowest confidence resources, *Indicated* resources being of increasing confidence and *Measured* resources being the highest confidence resource category which is most likely to generate future cash flows. To examine the impact of nonfinancial information on information asymmetry, I liken uncertain accounting information (high accruals) to technical information associated with greater uncertainty of generating

has a role in assuring the non-financial resource and reserve disclosure with the role of competent person bearing many similarities to that of an auditor (Ferguson and Pündrich, 2015).

Secondly, many studies of non-financial information in the US setting take place in industries where expenditures on research and development giving rise to patents or other intellectual property which are immediately expensed in the income statement. In contrast, the MDSE setting provides firms with much flexibility in terms of accounting for exploration and evaluation expenditure, with high levels of capitalization. For example, Lourens and Henderson (1972) provide survey evidence indicating that 53%, 62% and 70% of large, medium and small mining companies capitalized exploration and evaluation expenditures respectively. Under International Financial Reporting Standard 6 (IFRS 6) MDSEs can immediately expense, or capitalize or a combination of the two. Consequently, the balance sheets of such firms have two important asset accounts, cash and capitalized exploration expenditure, with typically very little else.[2]

Thirdly, a key advantage of this setting is the relative homogeneity of the mining development stage entities, all of whom have a common business objective (Shevlin, 1996). MDSEs exist for the purpose of raising capital for the identification and development of economic mineralization. The common business objective and sample homogeneity is useful given prior studies have required the pooling of firms with different firm level economic properties which can yield different results. For example, Trueman, Wong and Zhang (2001) find that measures of Internet usage such as page views are found to provide incremental explanatory value. However, sub-sample analysis of e-tailers, portals and content firms, indicates that specific web traffic measures are found to yield different results. An added bonus is that MDSEs are a very common form of enterprise in Australia, with hundreds of MDSEs currently listed on the Australian Securities Exchange (ASX).[3] The sample in this study of

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future cash flows (*Inferred* resources). Results in this study indicate that JORC Code resource disclosures are significant market events and consistent with larger positive resource changes being associated with stronger market reactions. I find that in the short-term market reacts to changes in the lower confidence (i.e., information quality) *Inferred* resource category, consistent with the interpretation that lower confidence resource changes are more informative regarding estimation of deposit dimensions and future deposit growth. As suggested, the main distinction between resource and reserve is described in terms of economic viability, which is typically established through the completion of feasibility studies. These relationships are observable in the JORC Code resource and reserve reporting framework in Figure 1, Panel A.

[2] See Appendix II for an example.

[3] I make a further observation about the materiality of the mining industry in Australia. In 2012, 'Materials' was the largest industry sector by number of companies listed on the ASX, with over 761 companies involved in mineral

around 1500 MDSE firm years (382 unique firms) contrasts with Trueman, Wong and Zhang (2001) who utilize a sample of 56 firms and 179 firm quarters, Amir and Lev (1996), a 10-year panel of 14 publicly-traded cellular, Ittner and Larcker (1998) a two-year period for 140 firms, and Chandra et al. (1999) a 8-years period for 22 firms.

Fourthly, the continuous disclosure requirements of the ASX require all material information to be released by companies as soon as it comes to hand. This suggests that non-financial information in the form of resource and reserve disclosures are readily identifiable of obtainable through the company announcement platform on the ASX suggesting that this setting enables us to conduct suitable daily and intraday analysis. Accordingly, I am able to combine the usually separate approaches of investigating market reactions to non-financial information innovations using an event study approach along with considering the value of 'other information' applying the Edwards-Bell-Ohlson framework (Preinreich, 1938; Edwards and Bell, 1961; Ohlson, 1995; Feltham and Ohlson, 1995).

Lastly, it has been observed in prior studies that negative earnings have little predictive ability and book value serves as a relevant proxy for future residual income (Collins, Pincus and Xie, 1999). Likewise, Shevlin (1996) suggests that the informativeness of earnings is less clear when examining the value-relevance of non-financial information in a mixed sample of positive and negative earnings and this would lead to concerns over the appropriate earnings expectation model for fast growing firms. The sample of MDSEs is systematically loss making, suggesting no need to include income statement information in the valuation model. I note however, that whilst the MDSE sample is systematically loss making, non-financial information in this setting can still be argued to be a better proxy for future earnings since quantified resources and reserves are likely to report to future earnings more readily than other non-financial information proxies such as page-views, eyeballs and internet clicks.

The event study analysis is conducted on two levels. Firstly, I conduct daily returns analysis. Secondly, I conduct intraday analysis. I report the following results. First, when undertaking

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exploration, development and production across over 110 countries (Metal and mining sector profile, ASX, 2012). Additionally, during 2011-12 the Australian mining industry had the highest profit margin (38.3%) and the highest level of capital expenditure ($86.8 billion, or 32.3%) of all industries in Australia (ABS 8155.0 - Australian Industry, 2011-12). In 2011-12, mining was the leading industry in terms of exports, contributing around 48% to the value of Australia's total exports and representing 9.6% of the total Australian GDP (ABS 5204.0, 5302.0, 5368.0 and 6291.0.55.003). Australia is one of the top mining exploration investment destinations in the world. According to the MEG (2009) survey of worldwide exploration budgets by region, Australia received 14% of the total global exploration spending.

event study analysis of non-financial information release, I find evidence of a positive and statistically significant return on the day of the resource disclosure, suggesting that the market responds to such disclosures. A further result is that larger resource changes are found to be associated with higher abnormal returns. Further, I find that changes in the lowest confidence JORC resource classification yield the largest short run market reaction. This is intuitive since changes in the lowest confidence '*Inferred*' resources will typically contain most 'new information' in any updated resource statement. I identify intraday market reactions bearing close similarity to the results I report on a short 3-day window basis.

The EBO results suggest both non-financial and financial information are important in determining price. Interestingly, accounting information in this high information asymmetry context appears to be highly value relevant. If anything, it appears to be even more value relevant than non-financial resource information. This finding is consistent with Amir and Lev (1996) who argue for allowing capitalization of expenses in the telecommunication industry context.

I run further tests considering the determinants of book value from a non-financial information perspective. These tests suggest higher confidence resources are more significant determinants of book value. Interestingly, the lowest confidence information (*Inferred*) although driving short term market reactions, has the lowest impact on firm's book value. A possible explanation is that managers are conservative in capitalizing expenses tend to capitalize expenditure associated with higher geological certainty. The remainder of this paper is organised as follows. Section 2 the sample selection is discussed. Section 3 presents the descriptives. Section 4 presents the research design and results. Section 5 comments on further analysis and sensitivity tests. Section 6 concludes.

2.0 Sample

The sample contains companies from the materials and energy sector listed on the ASX, which qualify as hard-rock and oil and gas MDSEs according to the definition adopted by Ferguson, Clinch and Kean (2011). I apply the same filtering criterion restricting the sample to companies with product revenues less than 5% of market capitalisation to ensure only MDSEs and not mining producers are included.[4] I identify a sample of 1,579 resource/reserve

[4] The sample includes 1 firm that commences production, but does not meet the 5% revenue threshold due to it being in the ramp-up phase, effecting 1 resource/reserve change. Initially I include this early stage producer in the

disclosures, released by 392 MDSEs over the period 1996 to 2012 and making at least 1 JORC Code resource/reserve disclosure as described in Table 1.[5] Data on resources and reserves are hand collected. Other properties of resource/reserve disclosures such as the length and tone of the announcement along with firm level financial information are obtained.

I classify information into each of the five JORC categories (*Inferred, Indicated, Measured, Probable* and *Proved* [sic]).[6] The total amount of metal content in each of these disclosures is then compiled at the project level. I exclude 79 disclosures for which commodities aren't publically traded and hence the price of the commodity is not available.[7] After omitting these observations, 1,500 separate disclosures made by 382 MDSEs are used in in tests. Daily prices, turnover, indexes, market capitalisation and commodity price data are obtained from Datastream. Book value and cash at the end of the period from FinAnalysis by Morningstar Datanalysis Premium. Intraday data is collected from the Securities Industry Research Corporation Asia Pacific (SIRCA).

3.0 Descriptive statistics

Descriptive statistics for the 1500 resource/reserve disclosures are presented in Table 2. The mean (median) 2-day window *BHAR* and *CAR* is 1.017 (1.005) and 1.017 (1.006) respectively. The mean size of resource change (*RSC*) is $53 million, whilst the mean reserve change (*RSV*) is $0.99 million.[8] Of the full sample, there are 1298 (86% of total sample) resource change disclosures, whilst there are 233 (15% of total sample) disclosures containing reserve changes. The reduced number of reserve change disclosures compared to resource change disclosures is expected, as reserve changes are likely to be more prevalent for mineral producers. The lower confidence resource category (*Inferred*) is the JORC Code category having a higher mean value change and higher sample representation. *Inferred* (*INF*) has a mean of $34.6 million, present

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sample, but then drop Fortescue (FMG) with primary results remaining unchanged. Further sensitivity tests are reported in Section 5.

[5] A limitation in this study is that prior to 1999 disclosures are not electronically searchable on Morningstar Datanalysis Premium. Accordingly, I have lower numbers of observations in the pre-1999 period.

[6] For oil and gas I use the equivalent of *Inferred, Indicated, Measured, Probable* and *Proved* as 1C, 2C, 3C for resources and 1P, 2P for reserves as indicated on Fig. 1, Panel B.

[7] In addition, some historic resource/reserve information where announcements can't be located are used to calibrate resource changes. An example is a deposit acquisition announcement of an offshore project where a historic resource estimate is reported to the ASX that was initially announced by a foreign company listed in another country.

[8] Note these $ amounts are deflated by average firm size.

in 86% of total sample disclosures. *Indicated* (*IND*) has a mean of $9.2 million, present in 58% of disclosures. *Measured* (*MEA*) has a mean of $1.17 million, present in 20% of disclosures. In terms of reserves, *Probable* (*PRB*) has a mean of $0.6 million present in 15% of disclosures, whilst *Proved* (*PRV*) has a lower mean of $0.12 million and is present in only 8% of disclosures. Intuitively, *INF* is by far the greatest, which would be expected for a lower confidence resource category.

The 382 listed sample firms have a mean (median) market capitalization (*SIZE*) of approximately $241 million ($50 million). The minimum size is $1 million whilst the maximum is $20.4 billion.[9] The average commodity price change in the year prior to mineral disclosures (*COMM_PRICE*) is 18%.[10] The mean number of pages in each resource/reserve disclosure (*PAGES*) is 6.6. There are 579 disclosures, representing 38% of the total sample using announcement header terminology suggestive of growth (*GROWTH*).

The total value of resources owned by a firm (*TOT_RSC*) has a mean of $19.5 million whilst the total value of reserves (*TOT_RSV*) has a mean of $0.2 million. The total value of resources classified as *Inferred* (*TOT_INF*) has a mean of $11.0 million, *Indicated* (*TOT_IND*) has a mean of $3.9 million, *Measured* (*TOT_MEA*) has a mean of $0.2 million. In terms of total value of reserves owned, *Probable* (*TOT_PRB*) has a mean of $0.1 million, whilst *Proved* (*TOT_PRV*) has a lower mean of $0.5. Book value (*BV*) for these firms has a mean (median) of $0.2 ($0.1) per share. The estimated capitalized exploration (*CAPEXPL)* expenses has a mean (median) of $0.12 (0.08) per share. The cash at the end of the period (*CASH*) has a mean (median) of $0.05 ($0.03) per share. Market–to-book (M/B) ratio has a mean (median) of 2.4, while market-to-book ratio excluding capitalized expenses (M/BNC) has a mean of 12.4. Price at the end of fiscal year has a mean (median) of $0.4 ($0.2).

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[9] Recall the $20.4 billion observation is FMG (Fortescue Metals Group). The next closest observation in terms of size is Aquila Resources with a market capitalization of approximately $4 billion**.**

[10] This is not surprising given the sample period apart from the 6 years (1996-2001) coincided with the mining boom in Australia. By way of example, the London PM fix gold price when it bottomed in 2001 was $271 dollars per ounce. By the end of 2010, it was $1668 dollars per ounce.

4.0 Research design and results

4.1 Daily market returns

I examine how the changes in non-financial information impact stock equity valuation by measuring the market reaction to resource disclosure events by MDSEs using daily abnormal returns (*ARs*) and cumulative abnormal returns (*CARs*). The abnormal return (*AR*) is the difference between a firm's actual stock return and the expected return and is used in order to quantify the effect of the information contained in resource disclosures. Keim (1983) investigates the anomalous negative relation between firm size, measured by total market value of common equity, and abnormal, risk-adjusted returns using a sample of firms listed on the NYSE and AMEX. He shows that, even after applying the Scholes-Williams adjustment of beta for non-synchronous trading, excess returns are a monotonic decreasing function of firm size as measured by total market value of equity. Given the small size and possible non-synchronous trading in this setting, I create an MDSE index which constitutes the sum of market value of all the non-disclosing sample constituents in the same period of the resource/reserve disclosure. I conduct sensitivity tests using alternative index benchmarks, discussed further in Section 5.3. The abnormal return (*AR*) for firm *i* at event date *t* is calculated as:

$$AR_{i,t} = \left[\frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}}\right] - \left[\frac{R_{sr,t} - R_{sr,t-1}}{R_{sr,t-1}}\right] \tag{1}$$

where: $AR_{i,t}$ is the abnormal return of firm *i* at time *t*, $P_{i,t}$ is the share price of firm *i* at time *t* and $R_{sr,t}$ is the average return for all non-disclosing sample firms at time *t*. Cumulative abnormal returns over the period (*p*,*q*) are calculated as:

$$CAR_{i,t}(p,q) = \sum_{t=p}^{q} AR_{i,t} \tag{2}$$

Figure 2 presents graphically the daily raw returns for an extended 21-day window, centred on event day 0. There is a positive and significant market reaction on the announcement date ($t = 0$), with a mean (median) abnormal return (*AR*) of 2.08% (1.5%), significant at $p<0.01$ (Table 2).[11] The 'per cent positive' statistic peaks at 64% on the disclosure event date ($t = 0$). During

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[11] Median abnormal returns are 1.4% on the announcement date ($t = 0$), *Z*-score = 12.824, significant at $p<0.01$ applying a paired Wilcoxon test (Corrado, 2011).

the extended 21-day window, there is no other date with a similar price effect. *CARs* over the 21-day window before and after the announcement date (t = 0) are presented in Figure 3, indicating an increasing and positive pattern over the 21-day period. On untabulated results, I document that the only negative and significant price change at the p<0.01 level occurs on $t =$ 1 with a mean abnormal return (*AR*) of -1.17%, which is consistent with mean reversion. In summary, these descriptive results are consistent with the capital market reacting positively to information contained in JORC Code resource disclosures by Australian MDSEs.

4.2 Intraday measures

On an intraday level, I examine the 3-hour duration spanning one hour before and one hour after the hour in which a resource change is announced to the market. Intraday analysis can be conducted on resource disclosures because each ASX announcement has a precise time stamp. I run tests for three measures – abnormal return, volume and bid-ask spread – using trade-by-trade data.[12] I control for time of day effects and the idiosyncratic trading patterns of every stock in the following way. A measure's value in a 1-hour window is assigned its empirical distribution function value (between 0 to 1) based on observations during the same time of day from 100 preceding days. The expected empirical distribution function value is 0.5; a higher (lower) quantile function value indicates that the observation is higher (lower) than the usual value for that measure, time of day and stock (Brown et al. 2014). Table 3, Panel A, shows a significant intraday abnormal return in the hour following the release of resource disclosures for both the *t*-test (*t*-statistic 3.85, p<0.01) and the non-parametric Wilcoxon test (*z*-statistic 5.67, p<0.01). Further, there is evidence of an increase in liquidity (*t*-statistic 27.31, *z*-statistic 22.52, p<0.01) at the hourly level around the disclosure of resource information as indicated in Panel B. Panel C shows a significant decrease of 3% in the bid-ask spread (*t*-statistic -18.24, *z*-statistic -16.56, p<0.01) in the hour after the disclosure. Together, these intraday results indicate evidence of a

[12] To perform analysis in an intraday setting, some methodological issues need to be considered. For example, in disclosures announced outside of normal trading hours, the event period is treated as the first hour of the next trading day (i.e., between 10am to 11am). Most resource disclosures are released inside trading hours (865 observations). On the ASX, stocks are scheduled to open at different moments between 10:00 am and 10:10 am, depending on the starting alphabet of their ASX code. Once the schedule time is set, the stocks open within ± 15 seconds of this scheduled time, with the exact opening time randomly generated by the ASX for each stock every day. Another issue is that each firm may exhibit its own intraday trading pattern. Following Brown et al. (1999), I control for intraday patterns in market characteristics using the same time period as the event time over the control window.

meaningful market reaction around the release of resource disclosures at the hourly level, suggesting a reduction in information asymmetry.

Table 4 presents the intraday order-book response around the release of resource disclosure events. The results for the hour immediately before and after the disclosure hour are reported in Panels A and B, respectively. Panel A shows marginal results with respect to on-market trading (*t*-statistic -0.228) and volume of on-market trading (*t*-statistic -0.513), both insignificant. However both these results are significant when using the non-parametric Wilcoxon ranks test at $p<0.01$. The number of actions in the limit order-book, either with (*t*-statistic 11.89, $p<0.01$) or without trades (*t*-statistic 12.63, $p<0.01$) in the limit order-book is significant, further supporting the interpretation that the market responds to the release of resource disclosures.

An abnormal reaction in the hour immediately following the resource disclosure is depicted in Panel B. I find significantly higher trading in terms of the number of trades (*t*-statistic 34.433, $p<0.01$) and volume (*t*-statistic 34.226, $p<0.01$) using parametric tests. The equivalent non-parametric tests on these measures are also significant. This implies the market exhibits increased trading frequency and reductions in information asymmetry after a resource disclosure. Moreover, an abnormal order-book reaction in terms of actions is observed, both including (*t*-statistic 40.942, $p<0.01$) and excluding trades (*t*-statistic 41.429, $p<0.01$). These results indicate a prompt market microstructure reaction following a resource disclosure. A possible explanation for the insignificant result for the trade imbalance measure (*t*-statistic -0.355, $p=0.72$) is that resource disclosures result in lower information asymmetry, higher trading, lower bid-ask spread, and thus a balance of buyer and seller initiated trading. The differences between the reactions in the hour immediately before and after the hour of the resource disclosure are considered in Panel C of Table 4. In the hour after the resource disclosure, I observe a significantly higher level of on-market trading (*t*-statistic -26.785, $p<0.01$), volume (*t*-statistic -26.694, $p<0.01$), number of actions in the limit order-book, with (*t*-statistic -16.924, $p<0.01$) and without trades (*t*-statistic -16.656, $p<0.01$) than in the hour before the announcement is observed. In summary, the evidence in Table 4 indicates a significant order flow and intra-day trading reaction following resource disclosures and consistent with daily and other short window tests, provides evidence supportive the market responds to resource disclosure events.

4.3 Cross-sectional returns prediction

In the following section, I examine magnitude effects of non-financial information by testing whether greater resource changes are associated with a stronger market reaction. I estimate an Ordinary Least Squares (OLS) regression of buy-and-hold abnormal return (*BHAR*) over the 2-day (0, +1) window measured from the closing price of the 1st trading day before the event date to the closing price of the 1st day after, which measures the difference between the compounded actual return and the compounded predicted return. The use of *BHAR* is advantageous given possible non-synchronous trading as compounding abnormal performance measures most accurately reflects the effect of an event on an investor's portfolio. The effects of non-trading may not be detectable in the returns of individual securities due to the fact the daily return is not often significant. However, prior studies such as Lo and MacKinlay (1990) have shown that it is more pronounced in portfolio returns. Since it is the case that for a security that exhibits non-synchronous trade, the standard estimate of beta is not representative of its true sensitivity to the market (Scholes and Williams, 1977; Keim, 1983), I calculate the expected buy-and-hold return by computing the average return of all non-disclosing firms. The dependent variable is calculated as follows:

$$BHAR_i(0,+1) \ = ln[\prod_{t-0}^{t+1}(1 \ + \ R_{it}) - \ \prod_{t-1}^{t+1}(1 \ + \ BR_{it})] \qquad (3)$$

where: Ri is the short-term buy-and-hold return of firm *i*, and *BRi* is the short-term return for a benchmark firm measured by the average return of all non-disclosing firms of the sample at time *t*.

4.4 Experimental variables

I construct an OLS cross-sectional regression model to predict abnormal stock returns around resource disclosures using total resource changes (*RSC*) as the main experimental variable. Both *RSC* and *RSV* are measured as scaled value changes. This model is specified as follows:

$$BHAR\ (0,+1) = b_1 + b_2RSC + b_3RSV + b_4RSC\_GRADE + b_5RSV\_GRADE + b_6lnSIZE + b_7COMM\_PRICE + b_8lnPAGES \ + b_9GROWTH + e \qquad (4)$$

where: *RSC* and *RSV* (total value change in resource/reserve) define the growth in mineral resources/reserves expressed as total dollar values, measured as the difference between the total amounts of resource/reserve disclosed at announcement t and announcement $t-1$, multiplied by the current price of the commodity, divided by the market value (*MV*) which is the average market capitalisation over six months preceding month -2 relative to the event. The $ValueResources$ and $ValueReserves$ are measured as the total amount of resources/reserves multiplied by the price of the commodity and give rise to the definitions of *RSC* (6) and *RSV* (7) as follows:

$$ValueResources\ or\ ValueReserves = (Resources\ or\ Reserves) * PRICE\_COMMODITY \qquad (5)$$

$$RSC = \left(\frac{ValueResources_t - ValueResources_{t-1}}{MV}\right) \qquad (6)$$

$$RSV = \left(\frac{ValueReserves_t - ValueReserves_{t-1}}{MV}\right) \qquad (7)$$

where: $Resources$ or $Reserves$ indicates the total amount of mineral disclosed, and *COMM_PRICE* is the price of the primary deposit commodity on the date closest to the day of the announcement event.

4.5 *Control variables*

To control for other idiosyncratic factors that may affect market reactions to resource disclosures, I include changes in grade of resources (*RSV_GRADE* and *RSC_GRADE*) measured as percentage changes in each case. Controlling for grade variation in this model is consistent with Stephenson's (2004) assertion that failure to achieve predicted head grades remains one of the most serious threats to the economic viability of mining projects. This comment implies that deposit grade is a useful proxy for cash costs of production.[13] Consistent with prior capital market studies controlling for firm size (*i.e.*, Collins and Kothari, 1989), I control for the size of the firm making a resource/reserve disclosure (*lnSIZE*) by measuring the log of market capitalization in the month of the resource disclosure. In the same way, changes in the market for the commodity(ies) may have an impact on stock price changes around resource disclosures. To control for commodity sentiment, I calculate project specific deposit commodity price movements prior to the release of the resource disclosure (Moel and Tufano, 2002; Ferguson, Clinch and Kean, 2011). *COMM_PRICE* is calculated as price change for the primary deposit

[13] i.e., when deposit grade is high, cash cost of production per unit of output is likely to be lower and vice versa.

commodity in the 12 months prior to each respective resource disclosure. To control for voluntary disclosure levels, I use *lnPAGES*, which is the natural log of the number of pages in each announcement. The importance of news disclosed is controlled by the variable *GROWTH* which represents the presence of certain words in the announcement header representing growth such as "major increase", "doubles", "triples", "large", "significant", etc.

Under IFRS 6 MDSEs can immediately expense, capitalize exploration and evaluation expenditure or a combination of the two. Consequently the book value comprises two important asset accounts, being cash and capitalized exploration and evaluation expenditure, with typically very little else as evidenced on Appendix II. MDSEs are non-cash generating, so the signal of book value would be arguably the most meaningful financial information in the absence of earnings and cash flows. I control for the value of financial information on resource and reserves by including book value scaled by outstanding shares (*BV*). Next, I decompose book value by estimating capitalized exploration expenditure (*CAPEXPL)* by subtracting cash (*CASH*) from book value (*BV*).

4.6 Results for multivariate analysis

In Panel A, Table 5, I report results for tests specified in Equation (4) to examine whether disclosures of greater resource changes are associated with a stronger market reaction. In Table 5, Regression (1A), the model achieves an adjusted *R*-squared of 1.9%, with the *F*-statistic of 7.83, significant at $p<0.01$. In terms of experimental variables, *RSC* has a positive and significant coefficient (0.0001, $p<0.05$), whilst the coefficient for the control variable *RSV* is positive but not significant. I test the group effect of the two variables (*RSC* and *RSV*) using *F*-statistics.[14] I find similar results as the OLS model, with an *F*-statistic of 5.60, significant at $p<0.02$. The reported results indicate that changes in share prices around resource disclosures are driven by the size of total resource changes. In terms of control variables, I find a strongly negative and significant coefficient (-0.0065, $p<0.05$) on the proxy for firm size (*lnSIZE*). This implies the market reacts more strongly to resource disclosures made by smaller MDSEs. I report a positive and significant co-efficient on the commodity price change proxy, the

[14] In unreported results, I find a high correlation among the categories of resource/reserve changes according to the JORC Code classification: the resource categories of *IND* and *INF* with *RSC* and the reserve categories of *PRV* and *PRB* with *RSV*. These results support reporting of results in Panels A and B of Table 5 examining *F*-statistics after nesting the regression in blocks of variables.

implication being that the market response more positively to resource announcements where a favourable lead up in commodity prices is present.

I repeat the analysis in Regression (1A) by examining the impact of financial information including lagged book value as reported in Regression (2A). One fiscal year lagged *lag*BV is found to be is positive and significant (0.0234, $p<0.05$). Secondly, in Regression (3A) I decompose lagged book value by lagged cash at the end of the period (*lagCASH*) and lagged estimated capitalized expenses (*lagCAPEXPL)*. I find that the driver of the positive reaction is driven by lagged *CASH* (0.1229, $p<0.01$), whilst capitalized exploration and evaluation expenses is not significant.

4.7 Multivariate analysis including JORC sub-categories

In the following test I control for relevant confidence in geological information (i.e., *Inferred*, *Indicated*, *Measured*, *Probable* and *Proved*) sub-categories under the JORC Code. Following Fig. 1, I distinguish both total resource and total reserve changes and reconcile total resource and total reserve changes with individual JORC Code categories as follows:

$$RSV = (PROVED + PROBABLE) \qquad (8)$$

$$RSC = (MEASURED + INDICATED + INFERRED) \qquad (9)$$

In Panel B, Table 5, I re-specify (4) decomposing *RSC* and *RSV* into each of the five respective JORC Code resource/reserve categories (*Inferred*, *Indicated*, *Measured resources; Probable* and *Proved reserves*) as follows:

$$BHAR\ (0,+1) = b_1 + b_2INF + b_3IND + b_4MEA + b_5PRB + b_6PRV + b_7lnSIZE + b_8COMM\_PRICE + b_9lnPAGES\ + b_{10}GROWTH + e \qquad (10)$$

where: the five variables capturing the value increment in each JORC Code category reported in a given resource or reserve announcement are calculated as follows:[15]

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[15] *where: MV* is company market value lagged by two months; and each of the resource quantum measures (*Inferred*, *Indicated* and *Measured* resources; *Probable* and *Proved* reserves) is constructed as the quantum of resource multiplied by the relevant commodity price, (*PRICE_COMMODITY*):
- $ValueResourcesInferred = InferredResources * PRICE\_COMMODITY$,
- $ValueResourcesIndicated = IndicatedResources * PRICE\_COMMODITY$,

– Value change in *Inferred* resources:

$$INF = \frac{ValueResourcesInferred_t - ValueResourcesInferred_{t-1}}{MV} \quad (11)$$

– Value change in *Indicated* resources:

$$IND = \frac{ValueResourcesIndicated_t - ValueResourcesIndicated_{t-1}}{MV} \quad (12)$$

– Value change in *Measured* resources:

$$MEA = \frac{ValueResourcesMeasured_t - ValueResourcesMeasured_{t-1}}{MV} \quad (13)$$

–Value change in *Probable* reserves:

$$PRB = \frac{ValueReserveProbable_t - ValueReserveProbable_{t-1}}{MV} \quad (14)$$

and Value change in *Proved* reserves:

$$PRV = \frac{ValueReserveProved_t - ValueReserveProved_{t-1}}{MV} \quad (15)$$

In Table 5, Panel B, I decompose the model into individual JORC Code categories. Results suggest that returns are driven by the changes in lower confidence *Inferred* resources with *INF* having a positive coefficient of 0.0001, significant at p<0.05 while *Indicated* (*IND*) resources and *Measure* (*MEA*) resource are not significant. Intuitively, these results suggest that changes in the higher confidence resource categories (*Indicated* and *Measured* resources) are typically associated with more mature deposits, where overall deposit size is better known by the market and hence any future changes in deposit quantum more easily predictable. On the other hand, the lower confidence *Inferred* resource changes may be more strongly associated with measures of future growth in resources/reserves.[16] In further analysis, consistent with the approach in Panel A, I test the group effect of the decomposed JORC code categories using *F*-statistics. I find similar results as those reported in conjunction with analysis in Panel A, with the OLS model testing group effects of the resource breakdown (*Inferred*, *Indicated* and *Measured*) having an *F*-statistic of 12.87 (significant at p<0.01). Consistent with this finding the group effect of the reserve breakdown (*Probable* and *Proved*) has an *F*-statistic of 2.28, but is not significant at conventional levels.

- $ValueResourcesMeasured = MeasuredResources * PRICE\_COMMODITY$,
- $ValueReserveProbable = ProbableReserves * PRICE\_COMMODITY$ and
- $ValueReservesProved = ProvedReserves * PRICE\_COMMODITY$.

[16] As indicated on descriptive analysis, the quantum or resource value change is far greater for the lower confidence *Inferred* category as the mean (median) value for *INF* is 34.6 (1.19) compared to 9.2 (0) for *IND* and 1.17 (0) for *MEA*.

Similar to Panel A, I repeat the test on regression (1B) after including financial information as reported on regression (2B) and (3B). Results are consistent with those reported on Panel A with a significant and positive lagged book value (*lagBV*) (0.0234, p<0.05). Similarly, after decomposing book value, I find that the driver of the positive reaction is driven by lagged balance sheet cash (*lag*CASH) (0.1236, p<0.01), whilst capitalized expenses (*lagCAPEXPL*) is not significant.

4.8 EBO approach

To further examine the interplay between financial and non-financial information, I utilise an adaptation of the Edwards-Bell-Ohlson (EBO) model, which is widely-used in the equity valuation research literature. Under the EBO model, price is a function of book value, net income and 'other information' (Ohlson, 1995; Feltham and Ohlson, 1995). 'Other information' in the EBO valuation model allows non-accounting (i.e., as yet unrecognised) information to be reflected in equity valuation. In this setting, mining industry specific resource and reserve information in incorporated as 'other information' in the model.

The prevalence of loss making among small mining companies in particular poses some issues in terms of operationalizing the EBO model. For MDSEs the relevant net income proxy is dropped from the EBO model. Firstly, I include book value in the model followed by a decomposition of book value. I split out cash from the book value and include it as a separate term. The remaining book value is then used as a proxy for capitalized exploration expenditure. Consistent with prior studies, I use share price as the dependent variable. The EBO model applied to MDSEs is specified as follows:

$$P_{it} = \alpha_0 + \alpha_1 BV_{it} + \alpha_2 TOT\_RSC_{it} \qquad (16)$$

$$P_{it} = \alpha_0 + \alpha_1 CASH_{it} + \alpha_2 CAPEXPL_{it} + \alpha_3 TOT\_RSC_{it} \qquad (17)$$

where: i and *t* denote the firm and year; P_{it} is the market price of the firm's *i* ordinary shares at fiscal year-end *t*; *CASH* is cash on hand per common share at financial year end; *CAPEXPL* is book value net of *CASH* at financial year end; and *TOT_RSC* is the total quantum of mineral resources and reserves of the firm per common share at financial year end. All explanatory variables in the above model are deflated by the number of shares outstanding to mitigate heteroskedasticity (Bryant, 2003). I report a number of different permutations of the models specified in (16), (17) in the following results discussion.

Coefficient estimates for Equation (16) are reported in Table 6, Panel A. Regression (1A) and (3A) report a low adjusted *R*-squared of 1.7% and 2.2% and a strong positive and significant coefficient (0.0024, $p<0.05$) on the amount of resource (*TOT_RSC*) and reserve (0.1447, $p<0.01$) (*TOT_RSV*) owned by a firm. In regression (2A) and (4A), I decompose the model into individual JORC Code categories to examine specifically which geological information drives the long-term price. The adjusted *R*-squared increases to 3.8% and I note contrary to the short-window return regression, the lowest geological confidence coefficient for *TOT_INF* is not significant, whilst *TOT_IND* (0.01, $p<0.01$) and *TOT_MEA* (0.075, $p<0.05$) become positive and significant. These results are consistent with price at the end of fiscal year being a function of the non-financial information, specifically higher confidence geological categories.

In Table 6, Panel B, I examine the standalone value-relevance of financial information. Regression (1B) shows that the coefficient on book value (*BV*) is positive and significant (2.38, $p<0.01$) and obtains an adjusted *R*-squared of 52%. When decomposing book value into cash at the end of the period (*CASH*) and estimated capitalized expenses (*CAPEXPL*) in Regression (2B), the model generates an adjusted *R*-squared of 54.8%. This result indicates that financial information is value-relevant regardless the presence of non-financial information and adds considerably to the explanatory power of the model.

Finally, in Panel C of Table 6, the incremental value-relevance financial information is considered. Regression (1C) shows that *TOT_RSC* is no longer significant when included to the model along with book value (2.39, $p<0.01$) which remains positive and significant. When I repeat the test decomposing book value in regression (2C), *TOT_RSC* remains insignificant whilst *CAPEXPL* (1.783, $p<0.01$) and *CASH_END* (4.65, $p<0.01$) remain positive and significant. These results demonstrate that long-term price is determined by the highest confidence geological information, with accounting book value (a close proxy for capitalized exploration expense) strongly significant using an Edwards-Bell-Ohlson approach. Overall these results support the importance and significance of accounting information in a highly asymmetric information environment. They suggest that in complex and high information asymmetry environments, the signalling value of accounting information is strong and of central importance compared to non-financial information.

5.0 Further tests and sensitivity analysis

5.1 Determinants of Book value

To examine the determinants of capitalized expenses, I regress the non-financial resource value on estimated capitalized exploration expenses. Table 7, Panel A, shows that total amount of resources and reserves (*TOT_RSC*) (0.0006, $p<0.01$) in a model with an adjusted R-squared of 2.7%. In Panel B and Panel C, I decompose *TOT_RSC* on JORC resource and reserve categories to examine for the impact of level of certainty in determining capitalized expenses and find that for resources in Panel B the model has an adjusted R-squared of 6.8% and *TOT_INF* is not significant whilst *TOT_IND* (0.0002, $p<0.01$) and *TOT_MEA* (0.0257, $p<0.01$) are significant and positive. In Panel B, a higher adjusted R-squared of 6.8% is observed and the reserve categories *TOT_PRB* (0.0465, $p<0.01$) and *TOT_PRV* (0.0013, $p<0.10$) significant and positive.

In summary, the results indicate that capitalized exploration expenditures *CAPEXPL* are driven by the highest confidence geological information. The strongest in this study results are demonstrated when the JORC reserve categories are included in the sample, consistent with reserves representing resources that have been subject to economic or feasibility assesments. It is possible to interpret this observation a number of ways. Firstly, it reflects the underlying economic reality that higher confidence resources implies closer drill spacing which requires higher expenditures on exploration and evaluation. Secondly, it may reflect some conservatism, although this is not explicitly tested in this study.

5.2 Alternative event window/Quantile regression

I test the sensitivity of the results repeating the analysis in Table 5, Panel A, using an alternative measure of the 3-day event window (-1,0,+1). The coefficient for *RSC* is positive (0.0001, $p<0.10$) and the coefficient for *INF* is again positive (0.0001, $p<0.10$), and in Panel B lagged cash (*lagCASH*) is also significant and positive (0.1536, $p<0.05$). Together, these are similar results to those results reported in Table 5. When using a 5-day and 10-day event window, the model becomes either marginally significant or no longer significant due to noise. Consistent with Choi *et al*. (2008), I perform a median quantile regression to examine the impact of extreme observations on Table 5 results. The results indicate that the coefficients for *RSC* (0.00005, $p<0.01$), *RSV* (0.0017, $p<0.01$) and *INF* (0.00006, $p<0.01$) are each positive and significant on Panel A and lagged cash (*lagCASH*) is also significant and positive (0.0832, $p<0.05$), suggesting the results are similar, although slightly stronger using this approach.

5.3 Multicollinearity/Choice of performance benchmark

I calculate the variance inflation factors (VIFs) in the primary model in Table 5 to test for the possible presence of multicollinearity. For Panel A, the average VIF is ranges from 1.04 to 1.13, and average range from 1.13 to 1.19 for the model specified in Panel B. On Table 6, Panel A has an average ranging from 1.00 to 1.34, Panel B range from 1.00 to 1.17 and Panel C range from 1.03 to 1.15. This additional analysis suggests no harmful multicollinearity is present. I conduct sensitivity testing using five alternative index benchmarks being the ASX S&P 300 Metals and Mining Index, FTSE Australia Mining Index, Down Jones Australia Mining Index and Australia Datastream Mining Index along with the ASX All Ordinaries Index. All tests produce similar results to those reported on Table 5. I repeat the analysis in Table 5 using alternative measures of the dependent variable using 2-day cumulative abnormal return (*CAR*). When using *CARs* as opposed to *BHARs* the results are similar, with the coefficient on *RSC* positive and significant (0.0001, $p<0.05$) on Panel A and in Panel C the coefficient on *RSC* again positive and significant (0.0001, $p<0.05$) and lagged cash (*lagCASH)* remains positive and significant (0.1218, $p<0.01$).

5.4 Trading volume

I consider the market reactions using an alternative dependant variable in (4) defined as abnormal trading volume, modelled over the 2-day event window following the resource disclosures. Repeating the analysis in Table 5 using the alternative dependent variable measure, produces qualitatively similar results. For example the coefficient on *RSC* is positive and significant, as before (0.00132, $p<0.01$) in Panel A, and in Panel B the coefficient on *INF* is positive and significant (0.0018, $p<0.01$). When repeating tests for the 10-day event window, I find no effect.

5.5 Robustness tests

I examine the influence of the JORC Code revisions (1998 and 2004) on the results. Table 5 is re-calculated excluding 13 disclosures made prior to 1998, with the results similar to those reported in Table 5. Restricting the sample to post 2004 observations results in a reduced sample of 1320 disclosures. When re-running primary tests in Panel A, Table 5 I find little change in reported results with the coefficient on *RSC* positive and significant (0.00006, $p<0.05$) while results weaken in Panel B, with the coefficient on *INF* positive and significant (0.0001, $p<0.10$) while lagged cash (*lagCASH*) remain positive and significant (0.1310, $p<0.01$).[17]

6.0 Conclusion

This paper examines valuation implications of financial and non-financial information using a high information asymmetry setting, that of mineral explorers and developers. The study is subject to the following limitations. First, these results are restricted to the Australian mining industry, indeed to a subset of mineral companies, being those in the exploration and development phase, with mining producers are omitted. This means the study has obvious limits in terms of generalizability both in terms of its implications for other industries and jurisdictions.

Analysis is conducted on a two levels, being short and long duration tests. In terms of short window analysis, market reactions to resource disclosures by Australian hard-rock and oil and gas MDSEs are considered. Using hand collected resource data organised around specific mineral projects, I specify a multivariate model controlling for deposit properties, firm level economic attributes and announcement disclosure characteristics. I find evidence of a positive and statistically significant return on the day of the resource disclosure, suggesting that the market responds to such disclosures. Larger resource changes are found to be associated with higher abnormal returns. When decomposing the cross sectional model by JORC Code categories, I find the multivariate results are primarily driven by the lowest confidence (*Inferred*) resource category. This is an intuitive finding suggesting changes in this category contain more new information. Intraday analysis provides further support for interpretations based on daily returns analysis.

In terms of long duration tests, the application of the EBO model approach yields some interesting insights. First, both total resources and reserves are positively associated with share prices. Higher confidence resource categories (*Indicated* and *Measured*) have a significant association with share prices, whilst *Inferred* does not. This is not surprising since mine economics is determined by reserves and higher confidence resources (*Indicated* and *Measured*)

[17] I consider the impact of possible GFC effects by excluding the period of the sample during the GFC (2008). The coefficients *RSC* (0.00006, $p<0.002$) and *INF* (0.00008, $p<0.063$) are unchanged in terms of tests in Panel A, Table 5.

report to reserves (*Probable* and *Proved*) upon which feasibility studies are based and financing obtained. The surprising aspect of the results is that this other information is superseded by accounting information with Book value (a proxy for capitalized exploration expenditure and cash both highly significant in augmented models. Other information (resources and reserves) is not significant after controlling for accounting information. I conclude that even in this high information asymmetry setting, accounting information conveys and signals value to markets readily, even in the presence of an alternative in the form of structured non-financial resource and reserve information. Whether this would be the case for production firms is an open question.

7.0 References

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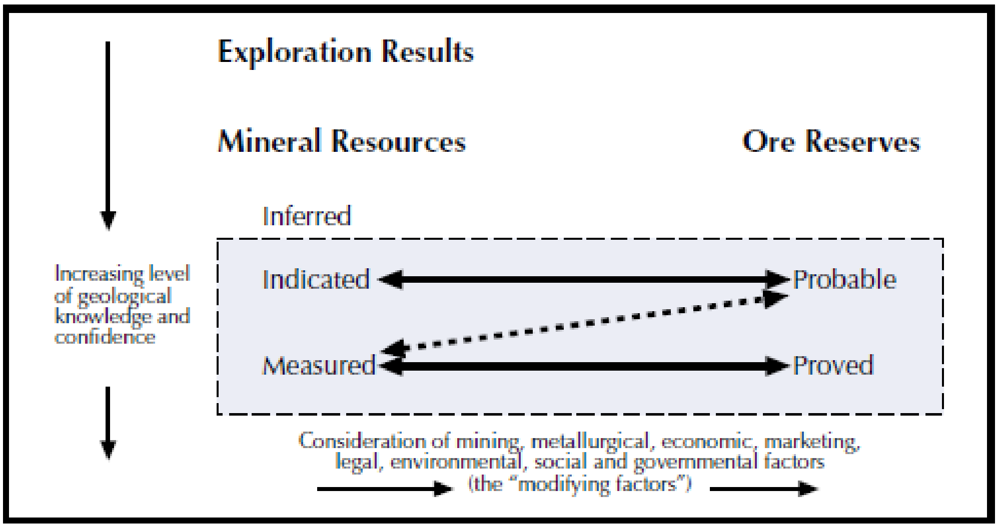

Figure 1, Panel A - JORC Code relationship between Exploration Results, Mineral Resources and Ore Reserves

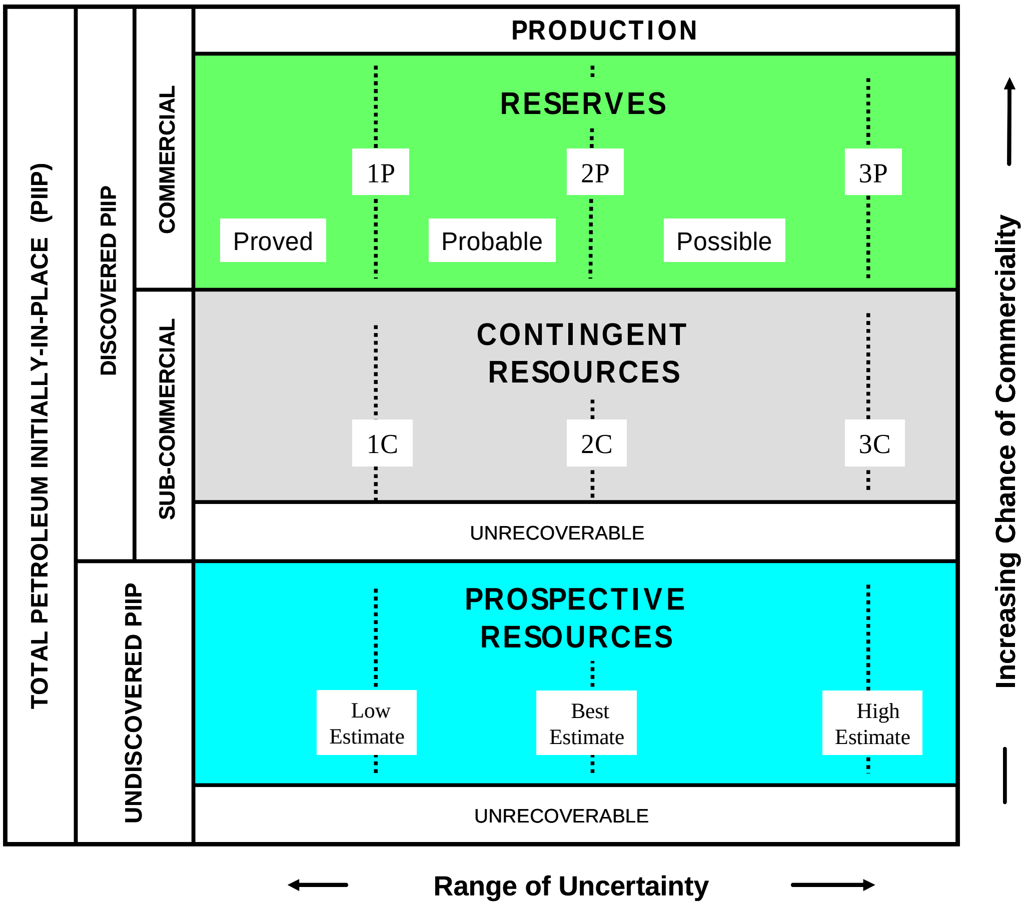

Figure 1, Panel B - SPE/WPC/AAPG/SPEE Resources Classification System

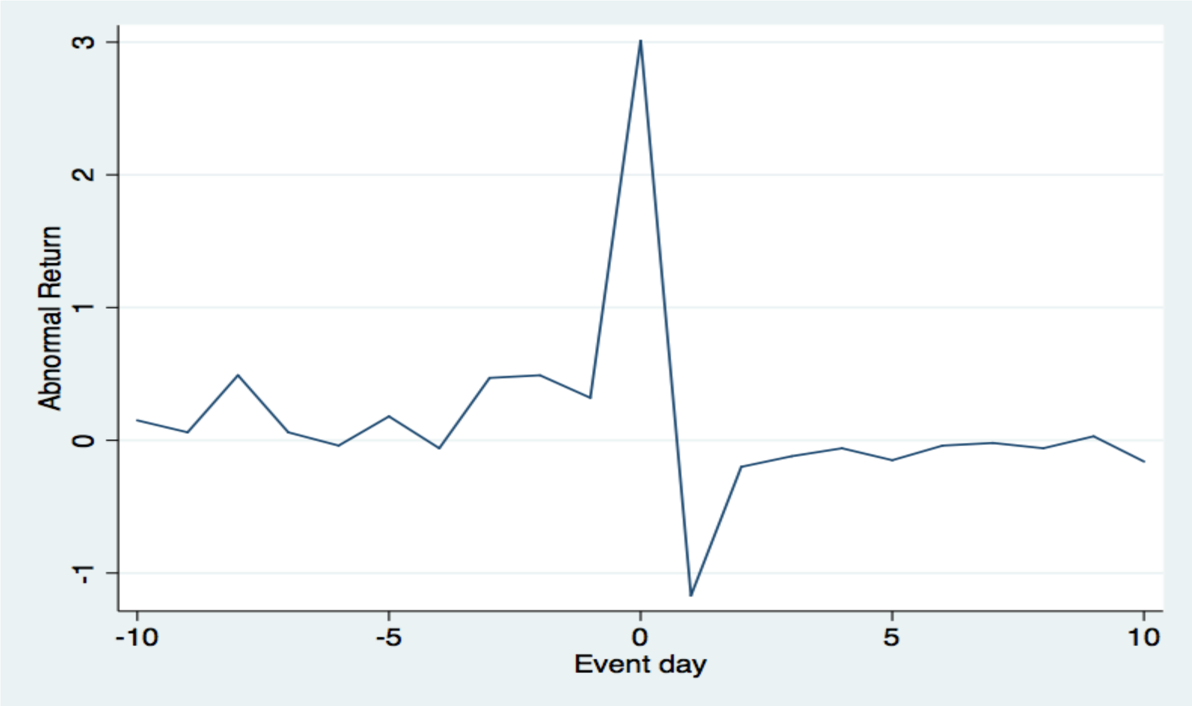

Figure 2 – Daily Abnormal returns over the 21-day, -10,0,10 window

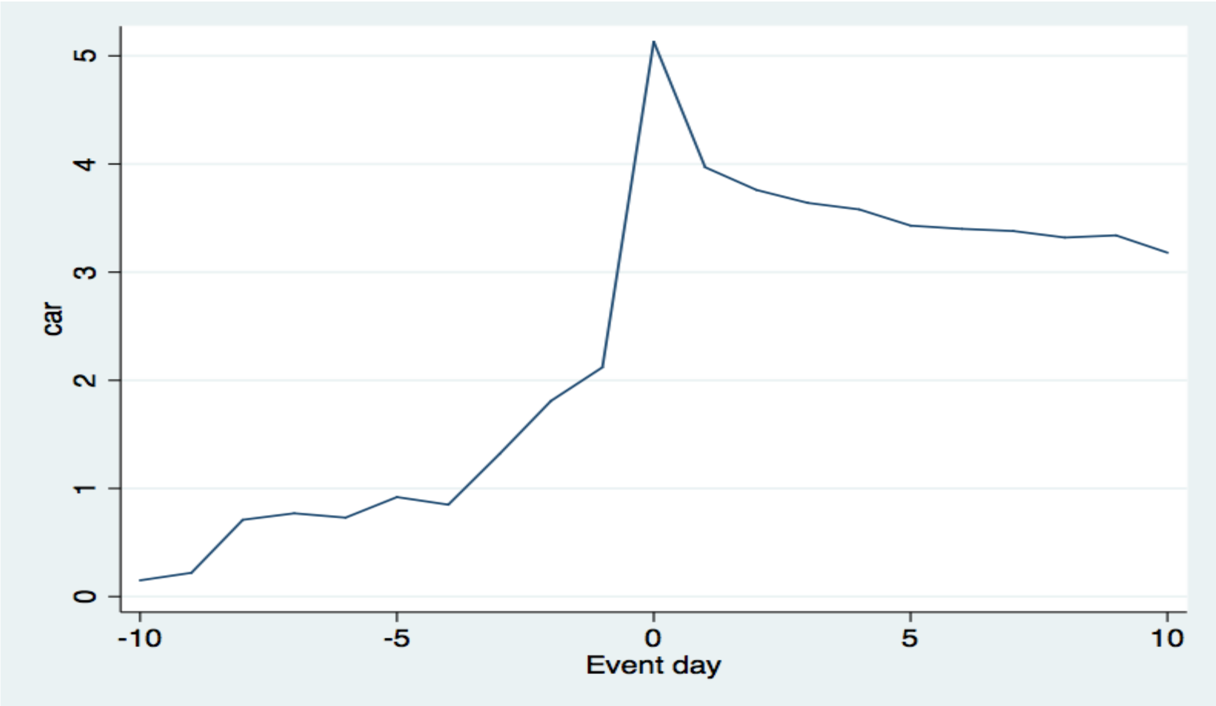

Figure 3 - Cumulative Abnormal Return over the 21-day, -10,0,10 window

Table 1 – Sample selection

	Action	Companies	Obs.
Original Sample	-	392	1579
Projects without commodity prices (Rare Earths, Mineral Sands)	Less	10	79
Final Sample	-	382	1500

The sample consists of 1,579 resource/reserve disclosures, released by 392 MDSEs listed on the Australian Securities Exchange (ASX) over the period 1996 to 2012. I exclude 79 disclosures for which commodities aren't publically traded and hence the price of the commodity is not available. After omitting these observations, 1,500 separate disclosures made by 382 MDSEs are used in in tests.

Table 2 – Descriptive statistics

	Mean	Median	Std. Dev.	Min	Max	Obs.	Non Zero Obs.
BHAR	1.017	1.005	0.108	0.466	2.268	1500	1500
*ln*BHAR	0.012	0.005	0.103	-0.763	0.819	1500	1500
CAR	1.017	1.006	0.109	0.364	2.268	1500	1500
*ln*CAR	0.012	0.006	0.105	-1.009	0.819	1500	1500
AR	1.029	1.015	0.097	0.513	2.275	1500	1500
RSC (Resources)	53.578	4.370	135.333	-8.241	600.209	1500	1298
RSV (Reserves)	0.993	0	2.979	0	12.001	1500	233
INF	34.691	1.196	97.394	-30.077	423.302	1500	1293
IND	9.284	0	24.34	-3.171	109.999	1500	880
MEA	1.174	0	3.627	0	15.996	1500	308
PRB	0.642	0	1.983	0	8.101	1500	230
PRV	0.124	0	0.463	0	2.042	1500	131
GRADE_RSC	0.986	1	0.086	0.764	1.164	1500	1500
GRADE_RSV	0.999	1	0.014	0.901	1.059	1500	1500
SIZE	241.447	50.5	1072.1	1	20488	1500	1500
*ln*SIZE	4.037	3.922	1.558	0	9.928	1500	1497
COMM_PRICE	0.187	0.136	0.383	-0.578	1.674	1500	1483
PAGES	6.626	5	7.885	0	167	1500	1496
*ln*PAGES	1.628	1.609	0.849	-9.21	5.118	1500	1500
GROWTH	0.386	0	0.487	0	1	1500	579
TOT_RSC	19.509	3.694	31.965	0.000	99.904	1500	1299
TOT_RSV	0.233	0.000	0.573	0.000	1.794	1500	254
TOT_INF	11.082	1.626	18.688	0.000	58.872	1500	1284
TOT_IND	3.913	0.302	7.245	0.000	23.520	1500	875
TOT_MEA	0.251	0.000	0.584	0.000	1.812	1500	345
TOT_PRB	0.125	0.000	0.311	0.000	0.972	1500	250
TOT_PRV	0.527	0.000	3.699	0.000	33.477	1500	146
BV	0.200	0.140	0.169	0.030	0.560	1500	1500
CAPEXPL	0.125	0.088	0.108	0.012	0.354	1500	1500
CASH	0.059	0.032	0.065	0.003	0.204	1500	1500
M/B	2.487	1.820	1.878	0.610	6.476	1500	1500
M/BNC	12.248	7.827	10.395	2.378	35.128	1500	1500
PYE	0.495	0.240	0.556	0.040	1.740	1500	1500

This table presents the variables utilized in the tests. Data on resources and reserves are hand collected. Other properties of resource/reserve disclosures such as the length and tone of the announcement along with firm level financial information are obtained. Daily prices, turnover, indexes, market capitalisation and commodity price data are obtained from Datastream. Book value and cash at the end of the period from FinAnalysis by Morningstar Datanalysis Premium. Intraday data is collected from the Securities Industry Research Corporation Asia Pacific (SIRCA). Variables are defined as follows:
BHAR = 2 day buy-and-hold return; *lnBHAR* = Log of 2 day buy-and-hold return; *CAR* = 2 day cumulative return; *lnCAR2* = Log of 2 day cumulative return; AR = Abnormal return on the event day (t=0); *RSC* = Value change in mineral growth classified as resources, scaled by pre-announcement market capitalization; *RSV* = Value change in mineral growth classified as reserves, scaled by pre-announcement market capitalization;

MEA = Value change in resource category classified as *Measured*, scaled by pre-announcement market capitalization; *IND* = Value change in resource category classified as *Indicated*, scaled by pre-announcement market capitalization; *INF* = Value change in resource category classified as *Inferred*, scaled by pre-announcement market capitalization; *PRV* = Value change in reserve category classified as *Proved*, scaled by pre-announcement market capitalization; PRB = Value change in reserve category classified as Probable, scaled by pre-announcement market capitalization; *GRADE_RSC* = Percentage change in resource grade; GRADE_RSV = Per*centage change in reserve grade; SIZE* = Disclosing firm's size measured by the market capitalization in the month announcement; lnSIZE = Natural logarithm of SIZE; COMM_PRICE = Price change for the primary deposit commodity in the 12 months prior to each respective resource or reserve disclosure; PAGES = Number of pages in each report; lnPAGES = Natural logarithm of PAGES; GROWTH = Dummy variable which equals 1 if the announcement header contains keywords that represent significant growth in resources/reserves and 0 otherwise; TOT_RSC = Total amount of resource owned by a firm scaled by outstanding shares; *TOT_RSV* = Total amount of reserve owned by a firm scaled by outstanding shares; *TOT_INF* = Total amount of resource classified as *Inferred*, scaled by outstanding shares; *TOT_IND* = Total amount of resource classified as *Indicated*, scaled by outstanding shares; *TOT_MEA* = Total amount of resource classified as *Measured*, scaled by outstanding shares; *TOT_PRB* = Total amount of reserve classified as *Probable*, scaled by outstanding shares; *TOT_PRV*= Total amount of reserve classified as *Proved*, scaled by outstanding shares; *BV* = Book value at the end of fiscal year, scaled by outstanding shares; *CAPEXPL* = Estimated capitalized expenses, scaled by outstanding shares; *CASH* = Cash at the end of the period, scaled by outstanding shares; *M/B* = Market to book ratio; *M/BNC* = Market to book ratio with book value excluding capitalized exploration expenditure; *PYE* = Price at the end of fiscal-year.

Table 3: Intraday market reaction to resource disclosures using abnormal return, liquidity and bid-ask spread measures

Panel A – Abnormal return

Event hour	Student				Wilcoxon	
	N	Mean	*t*-stat	*P>t*	*z*-stat	*P>t*
-1	1250	0.5014212	0.1304		1.953	*
0	1250	0.5029183	0.2668		2.146	**
1	1250	0.5428216	3.8505	***	5.672	***

Panel B – Liquidity

Event hour	Student				Wilcoxon	
	N	Mean	*t*-stat	*P>t*	*z*-stat	*P>t*
-1	1250	0.7523447	28.734	***	23.112	***
0	1250	0.7628078	30.0019	***	23.519	***
1	1250	0.7446278	27.31	***	22.522	***

Panel C – Bid-ask spread

Event hour	Student				Wilcoxon	
	N	Mean	*t*-stat	*P>t*	*z*-stat	*P>t*
-1	1250	0.3428185	-17.8506	***	-16.232	***
1	1250	0.3361717	-18.2476	***	-16.563	***

This table presents modified Student *t*-tests and paired Wilcoxon rank tests on the hourly market reaction around resource/reserve disclosures. Panels A, B and C present tests on empirical distribution function values of abnormal return, turnover and bid-ask spread, respectively. Each empirical distribution function is based on the measure's values from 100 preceding days during the same time of day. The expected empirical distribution function value is 0.5. Two-tailed test of significance: *** = less than 0.001, ** = less than 0 .01 and * = less than 0.05.

Table 4: Intraday market reaction to resource disclosures using intraday flow and other trading measures

Panel A: The hour immediately before resource/reserve disclosure

			Student		Wilcoxon	
Variable	**N**	**Mean**	***t*-stat**	*P>t*	**z-stat**	*P>t*
On-market trading	1250	0.499	-0.228		-3.474	***
Volume of on-market trading	1250	0.497	-0.513		-3.830	***
Actions in the limit order-book	1250	0.604	11.890	***	11.698	***
Actions excluding trades in the limit order-book	1250	0.610	12.630	***	12.377	***
Trade imbalance	1250	0.493	-0.862	*	-0.940	

Panel B: The hour immediately after resource/reserve disclosure

			Student		Wilcoxon	
Variable	**N**	**Mean**	***t*-stat**	*P>t*	**z-stat**	*P>t*
On-market trading	1250	0.763	34.433	***	24.750	***
Volume of on-market trading	1250	0.755	34.226	***	24.592	***
Actions in the limit order-book	1250	0.796	40.942	***	26.441	***
Actions excluding trades in the limit order-book	1250	0.798	41.429	***	26.558	***
Trade imbalance	1250	0.497	-0.355		-0.941	

Panel C: Differences between the hour immediately before and after the resource/reserve disclosure (After-Before)

			Student		Wilcoxon	
Variable	**N**	**Mean**	***t*-stat**	*P>t*	**z-stat**	*P>t*
On-market trading	1250	-0.264	-26.785	***	-23.139	***
Volume of on-market trading	1250	-0.258	-26.694	***	-22.961	***
Actions in the limit order-book	1250	-0.192	-16.924	***	-17.266	***
Actions excluding trades in the limit order-book	1250	-0.188	-16.656	***	-17.170	***
Trade imbalance	1250	-0.004	-0.293		-0.765	

This table presents modified Student *t*-tests and paired Wilcoxon rank tests on the intraday flow and other trading measures around resource/reserve disclosures. Statistical tests are applied to empirical distribution function values of each observation. Each empirical distribution function is based on the measure's values from 100 preceding days during the same time of day. The expected empirical distribution function value is 0.5. Panels A and B present tests on the hour immediately before and after the disclosure, respectively. Panel C tests differences between the hour immediately before and after the release of the resource/reserve information. Variables are defined as: the number of on-market trades; the volume of on-market trading; the number of actions in the limit order-book *i.e*. trades, new limit orders, amends and deletes; the number of actions excluding trades in the limit order-book and the trade imbalance defined as BIN/(BIN+SIN), where BIN is the number of buyer-initiated trades and SIN is the number of seller-initiated trades. Two-tailed test of significance: *** = less than 0.001, ** = less than 0 .01 and * = less than 0.05.

Table 5: Cross-sectional regression of abnormal returns surrounding resource and reserve changes announcements on non-financial (resource and reserve upgrade/downgrade) and financial (book value) information

	Panel A				Panel B		
	(1A)	(2A)	(3A)		(1B)	(2B)	(3B)
	*ln*BHAR	*ln*BHAR	*ln*BHAR		*ln*BHAR	*ln*BHAR	*ln*BHAR
C	-0.0372	-0.0656	-0.0493	C	-0.0488	-0.0781	-0.0634
	(-0.47)	(-0.72)	(-0.57)		(-0.57)	(-0.81)	(-0.68)
RSC	0.0001**	0.0001**	0.0001**	MEA	0.0004	0.0004	0.0004
	(2.49)	(2.40)	(2.45)		(0.78)	(0.65)	(0.63)
				IND	0.0001	0.0001	0.0001
					(0.73)	(0.61)	(0.63)
				INF	0.0001**	0.0001**	0.0001**
					(2.40)	(2.41)	(2.42)
RSV	0.0012	0.0012	0.0012	PRV	0.0064	0.0067	0.0074
	(1.10)	(1.13)	(1.13)		(0.97)	(1.01)	(1.12)
				PRB	0.0013	0.0013	0.0011
					(0.66)	(0.66)	(0.58)
*ln*SIZE	-0.0065**	-0.0084***	-0.0088***	*ln*SIZE	-0.0066***	-0.0085***	-0.0089***
	(-2.89)	(-2.93)	(-3.25)		(-2.99)	(-3.01)	(-3.34)
COMM_PRICE	0.0115*	0.0134**	0.0127*	COMM_PRICE	0.0115*	0.0135**	0.0128*
	(1.90)	(2.16)	(1.99)		(1.85)	(2.12)	(1.95)
*ln*PAGES	-0.0008	-0.0003	-0.0007	*ln*PAGES	-0.0007	-0.0001	-0.0006
	(-0.24)	(-0.07)	(-0.22)		(-0.23)	(-0.04)	(-0.20)
GROWTH	0.0165***	0.0164***	0.0162***	GROWTH	0.0166***	0.0166***	0.0164***
	(3.19)	(3.12)	(3.19)		(3.13)	(3.07)	(3.13)
RSV_GRADE	0.0300	0.0580	0.0422	RSV_GRADE	0.0405	0.0697	0.0555
	(0.44)	(0.73)	(0.55)		(0.57)	(0.85)	(0.69)
RSC_GRADE	0.0340	0.0362	0.0359	RSC_GRADE	0.0340	0.0359	0.0357
	(1.27)	(1.38)	(1.33)		(1.22)	(1.31)	(1.27)
*lag*BV		0.0234**		*lag*BV		0.0234**	
		(2.31)				(2.35)	
lagCAPEXPL			-0.0007	*lagCAPEXPL*			-0.0017
			(-0.03)				(-0.07)
*lag*CASH			0.1229***	*lag*CASH			0.1236***
			(4.23)				(4.31)
N	1500	1500	1500		1500	1500	1500
Adj. R-sq	0.019	0.021	0.022		0.018	0.020	0.021
F-stat	7.836	8.294	21.11		16.90	14.94	20.01

The above table shows the regression results of 2-days buy-and-hold abnormal returns surrounding resource and reserve announcements on non-financial (resource and reserve change) and financial (book value) after controlling for commodity price sentiment, disclosure characteristics and mineral grade. Two-tailed test of significance are reported: *** less than 0.01; ** less than 0.05; * less than 0.10; *t*-statistics are calculated using robust standard errors clustered by year correcting for heteroskedasticity

Table 6: EBO regression of price at the end of the period on non-financial (total resources and reserves owned by a firm) and financial information (book value)

	Panel A				Panel B				Panel C	
	(1A)	(2A)	(3A)	(4A)	(1B)	(2B)	(1C)	(2C)	(3C)	(4C)
	P	P	P	P	P	P	P	P	P	P
C	0.4492***	0.4231***	0.4611***	0.4608***	0.0183	0.0007	0.0212	0.0145	0.0071	-0.0012
	(8.27)	(7.83)	(8.31)	(8.34)	(0.65)	(0.03)	(0.80)	(0.53)	(0.32)	(-0.06)
TOT_RSC	0.0023**						-0.0002		-0.0006	
	(2.71)						(-0.47)		(-1.13)	
TOT_INF		0.0010								
		(0.78)								
TOT_IND		0.0105***								
		(3.59)								
TOT_MEA		0.0754**								
		(2.85)								
TOT_RSV			0.1447***					0.0306		0.0190
			(5.69)					(1.24)		(0.76)
TOT_PRB				0.2422***						
				(5.74)						
TOT_PRV				0.0067						
				(1.69)						
BV					2.3807***		2.3902***	2.3637***		
					(24.55)		(24.56)	(25.58)		
CAP_EXP						1.7662***			1.7837***	1.7543***
						(8.22)			(8.01)	(8.23)
CASH_END						4.6129***			4.6595***	4.5965***
						(8.71)			(9.29)	(8.88)
N	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500
adj. R-sq	0.017	0.038	0.022	0.023	0.523	0.548	0.523	0.524	0.549	0.548
F	7.357	7.887	32.35	16.49	602.9	205.5	304.9	362.6	140.9	368.1

The above table shows the EBO model estimation of price at the end of the period on non-financial (total resource and reserve owned by a firm) and financial (book value). Two-tailed test of significance are reported: *** less than 0.01; ** less than 0.05; * less than 0.10; *t*-statistics are calculated using robust standard errors clustered by year correcting for heteroskedasticity

Table 7: Cross-sectional regression of capitalized exploration expenses at the end of the fiscal year on non-financial (total resources and reserves owned by a firm) information

	Panel A	**Panel B**	**Panel C**
	CAPEXPL	CAPEXPL	CAPEXPL
C	0.1139***	0.1070***	0.1183***
	(25.04)	(22.57)	(24.63)
TOT_RSC	0.0006***		
	(4.22)		
TOT_INF		0.0002	
		(0.55)	
TOT_IND		0.0024***	
		(5.92)	
TOT_MEA		0.0257***	
		(4.62)	
TOT_PRB			0.0465***
			(4.73)
TOT_PRV			0.0013*
			(2.10)
N	1500	1500	1500
Adj. R-sq	0.027	0.068	0.023
F	17.81	51.76	18.27

The above table shows the regressions results of capitalized exploration expenses at the end of the fiscal year on non-financial (total resource and reserve owned by a firm). Two-tailed test of significance are reported: *** less than 0.01; ** less than 0.05; * less than 0.10; *t*-statistics are calculated using robust standard errors clustered by year correcting for heteroskedasticity

Appendix I – Financial information example: Resource change announcement by Piorneer Resources (ASX:PIO)

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15 August 2011

ASX/Media Announcement

Pioneer posts maiden resource of 185,600oz Au at Mt Jewell Project

- **Estimate at this stage includes Hughes & Tregurtha deposits only, defined to JORC Mineral Resource standard - further updates will be provided**

(…)

Pioneer Resources Limited (ASX: **PIO**) is pleased to report a maiden JORC reportable in-situ Mineral Resource estimate of 3.78 million tonne at a grade of 1.53g/t Au for 185,600oz Au for its Mt Jewell Project, located 55km north of Kalgoorlie, WA. Of this total, 131,600oz Au or 71% is categorised as Measured or Indicated Mineral Resource. This information is shown in more detail in Tables 1 and 2.

(…)

Table 2
Mineral Resource by Resource Category (0.8g/t Lower Cut-off Grade)

	Hughes		Tregurtha		Total		
Category	**Tonnes**	**Au**	**Tonnes**	**Au**	**Tonnes**	**Grade**	**Au**
		(g/t)		**(g/t)**		**(g/t)**	**(oz)**
Measured	317,000	1.50	328,000	2.71	645,000	2.12	43,900
Indicated	969,000	1.32	906,000	1.60	1,875,000	1.46	87,700
Inferred	852,000	1.33	405,000	1.38	1,257,000	1.35	54,400
Total	**2,138,000**	**1.35**	**1,639,000**	**1.77**	**3,777,000**	**1.53**	**185,600**

Note: Totals might not add due to the timing of equation rounding. The CSA Mineral Resource was estimated within constraining wireframe solids based on a nominal lower cut-off grade of 0.5g/t Au. Ordinary Kriging technique with high grade treatment (to reduce the influence of some very high grade samples) was used. The resource is quoted from blocks above the specified gold cut-off grade.

Yours faithfully

Appendix II – Financial information example: Financial position statement by Australia Minerals and Mining Group (ASX:AKA)

Consolidated Statement of Financial Position

	NOTES	2012 $	2011 $
ASSETS			
CURRENT ASSETS			
Cash and cash equivalents	19(a)	**4,955,630**	6,580,296
Other receivables	6	**473,120**	143,577
Other assets	7	**-**	7,500
TOTAL CURRENT ASSETS		**5,428,750**	6,731,373
NON-CURRENT ASSETS			
Plant and equipment and motor vehicles	8	**39,330**	61,235
Capitalised mineral exploration expenditure	9	**2,227,172**	1,272,321
TOTAL NON-CURRENT ASSETS		**2,266,502**	1,333,556
TOTAL ASSETS		**7,695,252**	8,064,929
LIABILITIES			
CURRENT LIABILITIES			
Trade and other payables	10	**260,401**	101,791
TOTAL CURRENT LIABILITIES		**260,401**	101,791
TOTAL LIABILITIES		**260,401**	101,791
NET ASSETS		**7,434,851**	7,963,138
EQUITY			
Contributed equity	11(a)	**8,805,581**	8,804,581
Share Option Reserve	13	**921,049**	694,950
Accumulated losses	12	**(2,291,779)**	(1,536,393)
TOTAL EQUITY		**7,434,851**	7,963,138

The above Statement of Financial Position should be read in conjunction with the accompanying notes.