WRITE-OFFS OF EXPLORATION AND EVALUATION ASSETS IN AUSTRALIAN MINING DEVELOPMENT STAGE ENTITIES: DETERMINANTS AND STOCK PRICE REACTIONS

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CERTIFCIATE OF AUTHORSHIP/ORIGINALITY

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ABSTRACT

This thesis explores write-offs in exploration and evaluation (EE) assets reported by the pre-production Australian Mining Development Stage Entities (MDSEs). The financial reporting of MDSEs is subject to a specific principles-based accounting standard AASB 6, *Exploration for and Evaluation of Mineral Resources* which allows for multiple accounting choices to record EE assets. This reporting flexibility gives rise to managerial discretion in recording assets and can have a potential impact on asset quality. This study primarily evaluates different accounting choices in reporting EE costs at the firm level. This disclosure of information ultimately has a bearing over the impairment of the EE assets and the valuation of the firms.

To begin with, this thesis is the first comprehensive analysis on accounting choices under AASB6 since the Lourens and Henderson (1972) survey. It provides evidence of current accounting choices made by MDSEs to capitalise or to expense EE costs. This study further examines the determinants and market reactions of write-offs amongst MDSEs in the Australian mining sector. The latter signals a demarcation when uncertainty is resolved.

It is observed that capitalisation remains the dominating accounting choice for MDSEs. This descriptive finding holds in both the pre- and post-IFRS adoption periods. Based on descriptive statistics, firms choosing capitalization method, tend to have weaker financials with low cash balances, lower profitability and lower levels of equity funding. The expensing method tends to be used by firms with stronger financials with high cash balances, larger asset base, higher profitability and more equity funding.

In terms of the propensity to impair EE assets, impairment is more likely to occur amongst firms with a high proportion of non-exploration spending relative to

exploration-related spending, high cash burn rates, before obtaining project debt financing, during the mining boom. However, firms holding large EE assets with high book to market ratios, using non–Big 4 specialist auditors are associated with higher write-offs reported.

In assessing the impact of write-offs on equity valuation, on the announcement date, negative short windows (event date and 3 to 5-day abnormal buy-and-hold returns) are observed following price sensitive announcements, when information is derived from 'preliminary final' reports[1].

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[1] Preliminary final report must be lodged with Australian Stock Exchange as required by the listing rules while mining and oil and gas exploration companies are not mandatory. The preliminary final report contains statement of comprehensive income, financial position and cash flows and can be audited and unaudited.

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CHAPTER 1 – INTRODUCTION

1.1 Overview

This thesis explores write-offs of EE assets reported by pre-production Australian Mining Development Stage Entities (MDSEs). The thesis considers the principles-based accounting standard AASB 6, *Exploration for and Evaluation of Mineral Resources*. AASB 6 provides MDSEs accounting choices pertaining to either expensing or capitalising EE costs. This flexibility gives rise to managerial discretion in financial reporting, which may potentially create varying degrees of asset quality. Write-offs are a deterministic indicator of asset quality signifying part of the assets that can no longer generate probable future economic benefits. In this MDSE setting, the magnitudes of write-offs are potentially fungible dependent on available geological knowledge and managerial incentives. This thesis evaluates firm level accounting choices in reporting EE (capitalization) costs and subsequent determinants and implications of EE asset impairment.

Accordingly, the thesis has three objectives. The first is to provide descriptive evidence of the choice made by MDSEs to capitalize or expense EE costs. Effectively, the question addressed is what type of firms will capitalize EE costs and what type of firms will expense EE costs. This analysis is conducted at a descriptive level. The study looks at what accounting methods have been used in the last 21 years, 10 years before IFRS adoption and 10 years after. This study will not look at accounting choice switch or the history of accounting choice. The second objective of this thesis is to provide evidence on the determinants of write-offs amongst MDSEs in the Australian mining sector. Accordingly, the evidence in this thesis broadens the existing literature on impairment

to include impairment of EE assets, which has not previously been researched. The third objective of this thesis is to examine the sub-set of MDSE's capitalizing EE assets and to consider equity market reactions to EE asset impairment.

1.2 Motivation

The motivation for this thesis is the limited evidence on accounting choice determinants in the EE asset context. The setting has a number of attractive attributes. It has a presence of a large number of MDSE's listed on the Australian Stock Exchange. This means there is sufficient sample size to undertake research on impairment to provide statistical evidence with generalizable outcomes. This differs from the previous impairment studies typified by relatively smaller sample sizes. Next, the research setting has a further advantage in highlighting the characteristics shared amongst all MDSE participants and they all have a common business objective. That is, MDSEs are primarily concerned about raising equity funds to expend on risky mineral exploration activity in order to achieve mineral discovery.

The setting has another attractive feature in aspects of AASB 6. Australia is the first country to have an accounting standard established specifically for the extractive industry (Cortese et al. 2009). AASB 6 provides a great deal of flexibility in terms of accounting for EE costs. AASB 6 Aus7.2 allows[2] for EE costs to be capitalised both with

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[2] AASB 6 Aus7.2 states an exploration and evaluation asset shall only be recognised in relation to an area of interest if the following conditions are satisfied:
(a) the rights to tenure of the area of interest are current; and
(b) at least one of the following conditions is also met:
(i) the exploration and evaluation expenditures are expected to be recouped through successful development and exploitation of the area of interest, or alternatively, by its sale; and
(ii) exploration and evaluation activities in the area of interest have not at the end of the reporting period reached a stage which permits a reasonable assessment of the existence or otherwise of *economically recoverable reserves*, and active and significant operations in, or in relation to, the area of interest are continuing.

expected positive EE results (under Aus. 7.2bi) and pending EE results (under Aus. 7.2bii). Positive EE results imply the discovery costs of economically recoverable reserves to be recouped from development or disposal. Given it generally takes a long time (years) for the underlying feasibility studies to be completed to confirm the economic viability. Costs associated with the expected positive EE results are recorded as exploration assets, and later when the project is developed, it is transferred to a development asset. Pending EE results imply that the economically viable conditions have not been met.

To sum up, some expenditure will be successful (Aus. 7.2bi), while other spending will be capitalized subject to further exploration with viability at this point unknown (still waiting). The Conceptual Framework allows for uncertainty. The Framework SAC 4, para. 38[3] sets out criteria for asset recognition when it is probable that future economic benefits will occur. "Probable" is less than certain, and hence pending EE results are consistent with asset recognition where benefits are 'less than certain'. It should also be pointed out that exploration expenditure is likely to result in future economic benefits, since most prospects that a company has expended money on when the firm no longer sees the project as a priority, will ultimately be transferred to other parties for a non-zero sum, albeit small. Thus, the real uncertainty is in the quantum of recoverability, not so much whether there is recoverability.

A further interesting aspect of the setting is the reporting and disclosure of EE assets. In nearly every case, EE assets appearing on the Balance Sheet are described along the lines of 'Exploration Costs Deferred' or 'Exploration and Evaluation Assets'.

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[3] SAC 4, para 8 states the criteria for recognition of assets. An asset should be recognised in the statement of financial position when and only when:
(a) it is probable that the future economic benefits embodied in the asset will eventuate; and
(b) the asset possesses a cost or other value that can be measured reliably.

This means that amounts signifying different exploration potential and risk profiles are grouped together on the balance sheet in one line item (deferred EE assets). In the course of financial statement preparation, managers are privy to information on the probabilities of success in their exploration programs or projects but shareholders are not. This suggests that high information asymmetry exists in terms of understanding the potential of such assets in MDSE's. This holds implications for the signalling potential of the assets along with implications for impairment of such assets.

In terms of impairment implications, AASB136, para, 12 and AASB6, para, 20 prescribe the asset impairment test criteria for periodic assessments of EE assets. Write-offs largely determined by suitable technical information provided by competent persons who undertake deposit level resource modelling or provide assurance around the prosperity and economics of mineral projects. Similarly, if the company conducts feasibility studies on a certain deposit, which produces mixed information on project viability, impairment may be conducted. Viability assessments will be undertaken considering prevailing commodity prices and expectations of future commodity prices.

The reported impairment amount serves to calibrate the value of exploration assets in terms of current geological knowledge. Consistent with prior literature, firms may decide to write off EE assets to resolve uncertainty but the magnitude of the write-off may be influenced to some extent by managerial self-interest. An example might be a MDSE subject to stringent capital availability limitations where an impairment of an EE asset signalling reduced profitability of the firm's exploration portfolio may make equity raising all the more difficult. Under such circumstances, managers may opt to resist write-downs of EE assets on the basis that their interest are served giving the firm the best chance to raise further timely equity capital. To this extent, the presence of 'more' deferred EE assets exist on MDSE balance sheets owing to managerial incentives creates

the potential for adverse selection for MDSE investors. The adverse selection issue is particularly problematic for equity investors since there is no debt finance obtained by MDSE's prior to the development phase, so equity is the only way for MDSE to finance pre-development projects. The moral hazard problem in the MDSE setting is accentuated by high information asymmetry. Typically, mineral orebodies are situated in remote locations, distant from existing infrastructure with limited or no public access.

A second facet of this problem is the actions undertaken by managers after a capital raising occurs. There is a high degree of uncertainty in mineral exploration activity, with a high probability that no economic resource will be identified in any given exploration project. With a high probability of failure experienced in exploration endeavour, bad managers may have greater degrees of freedom to engage in shirking. This might include spending shareholders' funds in a self-interested fashion rather than on exploration activity in order to maximise their own utility as opposed to shareholders' value (Jensen and Meckling 1976). The actions of self-interested managers are more difficult to discern due to expectations of exploration failure that are geologically and industry related. Shirking and self-interested expenditure in a high information asymmetry setting are known as moral hazard. Again, moral hazard may potentially encourage self-interested managers to retain capitalized exploration on balance sheet as a mechanism to disguise and perpetuate self-interest and mitigate perceptions of exploration failure associated with impairment decisions.

Financial reporting can mitigate asymmetric information that causes adverse selection and moral hazard problems in the MDSE setting, where shareholders can be informed of the ongoing performance of managers. To mitigate liquidity issues amongst MDSE's, the ASX has instigated quarterly cash flow reporting for mining MDSE's that

take the specific form of the 'Appendix 5B'.[4] These reports require regular disclosure of cash positions and expected expenditure to the market on a quarterly basis. In addition, shareholders might pressure managers to contract with auditors to mitigate the risk of shirking and management self-interest and to increase the likelihood that impairment of EE assets, which will be conducted on a timely basis. Higher quality auditors have been associated with a propensity to impair assets as accurately reported in accordance to the prescribed accounting standards.

Clearly, the presence of deferred EE assets creates a level of uncertainty and gives asymmetric information consequences. IFRS 6 permits a greater degree of flexibility in the accounting choice to capitalize or expense. This flexibility does create uncertainty which is consistent with the asset recognition criteria in the Conceptual Framework. However, the current Conceptual Framework does not explicitly discuss how uncertainty is resolved over the life of the assets but merely sets criteria for initial asset recognition. Whilst uncertainty is not key characteristic nor a desirable attribute of the current Conceptual Framework but it has a presence within the Framework. Given the presence of uncertainty, this setting considers the implications when uncertainty is resolved through EE asset impairments. The implications of this uncertainty resolution are considered through the prism of stock price reactions around EE asset impairment decisions.

It is noted that this is the first comprehensive study to investigate the current accounting choice landscape under AASB 6 using a lengthy sample period of MDSEs spanning from 1995-2015. This enables the thesis to contemplate any implications of the IFRS harmonisation decision in 2005. The subject matter (MDSEs) is also

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[4] A specific format for the reporting of mining exploration entity and oil and gas entity quarterly report known as the 'Appendix 5B' as required by ASX.

economically significant. MDSEs have a sizable presence in the Australian equity market representing about one third of all listed companies and depending on how they are defined up to a quarter of total market capitalisation. Mining contributes to 6-7% of the GDP in Australia. Mineral exports contribute around 35% of Australia's exports (ASX 2010). The Lourens and Henderson (1972) survey which produced the first evidence on accounting choice in the industry, was influential in providing key information to facilitate the development of the first EE accounting standard in Australia. The standard has inevitably undergone changes since its first official issuance in 1977 as Mueller (1967) discusses accounting standards can undergo changes. Interestingly, there has been no other subsequent substantive descriptive analysis of accounting choice under AASB 6. In this thesis, the descriptive statistics detail what accounting choices are used in treating EE costs and what kind of firms will choose capitalizing versus expensing. The subsequent empirical models detailing what determine capitalizing firms to impair EE assets and the implications of those impairment decisions in the capital market setting.

The magnitude of EE asset impairment is fungible. Accordingly, this thesis also examines the managerial incentives to impair EE assets in the MDSE setting. Through the unique cash flow disclosure requirements (See Appendix 3), the thesis is able to consider new aspects of managerial incentives in relation to impairment decisions. For example, using the ASX-required Appendix 5B disclosure format, it also allows consideration of the amount of spending on non-exploration activities (a potential proxy for managerial self-interest) relative to exploration spending (a potential proxy for shareholder interest) may have a bearing on the size of write-offs reported.

Given prior research has identified evidence of auditor industry specialist effects in the MDSE setting, auditor industry specialists in the MDSE setting are identified to

assess implications for EE asset impairment. The role of an audit is to assure financial statement users that statements are presented in accordance with applicable accounting standards (AASB6 for the EE activities and AASB136 for asset impairment). The impact of auditors on accounting choices in the EE asset context is considered in two dimensions. The effects of auditor reputation (specialists) are considered along with the generic distinction between the Big 4 and non-Big 4 auditors. It is noted that the presence of Big 4 auditors in the MDSE setting is atypical in the sense that this setting features many more non-Big 4 clients than Big 4 clients, which is not the case for the other sectors, unrelated to the mining industry, in the Australian capital market,

Further, the effects of specific auditors' opinions are considered. These comprise a multiple forms of auditor opinion modifications in this setting. These include modifications on the basis of asset recoverability, cash flow, net working capital position and losses.

Geological and technical complexity in the mineral exploration industry is considered non-trivial. This is demonstrated by the Tasminex and Poseidon events[5] in late 60s in Australia. The advent of these cases engenders the development of the reporting framework for resource sector in Australia. The framework pertains to a structured standardised reporting of non-financial information in the form of the Joint

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[5] Poseidon was a nickel mining company in Australia. Due to tight nickel supply, from around a dollar, the price of Poseidon stocks soared in late 1969 after the release of news concerning discovery of nickel and continued to rise to $280 in February, 1970 as a result of speculation. The stock price crashed quickly thereafter. When Poseidon started to produce nickel, the nickel ore was of a lower grade compared to expectations. Coupled with high extraction costs and falling nickel prices, loss-making finally led to the delisting of Poseidon in 1976. Many investors lost money. The further investigation of the Poseidon's case by the Rae Committee recommended changes to the resource reporting disclosure requirements. During the Poseidon bubble, another Tasmanian-based company, Tasminex, listed in November, 1969 and produced misleading and grossly overoptimistic statements regarding geological prospectivity. Tasminex shares fell from $96 to $7.50 in early March, 1970. Many investors suffered financially.

Ore Reserve Committee (JORC) Code to ensure a high level of integrity in reporting and to increase transparency to investors. The JORC Code is mandatory for all listed mining firms. The JORC code is conservative as geologists or mining consultants (Competent Persons) provide assurance on both exploration results and on reported resources and reserves that underpin EE asset values. Auditors are required to observe the disclosure endorsed by Competent Persons providing a form of joint assurance in compliance with the accounting standards and the JORC code respectively. The primary role of the assurance provided is to enhance reliability of the accounting figures to facilitate the role of financial reporting (Maines and Wahlen 2006).

In terms of prior empirical research on the role of Competent Persons and resource assurance, Ferguson and Pündrich (2015) provide evidence on similarities of the assurance roles between Competent Persons and auditors bounded by their respective industry codes of ethics and standards. As such, if the audit enhances the reliability of the financial report then geological consultants can do the same in relation to technical geological information to reduce asymmetric information. Financial statement users can consider the auditors' opinion as an alternative to stated resource and reserve disclosures to assess liquidity, asset quality and financial position of the MDSE.

Lastly, this thesis considers market reactions of EE asset write-offs when uncertainty is resolved lending support to the Conceptual Framework study advocated by Baker & Penman (2013). Commercially and operationally, write-offs in EE assets are generally connected with failure to achieve economically viable discoveries and they also reduce expectations of future project development probabilities. It is a conscious decision made by firms to write off EE assets to resolve uncertainty. Francis et al

(1996)[6] find write-offs in different assets exhibit varying stock price reactions. Impairment signals bad news with negative stock price reactions expected to be associated with EE asset impairment. It is noted that this is a relatively clean test of impairment effects for a number of reasons. As discussed, the sample is relatively homogeneous compared to other impairment studies. Further, all MDSEs value their EE assets at cost, so there are routinely no fair value adjustments and routinely no reinstatement of previously written down amounts. Last, the setting features the absence of debt finance prior to the development phase, suggesting debt contracting related management incentives are not present.

1.3 Summary

Over the sample window from 1995 – 2015, 44% of MDSEs use the capitalisation method, followed by 24% of the sample using the expense method with 14% using a combined expensing and capitalizing approach (refer to Table in Appendix 7 for details). Of 7097 firm years, 26% are pre-IFRS adoption in 2005 and 74% are post-IFRS. There is an increasing presence of MDSE listed on the ASX during the sample period, with the main reason being higher resource prices observed during the resource boom rather than any accounting standard or regulatory change. In terms of financial characteristics, capitalising firms tend to be weaker with lower equity raising ability, profitability and cash balances. Firms choosing to expense EE costs tend to be stronger with higher equity raising capability, stronger profitability and cash balances. Firms

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[6] Francis et al. (1996) discuss signalling effects associated with positive stock price reactions in restructuring write-offs, with an expectation of an improvement in future cash flow. In the MDSE context, impairment signals management's geological acumen and credibility.

with a high proportion of spending on non-exploration activities relative to exploration activities use the capitalisation method.

In examining the determinants of the propensity to impair EE assets, I find evidence firms more likely to engage in impairment to have the following characteristics. Firms with a higher proportion of non-exploration spending relative to exploration spending, during the resource boom tend to be less inclined to report write-offs. The same result holds for firms using capitalizing and combined method. High cost explorers during the resource boom and when the commodity prices are strong also have a lower tendency to have write-offs reported. The same result holds for capitalised firms with high proportion non-exploration spending and high cash burn rate during resource boom after IFRS is adopted.

I find consistent evidence that specialist have a positively significant association with the propensity to impair EE assets, whilst Big 4 auditors have no effect except for capitalised firms. This may point to the importance of auditor industry specialisation in the MDSE setting, where evidence of specialisation has been observed (Ferguson, Pündrich and Raftery, 2014).

In examining whether uncertainty resolution is value increasing or value decreasing to shareholders, write-offs disseminated through the preliminary final reports, are significantly associated with negative abnormal returns on the announcement date and over the 3- and 5- day windows. Write-offs disseminated through the annual reports are only significantly associated with negative abnormal returns on the announcement date.

It is noted that write-offs in other sectors increase leverage and heighten the potential of covenant violations. However, the presence of leverage is not a typical feature in the EE phases of MDSEs until the development phase is reached, which

normally involves the completion of a bankable feasibility studies. In the pre-development exploration phase, impairment sends a strong signal of failed exploration effort in an environment where leverage is not present.

In summary, this thesis contributes to the impairment literature by providing descriptive statistics of the accounting choice landscape, empirical evidence of the determinants of impairment decisions of EE assets and the capital market implications of impairment decisions in this setting. This area of research is interesting as it enhances knowledge of accounting choices in a principles-based accounting standard environment with respect to IFRS 6. Further, many prior impairment studies are typically related to goodwill, inventory and fixed assets namely Property, Plant and Equipment (PP&E) as in Francis et al (1996) and Riedl (2004). This is the first study that the author is aware of to explore write-off decisions in EE assets. In doing so the thesis adds to the literature where uncertainty exists both in terms of recognition of the underlying asset and in disclosure in the financial statements. This heightened uncertainty along with information asymmetry due to the technical nature of the mining industry suggests this is an ideal setting to explore the role of managerial incentives in both accounting choice and impairment decisions. The setting features failure as a dominant exploration outcome suggesting adverse selection and moral hazard issues feature prominently in the setting.

1.4 Thesis structure

The remainder of this thesis is organised as follows. Chapter 2 provides background information on relevant financial accounting standards and industry technical reporting standards (the JORC code) and theoretical framework. Chapter 3 provides descriptive evidence of accounting choices by MDSEs to capitalize or expense

EE (EE) costs. The question of what determines choice to capitalize verses expense is also considered. Chapter 4 provides empirical evidence on the determinants of write-offs amongst MDSEs in the Australian mining sector. In the sample of write-off and non-write-off firms, associations between the propensity to write down the EE assets and variables measuring agency cost related proxies along with controls for firm financial characteristics are examined. Chapter 5 examines the market reactions following a write-off. Drawing on prior literature, tests are conducted on abnormal returns over 3 and 5 day-windows as well as on the announcement date. A variety of robustness tests are undertaken, including whether the write-off follows a price sensitive announcement. Chapter 6 concludes with a summary and implications from previous chapters. Potential contributions and limitations of the research design are discussed along with suggestions for future research.

CHAPTER 2 - THE DUAL ASSURANCE FRAMEWORK: FINANCIAL AND RESOURCE REPORTING IN THE AUSTRALIAN MINING INDUSTRY

2.1 Background

Lourens and Henderson (1972) conducted the first descriptive study investigating accounting choice in the Australian mining industry. This survey states that 'there is an immediate need to develop an improved set of reporting standards for the extractive industries.' The survey likely informed the accounting standard setting process for the mining industry (Refer to the standard development process described in Appendix 2). Lourens and Henderson queried respondents on their treatment of EE costs. Across the whole sample of a total of 129 respondents, 72% deferred the exploration expense while 27% immediately expensed the EE costs. Capitalization was less common for larger firms with 56% capitalizing and 42% expensing. Smaller firms in case of 79% capitalized while 21% expensed.

The first Accounting Standards DS 12/308, Accounting for the Extractive Industries, was approved and become operative on January 1, 1977. Its goal is to provide a framework for practice bringing greater uniformity to the process of accounting for EE costs. It stipulated the Area of Interest (AOI) accounting method, which the standard makes clear, is a subset of successful efforts accounting. The primary issue considered in the early development of accounting standards in the industry was the appropriate treatment of EE costs. Treatment of these costs has been somewhat controversial (Selig 1980, Gerhardy 1999). The first version of DS12 was resisted by the industry owing to the limit of carry forward of EE costs to two years. An amended version was subsequently issued in December 1977, with a deletion of the two-year carry forward cap (Whittred et al., 1996). This, in essence, allowed mining

firms in Australia more latitude in deferring EE costs indefinitely. Any short term or immediate write-offs of exploration costs under the successful efforts method can discourage companies from engaging in exploration of risky ventures (Katz 1985, Van Riper 1994).

Prior to DS12/308 there had been little in the way of specific guidance from professional accounting bodies, at a time of controversy related to the Poseidon and Tasminex events. The major issues requiring guidance, in association with accounting and reporting problems at the time, include the following six issues;

1. Cost measurement,

2. Disposition of capitalized costs,

3. Accounting for revenue,

4. Capitalisation/expense decisions for pre-production EE costs,

5. Accounting method prescription,

6. A framework for disclosure of mineral resources.

This thesis primarily considers empirical evidence in relation to issue number 4. Complications arise in the form of the differing accounting principles underlying accounting treatment in relation to EE costs. For example, the conservatism principle suggests immediate expensing may be the most suitable approach, but application of the matching principle would suggest deferral of EE costs so as to align with revenue generation in the production phase. Further, there is the presence of substantial time lags between the occurrence of expenditure and the advent of revenue generation.

There are idiosyncratic features of the regulatory environment that may also impact accounting treatment. For example, in some States, directors are required by law to provide an explanation if any non-current assets are priced above their replacement value. This provision was included in the amendment to the NSW Companies Act S162

(7) (c) and may have encouraged the immediate expensing of EE cost (Selig, 1980). One could assert that this requirement safeguards against overstatement, consistent with conservatism.

2.2 Conceptual framework for asset definition and recognition

Statement of Accounting Concepts (SAC) 4 para. 15 identifies assets as having three essential characteristics:

- Assets must generate future economic benefits,

- Entities must have control over such benefits,

- The transaction or other event that gives rise to control must have occurred.

SAC 4, para. 38 sets out two criteria for asset recognition. Assets are recognised when it is probable future economic benefits will eventuate and when the assets possess a cost or other value that can be measured reliably. In AASB 6, Aus. 7.2a, the approval of an exploration license and the granting of land access allow for rights and control over the areas designated to conduct exploration activities. Firms will have control over the future economic benefits under SAC 4 para.15 as they are entitled to the ownership of minerals, if and when any minerals are discovered.

Assets are recognised under AASB 6, Aus. 7.2bi where economically viable reserves exist, for it is certain that future economic benefits will eventuate, since assets arising from EE cost incurrence can be measured reliably. The Conceptual Framework allows for recognition of uncertainty under SAC 4, para.38, to the extent it is probable that the future economic benefits embodied in the asset will eventuate. To that end, whilst controversial, the 'pending outcomes' of proven reserves can be capitalised as assets under AASB 6 Aus. 7.2b(ii), in line with the criteria laid out in SAC 4, para.38.

The term 'pending outcomes' implies uncertainty, but uncertainty is not permanent and can be resolved over time. The conceptual framework recognises the existence of uncertainty but does not explicitly address the issue of when uncertainty can be resolved over time. Barker & Penman (2013) lend support to the accounting for uncertainty which leads to mismatching whereas certainty allows for perfect matching. Uncertainty, originated by accrual accounting, provides a source of information in helping investors to distinguish between the certain and uncertain and the information is embedded in firm valuation. The associated impacts can be tested through market reaction.

2.3 Development of accounting standards

There have been overseas academic studies providing reviews of accounting practices in extractive industries including Coutts (1963), Porter (1965), Mulholland (1967), and Field (1969). Field's Accounting Research Study No. 11, entitled 'Financial Reporting in the Extractive Industries', was undertaken in the United States (US) and drew comments from both US and Australian practitioners and regulators. Field's study has some relevance and applicability to the Australian setting and thus served to motivate Lourens and Henderson (1972). The Lourens and Henderson (1972) survey extended Field (1969) and motivated the issuance of Exposure Draft 12/308. The findings in Lourens and Henderson differ from those in Field due primarily to a higher concentration of exploration companies in Australia as compared to the US, which has an industry profile with a relatively greater number of producers compared to explorers and a greater commodity focus on oil and gas.

About 90 replies, including many from various extractive industry stakeholders, were received.[7] Most survey responses addressed questions of carry forward, expensing, and disclosure. Contrary to other academic literature, Selig (1980) argues that para.12 of AAS9, 'Expenditure carried forward to subsequent accounting periods', has its benefits, as this accounting treatment provides geological information as carrying forward the costs to subsequent reporting periods simply reflects the drawn out life cycle of exploration projects. The paragraphs point out the fact that the carry forward of any expenditure incurred in exploration must be evidenced by benefits expected to accrue, similar to the current AASB6 Aus. 7.2bi. Further, these amounts must be audited.

As was briefly mentioned, the abandonment of DS 12/308 in October 1976 effectively nullified the imposition of an arbitrary two-year limit EE costs. The argument against a two-year cap hinges on the very long life cycle[8] from initial discovery to commencement of production. The revised approach of cost deferral with an indefinite timeframe (subject to certain caveats) is still in use today. DS12/308, designated AAS7 in August 1979, makes no recommendation as to the disclosure of resource and reserve quantities. It implies that the appropriate resource and reporting framework will evolve separately as what is now known as the JORC code was to develop. The accounting standards are set to account for a broad range of mineral resources including minerals, oil and gas, and non-regenerative resources. This thesis focuses on

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[7] Mohebbi et al (2007) states there are significant differences between on the one hand oil and gas firms and mining firms on the other. On that basis, the Mohebbi study focuses only on mining companies.
[8] The stages in the life cycle of a mine are: 1) Prospecting and Exploration, 2) Development; 3) Extraction and Operation, and 4) Closure/Reclamation. Each of the stages may overlap with the next and is very lengthy and expensive. Prospecting is the process of searching the region for mineral deposits. Exploration involves geological desk studies, geophysics and geological mapping, drilling and test programme. Development involves bankable feasibility studies project financing construction of infrastructure and mine development. Extraction involves mine and infrastructure operations and maintenance, capital upgrades. Mine closures involves mine rehabilitation and monitoring.

pre-production MDSEs, with its scope limited due to extensive amounts of hand collection of data required.

ASRB 1022 was first issued in October 1989 and subsequently was redesignated to AASB1022 in July 1991, with AAS7 issuance following in November 1989. Two sets of standards exist because AASB applies to entities incorporated separate legally subject to the Corporations Law, whereas AAS governs entities that are unincorporated and thus not regulated under the Corporations Act (namely, JV partnerships common operating vehicles in the mining sector that constitute no separate legal entity). Subsequently, through the International Financial Reporting Standards (IFRS), adoption effective January 1, 2005, AASB6 replaced AASB1022 and AAS7, given that the requirements of the latter two standards are the same. With the IFRS adoption, the existing AASB standards were replaced with the Australian equivalents of IASB.

It is important to highlight the main differences between standards, pre- and post-IFRS adoption. One key difference is that AASB 6 and the prescribed accounting treatments are specific and dedicated to EE stages, whereas AASB 1022 was more comprehensive (including guidance for producers). Post-AASB 1022, entities must apply other Australian Accounting standards in order to arrive at the correct accounting treatments in the production stage. More importantly, unlike AASB 1022, after initial recognition, EE assets can be "measured" at cost or at fair value, using the cost or revaluation models given in AASB 116 *Property, Plant and Equipment* or in AASB 138 *Intangible Assets*. Subsequent measurement is not specifically addressed in AASB 1022. In practise, however, almost no MDSE apply fair value accounting.

AASB 6 makes specific reference to the treatment of EE costs "after" the entities have obtained the legal rights to explore specific areas. This may lead to impairment or revaluation of "intangible" assets in subsequent periods. Defining exploration, AASB

1022 makes no reference to legal rights to explore. It broadens the range of assets from tangible to both tangible and intangible for subsequent period impairment. AASB 6 requires the disclosure of liability, operating, and investing cash flows in addition to the conventional disclosure of asset, expense and income amounts required by both AASB 6 and AASB 1022. Compared with AASB 1022, AASB 6 is more detailed and restrictive, as its disclosure requirements are more extensive. In addition, under para.13 of AASB 6, an entity may change its accounting policies for EE expenditures, if the change makes the financial report more relevant and more reliable to the users' needs. Under AASB 108 para.14 an entity shall change an accounting policy only if the change is required by an Australian Accounting Standard or if it results in the financial statements providing reliable and more relevant information about the effects of transactions, other events or conditions on the entity's financial position, financial performance or cash flows.

2.4 Applications of IRFS 6 by Australian MDSEs

Under AASB 6's principles-based approach, substantial flexibility exists in the way firms applying the Area of Interest method (AOI) in treating EE costs. Consider, for example, the following excerpts from the accounting standard;

Aus. 7.1 An entity's accounting policy for the treatment of its EE expenditures shall be in accordance with the following requirements. For each area of interest, expenditures incurred in the exploration for and evaluation of mineral resources shall be:

*(a) expensed **(Expensing Method aka Cost Written-Off Method Or The Cost Written-Off Portion Of Successful Method)** as incurred; or*

*(b) partially or fully capitalized **(Capitalizing Method aka Full Cost Method Or The Capitalization Portion Of Successful Method)**, and recognised as an EE asset if the requirements of paragraph Aus7.2 are satisfied.*

An entity shall make this decision

*Aus. 7.2 An EE asset shall only be recognised **(Capitalizing Method)** in relation to an area of*

interest if the following conditions are satisfied:

(a) the rights to tenure of the area of interest are current; and

(b) at least one of the following conditions is also met:

(i) the EE expenditures are expected to be recouped through successful development and

exploitation of the area of interest, or alternatively, by its sale; and

(ii) EE activities in the area of interest have not at the end of the reporting period reached a stage

which permits a reasonable assessment of the existence or otherwise of economically recoverable

reserves, and active and significant operations in, or in relation to, the area of interest are

continuing.

Clearly, the controversy in terms of accounting treatment arises from AUS 7.2(ii) which permits capitalization of EE assets where decisions on viability have yet to be made. In practise, given the prolonged and lengthy nature of the mine life cycle culminating in project development, project viability assessment may take many years. In addition, there is a practical element in the standard which relates to an area of interest or a project and how this is defined. Essentially, there is an issue as to what costs are assigned to what projects. In theory, at least, this means that some firms can both expense and capitalize depending on the 'success' or lack thereof of differing areas of interest.

Conceptually, choices to capitalise, expense or a combined approach, can signal various degrees of uncertainty (Barker and Penman 2013). On one hand, expensing provides absolute certainty given the assessment that no economically viable resources are found. In contrast, capitalising reduces certainty in that there are decisions pending on viability, but does not eliminate uncertainty in that investors do not know the degree to which the exploration will be ultimately successful, nor the timing of that ultimate

success. Some expenditure will be successful (Aus. 7.2bi) whilst other amounts will be

capitalised pending EE results (Aus. 7.2bii). With the asymmetric information, the

probability to obtain economically recoverable reserves is considered less than certain.

The combined accounting method is a hybrid of absolute certainty (the expensing

proportion) and a less than certain scenario based on the proportion of costs

capitalized. Examining accounting choices enhances understanding of economic

consequences.[9].

   Several alternative treatments are permitted by AASB 6 under the umbrella of

Area of Interest method. Under AASB6 Aus. 7.1, the costs written-off method applies to

EE costs expensed as incurred. The full cost (FC)/capitalisation and successful efforts

(SE)/combined methods apply when resources or identified reserves are EE capitalised

as assets under Aus. 7.1b, subject to the condition of Aus. 7.2 EE costs being incurred or

through its sale. Entities are expected to make decisions 'separately' for each AOI under

Aus. 7.2. The standard encourages flexibility in terms of a viability assessment on a

project-by-project basis. The following sections describe the various choices in terms of

treatment of EE costs provided by the standard and associated accounting issues.

Costs written off method (Immediate Expensing)

   Under the costs written off method, all EE costs are wrtitten off as incurred. This

method is more conservate with entities signalling certainty in that EE costs incurred

are associated with no chance of exploration success. Where subsequent discovery of

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[9] Economic consequences are defined as the impact of accounting reports on the decision-making
behavior of business, government, unions, investors and creditors were identified as substantive issue in
accounting policy in the 1970s representing a "veritable revolution in accounting thought"(Zeff, 1978, pg.
56)

economic resources and reserves at a later stage, immediate expensing prevents a proper matching of expenses and revenues.

Full cost method (Capitalisation)

All EE costs are capitalized without distinguishing between particular AOI's with respect to economically recoverable reserves discovered or success by the entity. This means successful and unsuccessful exploration and development costs are treated as assets and amortised against revenue from successful discovery and production revenue. The issue with the full cost method is whether it is feasible to apply to an entity while searching for and not yet possessing economically recoverable reserves. It is convenient to apply it even when such proven reserves exist given problems in determining their value. Current EE costs are charged against revenue produced from previously discovered reserves. By permitting the costs of abandoned areas to be carried forward as assets, the method is inconsistent with asset recognition concepts under the conceptual framework.

Successful efforts method (Combined)

This method allows EE costs to be capitalised as assets in order to establish economically recoverable reserves. Only those EE costs resulting in economically recoverable reserves are deferred, with those not resulting in the discovery of such reserves immediately written off. Costs carried forward should not exceed the expected net realised value of all economically recoverable reserves. One issue is that it fails to recognise the total costs of establishing the existence of economically recoverable reserves.

Area of interest method

A subset of successful efforts accounting, falls part way between the "full cost" method and the "cost written off" method as described in DS12. The area of interest

method differs from FC method due to the restricted area (project basis) for considering accounting choices (as opposed to across the entire entity). In other words, decisions to defer or expense EE costs are made on a project-by-project basis, or distinct project areas. The benefits of the AOI method are that by allowing viability assessments to be undertaken at the project level, this should promote a better matching of expenses and revenues.

Costs written off and reinstated method

For completeness, this method is included in this discussion but not applicable under AASB6. This method provides more flexibility. EE costs are written off as incurred, and if there prove to be economically recoverable reserves all costs pertaining to their discovery and evaluation are reinstated. This method, commonly used when there is a low probability of success in the EE phase is a subset of the costs written off method.

2.5 Recognition of EE assets (AASB6) vs. intangible assets (AASB 138)

Under AASB 6, companies have considerable latitude in expensing or deferring EE expenditure. This latitude of AASB 6 contrasts with AASB 138, 'Intangible Assets' where the treatment of research and development expenditures is somewhat different. In particular, research expenditure when incurred under AASB 138, para. 54 can only be recognised as an expense with no deferral allowed under AASB 138, para. 54[10]. This is consistent with the notion of unconditional conservatism. Goodwill and development costs share the same accounting treatment, that is, they are recognised as assets at cost

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[10] AASB 138 para. 54 states no intangible asset arising from research (or from the research phase of an internal project) shall be recognised. Expenditure on research (or on the research phase of an internal project) shall be recognised as an expense when it is incurred (AASB 138 Dec 2015).

on the balance sheet since both will generate expected future economic benefits. According to AASB 138 para.60 demonstrating an intangible asset will generate probable future economic benefits an entity is assessing the future economic benefits to be received from the asset, the principles in AASB 136 *Impairment of Assets* will be used. If the asset will generate economic benefits only in combination with other assets, the entity applies the concept of cash-generating units enunciated in AASB 136. However, for development expenditure to be recognised as an asset, all the following conditions have to be met otherwise, expensing is required.

(a) The technical feasibility of completing the intangible asset so that it will be available for use or sale;

(b) Its intention to complete the intangible asset and use or sell it;

(c) Its ability to use or sell the intangible asset;

(d) How the intangible asset will generate probable future economic benefits. Among other things, the entity can demonstrate the existence of a market for the output of the intangible asset;

(e) The availability of adequate technical, financial and other resources to complete the development and to use or sell the intangible asset; and

(f) Its ability to measure reliably the expenditure attributable to the intangible asset during its development. AASB 138, para.57

In the case where research and development costs cannot be explicitly classified separately, entities are required to treat the expenditure for that project as a research expenditure. Overall, the recognition criteria for costs incurred for development expenditure are tighter and more conservative than is the case in the pre-development phase in the extractive industry. Mining firms have the latitude to capitalize EE costs, pending the discovery of minerals and proven economically recoverable reserves. This

highlights the strategic importance of the mining industry. It is possible to envisage flexibility in accounting choice as a function of industry participation in the due process phase of the standard setting process. Such flexibility in accounting choice is permitted by the accounting standards.

In a more recent literature review study, Gipper, Lombardi and Skinner (2013) consider a compendium of accounting standard studies done between 1978 and 2013, looking at all forms of political influence over standard setting.[11] Gipper et al. (2013) make a number of observations vis-a-vis the standard setting process. First, they argue that economic theories of regulation may not apply to standard setters, who differ from other regulators. Regulators tend to be direct political appointees, and make decisions on various resource allocations. By contrast, standard setters like the Financial Accounting Standards Board (FASB) are considered to be independent entities not directly affected by the political process. Gipper, Lombardi and Skinner (2013) observe evidence showing that firms' lobbying activities depend on the likely effect of a proposed accounting rule on their financial statements. Net asset and or income decreasing rules, which have an impact on bonus plans and leverage, increase the likelihood of lobbying.

The study finds strong evidence of large firms being actively engaged as lobbying parties, but weak evidence as to whether the lobbyists are in or out of political favour. In terms of ASRB 1022 and its predecessors, it is unclear whether MDSEs actively commented on letter submissions, as no detailed information on the size of submitters is obtainable due to the legal right to anonymity in Australia. Gipper et al. (2013)

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[11] Political influence in Gipper, Lombardi and Skinner (2013) is defined as a purposeful intervention in the standard setting process by an economic entity with the goal of affecting the outcome of that process to increase an entity's economic value or wealth or achieve some other self-interested purpose inconsistent with the FASB's mission.

examine the role of politics in standard setting and point to the need for more agenda setting research. For example, agenda decisions determine which topics are not considered for discussion.

2.6 Choice of valuation approach: cost versus revaluation models

EE expenses are recognised assets 'at cost', in accordance with AASB 6, para.8. Subsequently, cost or revaluation models can be used to further recognition of EE assets under AASB 6, para.12. A different set of standards will apply as the project moves through its life cycle. When the mineral project moves into the development phase, EE costs will be reclassified as project costs subject to AASB 116 *Property Plant and Equipment* or AASB 138 *Intangible Assets*. In this thesis, however, the EE expenses incurred in the pre-development phase are the primary focus.

The cost model is based on historical cost. Under AASB 116 para.30, once it has been recognised as such, an asset is carried at cost, less accumulated depreciation and impairment losses. Under the revaluation model pertaining to AASB 116, para.31, EE assets are stated at a revalued amount, that is, fair value, less accumulated depreciation and losses, and with the fair value being reliably measured. If the asset is revalued, the entire class should be revalued as well.

Switching from the cost to the revaluation model and vice versa is allowed, as long as the change generates financial information that is more relevant and reliable and as long as sufficient disclosure is made to justify the switch. Either model can create conditions calling for different treatments of the same asset impairment. Given the complexity of asset impairment, the following discussion is decomposed into 1) definition of impairment loss; 2) detection of asset impairment; 3) impairment tests and

the constituents; 4) impairment loss recognition within the cost and revaluation models; 5) asset revaluation within the cost and revaluation models; and 6) perspectives on asset impairment (see Appendixes 2 & 3).

2.7 International comparisons

Canada and the US are selected as the benchmark comparison in this thesis as they are both OECD countries with strong mining industries. Both have expansive landmasses (like Australia) with high mineral resource endowment. All countries have efficient capital markets to facilitate equity-raising activities, critical to the survival of early stage companies.

Australia adopted IFRS 6 effective on January 1, 2005 whereas Canada did so only on January 1, 2011. Canada released the Canadian Institute of Chartered Accountants (CICA) handbook in 1968 codifying Canadian GAAP (CGAAP). In addition to making some modifications to local industry characteristics, US GAAP had influenced CGAAP, until 2006, when the Accounting Standards Board (AcSB) announced its intention to adopt IFRS (CICA, 2009). Since then, CGAAP has been more aligned with IFRS than with US GAAP. Nonetheless, CGAAP and IFRS have many similarities. In general, the two sets of standards are deemed to be principles-based meaning firms can make their own accounting choices on the basis of similar conceptual foundations (CICA, 2009). Certain elements of application diverge. However, a number of individual standards are fundamentally different. One major difference is the greater reliance in IFRS on fair value accounting (Blanchette and Desfleurs, 2011; Chua and Taylor, 2008), although as already discussed, fair value accounting holds only limited relevance to MDSEs. The other key difference lies in the Conceptual Framework underlying consolidation associated with non-controlling interest, which, once again is not relevant to the MDSE setting.

Given that Australia and Canada now both utilize IFRS 6, comparability between the two jurisdictions has increased since 2011.[12] CGAAP had a broader standard covering a wider scope including both pre- and post-development phases, whereas IFRS is dedicated to the EE phase only. Like IFRS, under CGAAP, oil and gas EE costs may be expensed as incurred or capitalised, depending on whether the entity's selected accounting policy is the successful efforts or the full cost method. Unlike IFRS, under CGAAP, EE costs may be capitalised if an entity deems such costs to have the characteristics of PP&E, which includes the EE costs. Otherwise, these costs are expensed. Unlike IFRS, under CGAAP, there is no distinction drawn between tangible and intangible assets.

When comparing Australian and Canadian companies, under CGAAP, impairment is recognized when assets or groups of assets' carrying amount exceed 'undiscounted' cash flows expected through the use of assets. Under IAS 36, fair value and value in use entail 'discounted' cash flow with impairments thus being triggered more often. Under CGAAP, impairment loss reversal is not permitted under CGAAP and the CGU concept did not apply under CGAAP. Unlike IFRS, for mining and oil and gas entities using the successful efforts method of accounting, the test utilised to recover EE assets cannot combine asset groups. Oil and gas entities using the full cost method apply the ceiling test when testing the recoverability of EE assets, generally at a geographic level covering an entire country. IFRS allows the test for recoverability of EE assets to combine several CGUs, as long as the combination is not larger than a segment.

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[12] Comparability has increased, but IFRS adoption in both jurisdictions entails the grandfathering of existing accounting treatments. Hence, to the extent that differences between accounting treatments in respective standards existed, those differences will persist. Other features such as impairment testing, however, will by virtue of IFRS adoption, become effectively homogeneous.

Comparison of exploration accounting standards in Australia and US

The US oil and gas industries (FASB 932) have separate accounting standards to the mining industry (FASB 930). In contrast, the Australian oil and gas and mining industries all are both subject to the accounting standards of AASB 6. The successful efforts (SE) is the primary standard prescribed for the US oil and gas industry. The AOI method has been likened to the SE method in the US. Unlike the US accounting standards, the Australian extractive industry standard, AASB 6, covers the two sub-industries, mining and oil and gas providing the same accounting treatments. The US accounting standards have different accounting treatments for the two sub-industries – FASB 930 for mining companies and FASB 932 for oil and gas participants. When accounting for EE costs, there is no clearly prescribed accounting method. Current cost is used to recognise costs incurred in finding mineral reserves under FASB 255 with the standard covering all mining companies irrespective of the stage of development. The emphasis is on the detailed disclosure requirements for reporting mineral resource assets (FASB 930 and FASB 255-10-50-17 a & b include requirements to estimate significant quantities of proven mineral reserves or proven and probable oil and gas reserves, and quantities commercially recoverable. Table 2.1 summarizes accounting methods and treatments across the Australian, Canadian and US jurisdictions.

Table 2.1 Accounting Treatments of EE Assets by Jurisdiction

	Australia	US mining	Canada
Accounting treatment for exploration expenses	Expense/capitalise	Expense	Expense / Capitalise
For acquisition costs	Expense / capitalise	Capitalise	Expense / Capitalise
Accounting method	AOI	Current cost accounting	Not explicitly specified
Accounting standard	EE phase	Full cycle	EE phase
Disclosure	Less prescriptive	More prescriptive	Less prescriptive
Disclosure requirements (presented in)	AASB6	FASB255	IFRS 6
Impairment tests different across and specific to accounting methods?	No	No	No
Ceiling tests for full cost method?	No	No	No
Impairment test CA > FV = loss?	Yes	Yes	Yes

2.8 History of the mineral reporting standard (The JORC Code)

The JORC code is an influential industry reporting standard for reporting and disclosure of exploration results and resources/reserves for mining companies in

Australia. The genesis of the Code was motivated by concerns of disclosure and reporting practices following the Poseidon and Tasminex incidents in late 1960s. In 1971, the Minerals Council of Australia (MCA) and the Australasian Institute of Mining and Metallurgy (The AusIMM) created the Australasian Joint Ore Reserves Committee (JORC) in a move towards developing improved reporting standards for the mining industry. This can be interpreted as self-regulation by the Australian mining industry. The JORC Report was first issued in 1972, providing guidance and recommendations to mining companies on public reporting and definition of resource and reserve classifications. The adoption of guidelines by mining companies was on a voluntarily basis initially rather than a statutory requirement.

In February 1989, a revised version of the JORC Code was issued with a number of significant changes including mandatory adoption (JORC 2012, Clause 6). First, it was incorporated into the Australian Securities Exchange (ASX) listing rules. This meant the JORC Code had legal enforceability. The Corporations Law requires a listed company to comply with the ASX listing rules. Failure to comply has consequences i.e., listing suspension and possible litigation risk. The code was adopted by the AusIMM as an institute Code binding on its members. Hence, from February 1989, the JORC Code became mandatory for all publically listed mining companies.

Thus, there is the presence of a dual assurance environment with AASB 6 and the JORC Code. The JORC Code has undergone revisions in 1992, 1993, 1996, 1999, 2004 and 2012 incorporating comments and suggestions from industry participants in conjunction with professional and regulatory bodies. Examples of the main features in more notable revisions to the Code are;

- The 1992 JORC Code was further adopted as The Australian Institute of Geoscientists (AIG) Code and incorporated into the New Zealand Stock Exchange listing rules.

- The 1999 version introduced;

  - The 'recognised mining professional'. This allows a company reporting to the ASX on Resources or Reserves for an overseas deposit with reports not necessarily prepared by a Competent Person but rather by overseas professionals who are members of recognised professional bodies agreeing to sanction the person if he or she does not comply with the JORC Code. This allows for reporting of mining interests overseas.

  - Separate reporting and further definitions of mineral resources from ore reserves.

  - Disclosure of the name of Competent Person to enhance transparency and accountability.

Principles of the Code

Transparency, materiality and competence are the three principles of the JORC Code (JORC 2012, Clause 4). Transparency ensures sufficient and unambiguous public reporting. Materiality ensures relevant information to facilitate balanced judgement primarily for investors. Competence is an important professional principle. The reporting and disclosure under the JORC Code rests on responsible 'Competent Persons' who are qualified and experienced mining industry professionals subject to enforceable professional code of ethics (JORC 2012, Clause 4) (Competent Persons will be discussed in further detail in the following section). The first two principles, transparency and materiality provide the framework for the obligations of the Competent Persons. The

close similarities conceptually between the JORC Code and auditing standards are documented in Ferguson and Pündrich (2015).

Characteristics of the Code

The code is not excessively 'prescriptive' meaning the Code does not regulate the procedures used by Competent Persons to estimate and classify mineral resources and ore reserves and it does not regulate mining firms' internal classification and or reporting systems either. However, the Code does define the requirements for the Competent Person to be able to undertake mineral resource and reserve estimation. Competent Persons are required to have at least 5-years of relevant experience within the geological setting where they are estimating mineral resources and reserves. The Competent Person must be a member of a recognised professional organisation being AUSIMM and AIG, and thus governed by the professional code of conduct (JORC 2012, Clause 11).

Competent Persons

The Competent Person (CP) concept was first introduced in the inaugural JORC Report in 1972, even before it became mandatory in 1989. More recent versions of the JORC Code give autonomy and flexibility to CPs to use their expertise and discretion to decide appropriate estimation and classification approaches to a wide range of commodities. There is a clear separation of responsibilities between the CP and company directors. To align their interests with directors' and shareholders', the attributes and responsibilities of the CP are clearly defined. The CP must be a member of a recognised professional geological body namely, the AusIMM or the AIG and are subject to an enforceable code of ethics with sanctions for non-compliance (JORC Code, Clause 4). Publicly disclosed reports and announcements are the responsibility of the

directors and the contents are the responsibility of the CPs. The 'Public Report' must be

a fair and accurate representation of which the mineral content appears and must be

issued with prior consent of the CP in writing (JORC Code, Clause 9). Any public

questioning of the CP is likely to have an effect on their "reputation and employability"

Stephenson (1999), given the CP is a member of the professional organisation, which

has enforceability process including the power to suspend and expel members (JORC

code clause 11).

JORC Code Implications

The JORC Code has been established for investors, providers of finance and

general users of the financial and non-financial disclosure to provide more transparency

and less ambiguity in the reporting of mineral resources and reserves. The JORC Code

has become the benchmark mineral reporting framework worldwide with other

countries adopting large portions of the JORC Code as a basis for their own reporting

standards. The JORC Report was established in1972 as a guidance note becoming a

statutory standard incorporated in the ASX listing rules in 1989 and followed by the

United Kingdom (UK), Ireland and Western Europe in 1991 and the United States (US)

in 1992. The JORC Code has played a leading role in the development of the

international reporting standards and classification in response to the globalisation of

the mining industry through the efforts of the Committee for Mineral Reserves

International Reporting Standards (CRIRSCO). The US equivalent for the reporting

exploration results, mineral resources and mineral reserves adopted by the Society for

Mining, Metallurgy and Exploration Inc. Guide, the SME Guide, was modelled on the

JORC Code. The success of the JORC Code is attributed to industry commitment,

participation and involvement, its principles based approach and input in the design of

the standard. Further, the incorporation of the JORC Code into ASX listing rules in 1989

provided legal enforceability. Additionally, the presence of a CP who is accountable for

public reporting (Stephenson & Featherstone 2006). The JORC Code is effective in

reducing technical information asymmetry; curbing falsification and upward bias in

tonnage and grade reporting, consistent with professional conservatism.

2.9 Theoretical framework

This thesis adopts an agency theory theoretical approach. It is asymmetric

information, a common thread across different theories, which adequately characterises

the reporting environment of the MDSEs. Information asymmetry is the presence of

differential information in the hands of the agent (manager) vis-à-vis principles

(owners). Financial reporting is a product or an economic good, subject to supply and

demand mechanisms. Financial reporting also serves to form the basis of contracts

written to mitigate information asymmetry. Efficient contracting argues that the

demand for accounting information is for contracting purposes. Positive Accounting

Theory developed by Watts and Zimmerman (1978), Holthausen (1981), Leftwich

(1983), Holthausen and Leftwich (1983) and Watts and Zimmerman (1986), and Watts

(1997) is the empirical testing of agency theoretical concepts in the accounting context.

Positive Accounting Theory conjectures that the use of accounting information

enhances the efficiency of contractual arrangements by minimizing agency costs[13]. It

examines the incentives to choose amongst accounting methods because of contractual

reliance on accounting numbers.

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[13] Agency costs are defined as those arising from the separation of ownership and control through the delegation of decision-making authority to managers (agents) Jensen and Meckling (1976). Watts (1977) states that conflicts and goal incongruence arise as the actions that maximise managers' expected utility do not necessarily maximise shareholders' expected utility. Like Jensen and Meckling (1976), Eisenhardt (1989) indicates the principal-agent relationship is the unit of analysis with a contract between two parties with the organisation of information and risk bearing costs placing an emphasis on efficiency.

The efficient contracting perspective implies accounting methods selected serve to minimise agency costs and to maximise firm value. In the MDSE setting, the principals being the shareholders (initial capital providers) of mining firms which contractually engage managers. Shareholders delegate decision-making authority to the managers (agents) to run the firm on their behalf. The sole purpose of MDSEs is to engage geologists in exploration to discover economically recoverable minerals. If successful, firms will further engage engineers to conduct feasibility studies to confirm the economic viability of the deposit. Often initial capital is raised through the equity market. To fulfil the listing requirements with the Australian Stock Exchange (ASX), all listed mining firms are required to provide statutory audited financials and structured standardised reporting of non-financial information, subject to the JORC Code.

The array of users of accounting information contained in company's financial statements is large. Capital providers namely investors use financial information to assess financial health and future growth prospects; lenders use it to assess solvency of their borrowers; creditors use it to assess solvency of their suppliers; government, regulators use it to become informed. On the supply side, firms prepare financial statements to provide disclosure and transparency and for contracting purposes. Managers voluntarily subject themselves to audits. In the MDSE setting, auditors will observe filings by the Competent Persons (mining consultants) to assure reliability and accuracy of accounting information by incorporating technical information on resources and reserves. A typical example would be an auditor observing a resource definition announcement and calibrating its implications for the deferral of EE costs. Clearly, any resource downgrade would hold implications for project viability. The goal for this dual monitoring is to reduce asymmetric information, both financial and technical.

As argued, the contracting process is often complicated by information asymmetry with one party having more information or undertaking actions unobservable to the other. Managers may be more privy to the current condition and future prospects of the firms than investors. Under AASB6, the reporting format allows assets with differing exploration potential, both 'positive' and 'pending' to be consolidated into the same line item giving rise to asymmetric information. This also lends support to the quality uncertainty discussed in the study of the Market for Lemons (Akerlof 1970) using the purchase of second hand cars as an example of adverse selection.

In this thesis, financial reporting at the firm level records treatment of EE costs with accounting choices driven by firm characteristics, managerial incentives and project level attributes. For example, in the broader mining industry, firms with a large asset base with many independent projects, expensing EE costs is the typical accounting choice. In such cases, conservatism[14] suggests larger and more mature firms having greater financial resources will expense EE costs. Expensing EE costs will reduce income before tax. In contrast, early stage exploration firms with fewer but riskier projects will choose to capitalise EE costs. Capitalisation of EE costs should help attract equity funding. While firms continue to capitalise the exploration expense larger amounts of EE assets will appear on balance sheet, make financial statements appear stronger and facilitate equity funding.

It is important to note, capitalizing exploration costs can create information asymmetry. The inclusion of pending outcomes (Aus. 7.2bii) along with positive

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[14] Conservatism is considered the most influential principle of valuation in the accounting practice (Sterling 1970), with an influence over 5 centuries (Basu 1997).

outcomes (Aus. 7.2bi) in the same line item gives rise to uncertainty. It is difficult to assume all deferred costs are likely to be "lemons" as part of the deferred costs incurred can produce positive outcomes.

Routinely, write-offs are associated with a strong leverage effect. In this MDSE setting, however, write-offs are not associated with any leverage effect since MDSEs are pre cash flow generating and routinely have no access to debt. Asymmetric information which conditions the propensity to undertake EE cost impairment could be driven by managerial incentives. From a management perspective, with equity capital the only source of funds for MDSEs, the larger the EE assets stay on the balance sheet, the easier it would be to attract fresh funding. Managers may be inclined to want to present a favourable picture to investors prior to a possible capital raising by capitalising more EE costs on balance sheet and resisting any impairment decisions. [15] The recognition of uncertainty is permitted under the Conceptual Framework due to the probable future economic benefits being recognised where "probable" means "less than certain".

Managerial incentives can have a bearing on write-off magnitude. First, moral hazard can occur where an agent takes actions that are unobservable to principles. This occurs after contracts have been agreed upon, such as shirking and risk seeking. For instance, managers can spend on inefficient activities and perks for self-interest purposes other than acting consistent with shareholders wealth maximisation objectives. This can result in a lower tendency to report write-offs. Second, firms with high operating cost structures due to the remote locations of many mineral deposits

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[15] Aus7.1 states an entity's accounting policy for the treatment of its exploration and evaluation expenditures shall be in accordance with the following requirements. For each *area of interest*, expenditures incurred in the exploration for and evaluation of mineral resources shall be:
(a) expensed as incurred; or
(b) partially or fully capitalised, and recognised as an exploration and evaluation asset if the requirements of paragraph Aus7.2 are satisfied. An entity shall make this decision separately for each area of interest.

meaning it is difficult to directly access to the deposits. Firms with high cash burn rates will have a greater need to go out more often to raise fresh equity funding. Again, this can result in a lower propensity to impair EE assets resulting in risks of adverse selection.

Audited financial reporting can assist in revealing such unobservable actions by improving transparency and reducing asymmetric information. Shareholders can, if they are not satisfied with managers' performance, sell their stock holding. Contracting with external agents such as auditors by managers may reduce agency costs. Both fulfilling the monitoring functions and at the same time addressing moral hazard issues. External agents like auditors play a key monitoring role assuming the amounts reported in conformity with accounting standards. Similarly, a Public Report issued by the Competent Person is mandatory under the ASX listing rules and provides assurance of exploration results and resources and reserves quantities. The conservatism inherent in the JORC Code tends to mitigate any upward bias in tonnage and grade reporting and reduce information asymmetry between investors and firms. Ferguson & Pündrich (2015) find the CP's responsibilities closely resemble those of an auditor, with a difference being the scope of the assurance responsibilities undertaken by the CP. Both auditors and CPs are concerned with the reputation effects subject to an enforceable code of ethics (JORC 2012, Clause 4). Thus, both assurance of the financial statements by auditors and CP assurance of technical non-financial information helps to reduce information asymmetry and agency costs.

In terms of balance sheet effects, conservatism brings about a 'systematic' understatement of net assets and overstatement of liabilities (Watts 2003). In terms of Profit and Loss statement effects, a 'systematic' asymmetry in verifiability for the recognition of profit and loss occurs. Although write-offs are recorded as losses which

are recognised as they become probable and measurable and gains are not recognised until realized. Naturally, this results in an upward bias in losses and downward bias in net assets. However, under AASB6 Aus7.1b, capitalization can continue, with no restriction on timeframe. Consequently, this setting provides an interesting environment where conservatism may be observed in bringing forward capitalized EE cost impairment whilst opportunism might be observed in the deferral of any write-off. Such conservatism or opportunism is conditioned by external assurance and the need for equity raisings along with other factors such as dominant shareholders. MDSEs have a strong reliance on equity funding with Gray (1984) suggesting the inability to capitalise EE expenditures increases the probability of showing losses creating difficulties in raising capital.

More importantly, the respective write-off decisions provide information relating to uncertainty resolution. Since write-offs are considered bad news in terms of project viability, a negative market reaction is expected.

In summary, information asymmetry permeates this setting emanating from disclosure of EE assets and managerial self-interest. Decisions to undertake impairment will be based on specific financial characteristics inherent in MDSEs with negative market reactions expected. EE asset impairment determinants and implications will be the subject of investigation in Chapters 4 and 5.

CHAPTER 3 - ACCOUNTING CHOICE
3.1 Introduction

The objective of this chapter is to provide descriptive evidence of accounting choice by MDSEs to capitalize or expense EE costs under AASB 6. This part of the chapter is purely descriptive in nature and sets the scene for the following two chapters. The rest of the chapter is structured as follows. Section 3.2 briefly reviews the findings of prior accounting choice literature. Section 3.3 documents sample construction. Lastly, the chapter is summarised in Section 3.4.

3.2 Prior accounting choice research and related findings

Broadly, descriptive studies of accounting choice in the mining industry setting are relatively rare. Lourens and Henderson (1972) conduct the first descriptive study investigating accounting choice in the Australian mining industry. Lourens and Henderson queried respondents on their treatment of EE costs. Across the whole sample of 129 respondents in total, 72% capitalised the exploration expense while 27% immediately expensed the EE costs. Capitalization was less common for larger firms (56% capitalizing, 42% expensing). For smaller firms (below the average of market cap of $128mm), 79% capitalized whilst 21% expensed. Lourens and Henderson (1972) conducted their survey prior to respective accounting standards being put in place.[16] The accounting standard has undergone changes since its first inception and this includes the adoption of IFRS in 2005.

Gerhardy (1999) examines 128 firms in the Australian setting of which 63% of the sample uses the area of interest method, 26% use the area of interest with

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[16] Refer to the standard development process in Appendix 2.

provision, 9% use successful efforts and 1% for the area of interest with costs

reinstated and the remaining 1% for other. Mohebi et al. (2007) examine firms, which

capitalise pre-production expenditures both within and between countries like

Australia, Canada, South Africa and the UK as well as the US using a sample of 616 firm

years. They conclude explorers are more likely to capitalise pre-production expenses

than producers. There are variations in capitalisation rates across countries suggesting

country factors impact on capitalisation rates.

3.3 Sample construction

The sample consists of the population of all ASX listed MDSEs over the 21-year

sample window of 1995-2015. This sample includes firms subsequently delisted in

order to mitigate survival bias. The sampling process uses a number of ways, based on

COGS identification, to screen out production firms' from the MDSE sample frame in

order to arrive at a sample of MDSEs. Firms with non-production years as well as firms

with a hybrid of production and non-production years are considered. For the latter,

only non-production years are included in the MDSE sample.

The sample period includes the population of MDSEs from July 1, 1995 to June

30, 2015, listed on the ASX. Observations are excluded if a firm has commenced

commercial mineral production, if the firm is an energy and non-resource business or if

the firm does not have market data available. The result is a manually constructed

sample for 7097 firm years of 863 firms (See Table 3.1). All companies delisted during

the sample period are included in the sample to eliminate survival bias.

Table 3.1 Attrition Table for the MDSE Sample by Firm Year

MDSE SAMPLE BY FIRM YEAR (1995-2015)		
LISTED		
	Firm years with available finacial reports	7,137
less	Energy	52
less	Non resource	85
less	Production firms	1,529
equal to	MDSE (1)	5,471
	Missing reports	
equal to	MDSE (2)	37
Total listed firm years	(1) + (2)	**5,508**
DELISTED		
	Firm years with available finacial reports	2,454
less	Energy	86
less	Non resource	106
less	Production firms	690
equal to	MDSE (3)	1,572
	Missing reports	
equal to	MDSE (4)	17
Total delisted firm years	(3) + (4)	**1,589**
Total MDSE firm years	**(1) + (2) + (3) + (4)**	**7,097**

Data are mostly collected from the following database sources: Morningstar DatAnalysis, Connect 4, Securities Industry Research Centre of Asia (SIRCA) and with an extensive hand-collection of data from annual reports. Market capitalization data are obtained from DataStream. I also conduct textual analysis using the Perceptive software program (Perceptive) on the annual reports identifying different stages of mine life cycle progression. When the available file is not readable from a particular data provider where the file is corrupted or the scanned PDF is unreadable, by resorting to a different provider, I collect a hard copy of the annual report and manually enter it into the text database to ensure sample completeness.

In terms of prior research on MDSEs, Ferguson, Clinch and Kean (2011) investigate the determinants of failure of single-project MDSEs. They identify 85 gold projects representing the full sample of known feasibility disclosures made by single project gold MDSEs from 1990-2007. More recently, Ferguson and Pündrich (2015) explore the impact on firm valuation of mandatory assurance of non-financial

information based on a sample of 1,467 sample reserve disclosures by 404 MDSEs from 1996 to 2012. Like these prior studies, this thesis examines a single sector such as MDSE, which engaged in pre-production mining activities. In this thesis, oil and gas as well as mining engineering companies and mining service providers are not considered mainly due to the already extensive hand collection of data involved in the assembly of the MDSE sample which focuses on firms with more homogenous business activities of similar risk profiles.

In defining MDSE sample constituents, Ferguson, Clinch and Kean (2011) and Ferguson and Pündrich (2015) restrict MDSEs to those with product revenues less than 5% of market capitalization. In this thesis, Perceptive software is used to conduct textual analysis for a keyword search of "production" where a long list of results extracting texts with "production" as well as "non-production". In addition, to distinguish non-production firms from production firms, I examine the composition of firms' revenues to establish whether revenues are related to production or not. It is noted that MDSEs can derive revenues from the receipts of government grants, rebates, disposals of exploration assets and production royalties on farmed-out exploration interests. Consequently, the presence of a COGS figure is used to distinguish firms with production capabilities from firms without. Firms without COGS are categorized as MDSEs, otherwise they are considered production firms. This is manually examined for every single firm in the sample.

Where firms have a mix of non-production and production years within the sample period, this reflects option value in the mining industry (Moel and Tufano, 2002). Firms may have both production and non-production firm years within the sample period of 21 years. This is due to fluctuations in commodity prices and the potential for repeated opening and closing of an economically marginal deposit or

production facility. Only the specific non-production firm years are included in the primary MDSE sample. The primary sample size amounts to 7079 firm years of 863 firms. (See Figure 3.1).

Accounting treatment variable descriptions

This section outlines the variables used as controls in the multivariate model of accounting choice. Some variables namely yearly addition to the capitalised amounts, exploration expenses and write-offs are hand collected from the notes in the annual reports and the latter two are reconciled with those in the Profit and Loss Statement (P&L).

CAP is the reported amount of new addition to EE assets (t);

EXPL_EXP is the reported amount of exploration expense recorded on P&L (t);

CAPEXP is an indicator variable coded 1 for concurrent reporting of new addition to EE assets (t) and exploration expense (t), otherwise 0;

NO_AC is an indicator variable coded 1 for no CAP, no EXPL_EXP and no CAPEXP (t), otherwise 0.

To provide insight into the effects when resolution of uncertainty exists, confirmed EE assets are generally connected with failure to achieve an economically viable discovery. Firms decide to write off EE assets resolving uncertainty analysis include the following;

EXPL_ASSET_WO is the reported amount of write-off (t);

When examining the motivation for accounting choices by exploring firm, the following firm financial characteristics are specified as follows:

EXPL_ASSET_CLOSING is the reported amount of closing balance of exploration assets (t);

LEV is the reported amount of total liabilities divided by total assets (t);

EQUITY_ISSUANCE is the reported amount of equity issuance (t);

NPAT is the reported amount of net profit (t);

CASH is the reported amount of cash (t);

Examining the assurance and monitoring mechanisms of financial reporting, I control for auditor opinions represented in emphasis of matter for asset recoverability, which can proxy for exploration asset quality.

EOM_ASSET_RECOVERABILITY is an indicator variable coded 1 for asset recoverability, otherwise 0;

Textual analysis can measure the descriptive content of the document through a keyword search, which is used to examine various accounting stages in the mine life cycle. The various life-cycle controls include;

PRO_ACQ is an indicator variable coded 1 for project acquisition, otherwise 0;

EXPL_LIC_APP is an indicator variable coded 1 for exploration license application, otherwise 0;

GRAS_EXPL is an indicator variable coded 1 for grass root application, otherwise 0;

DRILL is an indicator variable coded 1 for drilling, otherwise 0;

JORC is an indicator variable coded 1 for JORC, otherwise 0;

SCOP is an indicator variable coded 1 for scoping study, otherwise 0;

FEAS is an indicator variable coded 1 for feasibility study, otherwise 0;

DEV_APP is an indicator variable coded 1 for development application, otherwise 0;

PRO_FIN is an indicator variable coded 1 for project finance, otherwise 0;

CONSTR is an indicator variable coded 1 for construction, otherwise 0;

COMM is an indicator variable coded 1 for commissioning, otherwise 0.

3.4 Accounting treatment summary statistics

This thesis examines the frequency and the distributions of specific accounting methods used particularly across two different accounting standard regimes marked by the IFRS adoption in 2005. By dividing the matrix of firm years by the number of firms, this thesis illustrates the average duration of accounting choices in use.

Figure 3.1 Distribution of Listed and Delisted Firms in MDSE Sector from 1995 - 2015
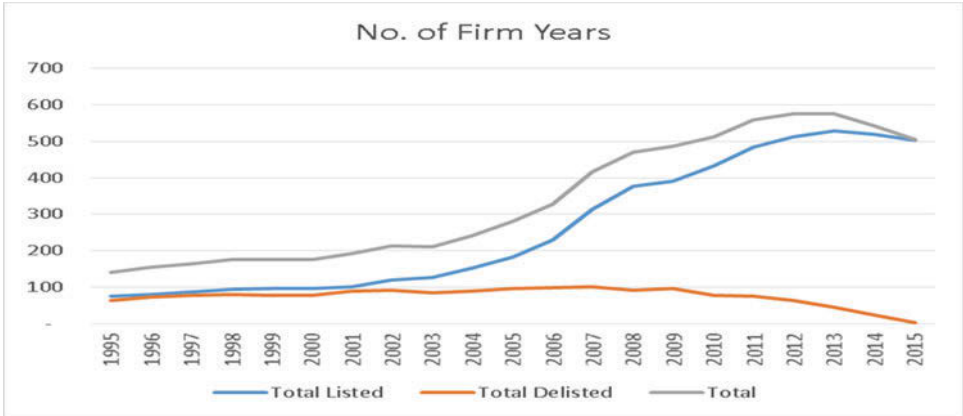
Figure 3.1 indicates an increase in listed MDSEs defying the downward trend triggered by the financial crisis in 2008- 2009. The new firms listing on the exchange are entering the sector as beneficiaries of the mining boom. Firms are increasingly using

the capitalization method owing, most likely, to greater viability of mining projects over the life of the mining boom. However, post-2013, the gap narrows, reflecting lower commodity prices (Figure 3.2).

Figure 3.2 Distribution of Accounting Choices by Firm Year from 1995 - 2015
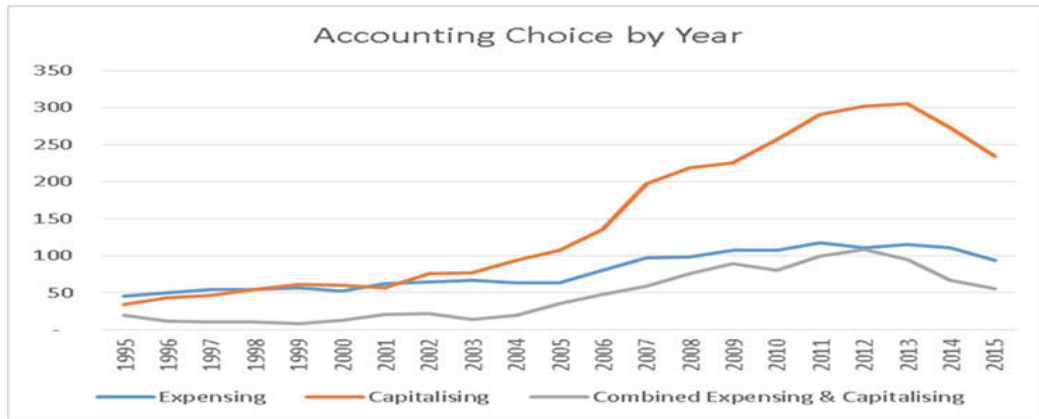
2013 has the highest number of listed firms standing at 529 as in Table 3.2. The large subsequent dips are caused by the slow-down in the economies of the neighbouring consuming countries. The trend for delisted firms is flat in earlier years and on the decline commencing in 2008.

Table 3.2 Breakout of Firm Years by Accounting Treatment & Listing Status

Year	Expensing	Capitalising	Combined Expensing & Capitalising	No Expensing and Capitalising	Total Listed	Total Delisted	Total
1995	46	34	19	41	75	65	140
1996	50	43	12	49	81	73	154
1997	54	47	11	53	88	77	165
1998	54	54	11	57	95	81	176
1999	57	61	8	50	97	79	176
2000	52	60	13	50	96	79	175
2001	62	57	21	52	102	90	192
2002	65	76	22	50	120	93	213
2003	67	77	14	52	126	84	210
2004	63	94	19	66	152	90	242
2005	64	107	35	74	183	97	280
2006	80	136	48	65	229	100	329
2007	97	197	59	63	314	102	416
2008	98	219	76	78	378	93	471
2009	107	226	89	65	391	96	487
2010	107	257	80	68	433	79	512
2011	117	291	99	52	484	75	559
2012	111	302	108	55	513	63	576
2013	115	305	95	60	529	46	575
2014	111	273	67	92	519	24	543
2015	94	235	56	121	503	3	506
1995 - 2015	1,671	3,151	962	1,313	5,508	1,589	7,097
% of total firm year	24%	44%	14%	19%	78%	22%	100%

There is a total of 3,151 capitalising firm years in the sample in Table 3.2. The range in capitalising firm year grows from 34 (1995) to 305 (2013) followed by a large drop. There is a total of 1,671 expensing firm years ranging from 46 (1995) to 117 (2011) and 962 combined accounting treatment firms ranging from 8 (1999) to 108 (2012).

Of the 7,097 sample firm years consisting of 863 firms, 26% (1,843 firm years) exist prior to IFRS adoption with 74% (5,254 firm years) occurring after. The distribution of capitalised firms is skewed towards the post-2005 period. Table in Appendix 7 indicates the actual number of firms following a similar distribution with more firms choosing to capitalise in the post-IFRS period (543 vs. 170), combined methods (303 vs. 80) and expense (314 vs. 156).

Before the IFRS adoption, measured by firm year, about 1/3 (570) of MDSEs use the expensing method and another 1/3 (603) use the capitalisation method. The IFRS adoption in 2005 has seen an increase of usage of the capitalisation method close to 50% (2,548) whereas the expensing method fell to 21% (1,101) although this may reflect commodity price increases around this time. Tables in Appendix 6 and 7 show an upward (downward) trend in the capitalisation (expensing) method used over time. As an alternative, the usage of combined method of capitalising and expensing grows from 150 to 812 firm years.

To provide insight into whether the average duration of specific accounting methods is used, I divide firm years by the number of firms. Appendix 8 shows that an increase (decrease) in duration experienced in the usage of the capitalising method and combined (expensing) post-IFRS adoption. Over the 21-year sample period, the

capitalising method has the longest duration of usage (5.27 years), followed by expensing (4.16 years) and the combined method (2.78 years).

Tables in Appendix 9 indicate capitalising methods are used by firms with larger EE assets and weaker financials with lower mean (median) equity raising capability of $5.76mm ($1.44mm), mean (median) profitability of -$3.26mm (-$1.28mm) and mean (median) cash balances of $6.40mm ($1.74mm).

The expensing method is largely used by firms with stronger financial positions, with larger mean (median) annual equity amounts raised per annum of $9.12mm ($0.93mm), higher mean (median) profitability of -0.940mm (-$1.55mm) and mean (median) cash balances of $21.3mm ($1.94mm). In a nutshell, the expensing decision is a function of financial wherewithal.

Out of the sample of 962 firm year observations, the capitalisation method and the expensing method dominate 70% and 30% of the aggregate dollar amount of the combined method respectively. Combined method firms are weaker than expensing firms but stronger than capitalising firms in the areas of profitability with a mean (median) of -$2.67mm (-$1.82mm) and cash with a mean (median) of $9.27mm ($2.38mm). However, write-offs in combined method outweigh other accounting methods with a mean (median) of $1.95mm ($0.103mm). Firms using the combined method have the largest lagged exploration asset with a mean (median) of $15.8mm ($4.68mm).

More write-offs occur amongst combined method and capitalised firms as the write-off magnitudes of both types of firms are 5 to 6x larger than expensing firms. It is important to note, given the presence of outliers, median write-off magnitudes are more appropriate.

3.5 Summary

This chapter provides a descriptive analysis of accounting choice for Australian MDSEs over a long sample period. The principles-based accounting standard, AASB6, is designed to allow firms to choose from a range of accounting methods. Using the population of MDSEs over the 21-year period from 1995 – 2015, the capitalisation method remains the dominant accounting choice, including in the post-IFRS period. The capitalisation method tends to be used by less mature firms during the resource boom in Australia. Conceptually, capitalised exploration assets are less than certain. Disclosure that pools pending exploration outcomes along with positive deferred EE costs in the same line item creates asymmetric information. To improve reliability in the underlying asset quality, capitalised assets are subject to periodic impairment tests. How different factors impact impairment choices of MDSEs is the subject of Chapter 4 of this thesis.

3.6 Prior Accounting Choice Research and Related Findings

In the late 70s, an alternative approach to accounting choice studies emerged motivated by Watts and Zimmerman's Positive Accounting Theory (1978 & 1986) pertaining to accounting practices that evolve to mitigate contracting costs by establishing ex ante contractual agreements. These choices are argued to impact the underlying firm economics (Lev and Ohlson, 1982).

Accounting choice is further redefined in a study by Fields et al., (2001) who broadens the definition of accounting choice. According to Fields et al., (2001, accounting choice) encompasses the following considerations; equally acceptable

accounting rules, judgement and estimates to implement acceptable accounting rules. Facets include disclosure, timing, lobbying, representation or display, aggregation and classification decisions. The last item, classification decisions, refers primarily to accounting methods providing latitude in the mining industry to expense or to capitalise EE costs in this thesis. Unlike other studies, Fields et al (2001) examine accounting choice determinants by considering facets such as auditors, audit committees and standard setting groups. Contracts provide incentives to managers to choose appropriate accounting methods to achieve desired financial reporting objectives. However, there was mixed results in empirical testing (Fields, 2001).

Positive Accounting Theory explains how various managers choose accounting methods. Collins et al., (1981) incorporate contracting costs and estimation risk theories in explaining the impact on earnings and equity, financial contracts associated with accounting numbers and firm size from mandatory accounting method switches. The study considers the proposed elimination of the full cost method proposed by FASB in 1979. In October 1986, the SEC made a second attempt to eliminate the full cost accounting method. The initial decision not to reject the full cost method was based on efficient contracting arguments associated primarily with agency costs (Malmquist 1990).

Under Positive Accounting Theory, managers can act opportunistically and can choose accounting policy in a self-interested manner. Different types of hypotheses exist. In addition, accounting choices are driven by economic incentives. Studies by Collins et al. (1981), Lilien and Pastena (1982), Malmquist (1990), indicate that the choice of accounting methods are influenced by economic incentives arising from the following theories or hypotheses which are more relevant to financial reporting incentives in this thesis:

- Debt covenant hypothesis

- Capital raising hypothesis (including leverage)

- Political cost hypothesis

- Bonus plan hypothesis

Debt Covenant Hypothesis

Debt covenants are written in terms of financial data including leverage ratios and maximum dividend payouts. Managers may select or change accounting methods to avoid covenant violations that can, in turn, decrease firm value. Breach of debt covenants can potentially lead to bankruptcy. Shareholders are incentivized to avoid the higher bankruptcy costs by seeking to re-contract given the wealth transfers occurring between bondholders and shareholders in the case of bankruptcies (Jensen and Meckling 1976, Leftwich 1979). Bondholders rank before the shareholders who are residual claimants where bankruptcy occurs.

Accounting Method Changes and Wealth Transfer Effects

Firms adopting the FC method and not defaulting in the past may subsequently become subject to risk of default with a mandatory accounting switch or forced adoption of SE accounting. The expected cash flow produced by invested assets under SE accounting is lowered by the amount of potential bankruptcy costs. The stock value is anticipated to decline by the minimum renegotiation, redemption and bankruptcy costs forming part of agency costs. This represents a loss of wealth transferred from shareholders to bondholders as reflected in stock prices. Such method choices will be reflected in stock price reactions around mandatory change announcements or the lobbying behaviour prior to the mandatory accounting changes. Various measures are

used to measure the proximity to debt covenant violations with the leverage ratio commonly used as a proxy in the 80s. In the 90s, researchers examined violated covenants without using proxies

In a later study, Malmquist (1990) examines the relationship between debt equity ratios, the use of public debt and FC accounting. Malmquist (1990) finds it is the contracting; renegotiation costs and debt covenant monitoring forming part of the efficient contracting considerations being the determinants of accounting choice. He concludes firms choose FC or SE methods due to efficient contracting considerations, rather than opportunistic motives although Holthausen (1990) argues that Malmquist does not adequately distinguish between the efficient contracting view and managerial opportunistic behaviors. Debt equity ratios are used to gauge the sensitivity of such a choice. Book value of debt/market value of equity is significantly and positively associated with FC accounting that produces less variance in ratio and less white noise. In a more recent study, accounting method change is considered more costly than manipulating accruals in the DeFond and Jimabalvo (1994) study. They find the impact of accounting method change more systematic, applied repeatedly over a period of time, consistent with Watts (2003). The resulting financial impact recurs from one period to another and is more persistent instead of being a one-off event. However, the findings are subject to measurement error due to selection bias in the sample as successful manipulators of accruals are not included.

In all, Watts and Zimmerman (1986) outline positive associations between accounting method choice where benefits of higher reported earnings leads to higher compensation levels, higher share values, mininise the probability of debt covenant violations and alignment of shareholder interests. This is consistent with efficient contracting theory that is value maximizing rather than promoting managerial

opportunism. It is costly for shareholders to eliminate all flexibility hence the allowance for some managerial discretion (Fields et al., 2001).

Capital Raising Hypothesis

In support of the modified naïve investor theory, Collins et al., (1981) argue management take rational actions to avoid the consequences of irrational investors from potential lawsuits due to lower and more volatile earnings than anticipated. Malmquist (1990) provides further industry evidence. The study stresses underwriters are disinclined to bring an issue to market with negative book value even though the market value of the underlying assets net of liabilities may be positive due to litigation risk. Malmquist does not provide adequate justification for this assumption (Holthausen, 1990).

The choice of methods may indirectly affect bankruptcy and stock price performance through downward pressure on firm value and cash flows as a result of SE accounting. Smaller explorers may have a higher sensitivity to SE accounting due to the reduced ability to capitalize the EE costs in full. If all firms were forced to adopt the SE accounting proposed by FASB in 1987, costs associated with legal expenses and reputation effects faced by underwriters would have to be passed on to issuers incurring a higher cost of capital and discouraging capital raising activities. However, Malmquist (1990) provides only mixed evidence on the association between public debt issuance and FC accounting.

Political Cost Hypothesis

Malmquist (1990) states large firms are more likely to employ accounting methods that defer current earnings to future time periods. Consistent with this

assertion, Collins et al (1981) find that large firms are associated with positive abnormal financial performance. Political costs are important to larger firms. The reduction in reported earnings would result in reduced political costs. This is pertinent in particular to firms with price sensitive assets. In the 70s, rising oil prices generated increased profits for oil companies. Employing SE accounting would allow them to expense dry holes costs, reducing tax payments. Large producers have the financial wherewithal to benefit from a more conservative accounting choice.

Bonus Plan Hypothesis (Management Compensation Hypothesis)

Malmquist (1990) states accounting-based managerial compensation schemes create additional incentives for managers to choose an accounting method that provides accurate signaling of corporate financial conditions and performance. The managerial compensation plan is dependent on accounting numbers rather than equity market performance and the alignment of incentives should increase firm's financial performance and reduce agency costs. Managers of firms with bonus plans are more likely to choose accounting procedures that shift reported earnings from future period to the current period to obtain larger bonuses. For example, managers electing to use accelerated depreciation methods can shift income from earlier to later accounting periods. Managers who have financial performance incentives with their remuneration tied to the firm's accounting performance may increase their current bonus by reporting as high a net income as possible, which can be done by choosing accounting policies that will achieve this.

When management's compensation is tied to reported earnings, they bear additional risk compared to a salaried employee. Managers have to be compensated for bearing this additional risk. By aligning their incentives, managers bear more risk. The

more costly it is to renegotiate such plans the greater the possibility of opportunistic behavior in the choice of accounting methods by managers. Holthausen and Leftwich (1983) look further into the voluntary or mandatory changes in accounting rules. When there is a change in accounting rules, compensation plans should be adjusted due to the management's wealth impacts. Managers may respond to the mandatory change in accounting methods by altering the firm's investment and financing decisions to reduce any unfavorable impacts on compensation payments. The new set of investment and financing decisions may not maximize firm value but may change the value of the firm.

Intrinsic Firm Characteristics

Sunder (1976) states the increase in variation in accounting earnings resulting from switch to SE accounting is associated with the extent and the proportion of the firm's activities devoted to exploration and production activities. Firms with a higher proportion of revenue dollars allocated to exploration activities have a higher propensity to avoid SE accounting than firms with lower proportion of revenue dollars allocated to exploration activities. The change in total stockholder equity provides an alternative measure of the firm's commitment to exploration activities. Using the cutback in exploration expenditure or positive NPV projects, firms are at risk of lowering the value of equity in the long term due to the reduced growth prospects.

Large firms have a higher propensity to commit to large-scale exploration expenditure on a pure dollar basis. Malmquist (1990) uses exploration costs as proxy for firm size and finds a significant association between exploration spending and choice of the FC accounting method. Holthausen and Leftwich (1983) find that firm size and leverage are the only 2 significant variables in explaining voluntary and mandatory

accounting methods in their review study of 14 studies. Collins et al (1981) finds firm size is significant in association with market reactions reflecting positive firm valuation. The nature of the scope of business also has an impact on the choice of accounting methods. Explorers will face more engineering risk than a producer facing more market risk or oil pricing. Producers will have higher reported earnings under FC as all expenditure are capitalised on balance sheet as opposed to expensed under SE accounting.

Research Limitations

One caveat on the existing study results have limitations due to the small sample size. Collins et al., (1981) has a sample size of 57 firms, whilst Malmquist (1990) uses 282. Overall, evidence on accounting choices motivated by debt covenant concerns is inconclusive but there is significant amount of data in support of a relation between accounting choice and violation of debt covenants (Fields et al, 2001). There are limitations in the accounting choice studies, which assume that managers make the accounting choices either for self-interest or in favour of shareholders. Dye and Verrecchia (1995) confirm giving managers the discretion to adopt differing accounting methods is to solve two agency cost problems – internal and external. When there is internal agency problem alone, granting managers broad discretion is optimal because it generates more information and reduces costs of controlling managers. However, this may motivate managers to take advantage of shareholders. The effects are not independent and separable because empirical methods are inadequate to detect such effects. This poses limitations in accounting choice research.

I now test some of these concepts discussed in the agency cost literature in the empirical analysis of determinants of write-downs in Chapter 4.

CHAPTER 4 – DETERMINANTS OF THE PROPENSITY TO UNDERTAKE WRITE-OFFS

4.1 Background

Definition of impairment loss

Consistent with conservatism, the goal of asset impairment is to ensure that assets are not recorded at more than they are worth over their useful life. Assets are not to exceed their recoverable amount. Both AASB 6 and AASB 136 lay out the impairment test criteria. Assets are subject to annual assessment for impairment as part of the process of justifying deterioration of asset value.

Detection of asset impairment

The asset is assessed every year against indicators of impairment including market value decline, negative change in market conditions, asset idleness, and discontinued or restructured operations. Selective tangible assets, subject to AASB 136, are not required for the impairment tests unless the indicators confirm impairment. However, intangible assets with limited useful life - mining licenses and assets with unlimited useful life while goodwill must be subject to annual testing without reference to indicators. Goodwill however is less likely to feature prominently in this setting owing to the lower amounts of merger and acquisition activity in the MDSE sector. Indeed, where merger and acquisition activity does occur, it is typically larger firms acquiring MDSEs in the development phase.

AASB 6, para.20 provides guidance for impairment indicators specific to the extractive industries, although the list is not exhaustive. Once the indicators confirm

that impairment exists, further impairment tests will take place. Firms are required to measure, present, and disclose, subject to a separate standard, AASB 136. In the case of no indication of impairment, no impairment test is required. AASB 136 reads as follows;

'One or more of the following facts and circumstances indicate that an entity should test EE assets for impairment (the list is not exhaustive):

(a) The period for which the entity has the right to explore in the specific area has expired during the period or will expire in the near future, and does not expect to be renewed;

(b) Substantive expenditure on further exploration for and evaluation of mineral resources in the specific area is neither budgeted nor planned;

(c) Exploration for and evaluation of mineral resources in the specific area have not led to the discovery of commercially viable quantities of mineral resources and the entity has decided to discontinue such activities in the specific area;

(d) Sufficient data exist to indicate that, although a development in the specific area is likely to proceed, the carrying amount of the EE asset is unlikely to be recovered in full from successful development or by sale.

(AASB 6, para.20):

These conditions are summarised as follows. License expiration on the right to explore, unbudgeted or unplanned expenditure on EE in specific areas, discontinuity of resource where commercially viable resources are assumed to exist, despite sufficient data to support a development in the specific area is likely to proceed, the carrying amount of the EE asset is unlikely to be economically recoverable in full from the disposal of development projects. This can be due to commodity prices. In terms of reassessment of the impairment loss, AASB 136 para.12 provides the following indicators of impairment:

In assessing whether there is any indication that an impairment loss recognized, in prior periods for an asset other than goodwill may no longer exist or may have decreased, an entity shall consider, as a minimum, the following indications:

External sources of information

(a) there are observable indications that the asset's value has declined during the period significantly more than would be expected as a result of the passage of time or normal use.

(b) significant changes with an adverse effect on the entity have taken place during the period, or will take place in the near future, in the technological, market, economic or legal environment in which the entity operates or in the market to which an asset is dedicated.

(c) market interest rates or other market rates of return on investments have increased during the period, and those increases are likely to affect the discount rate used in calculating an asset's value in use and decrease the asset's recoverable amount materially.

(d) the carrying amount of the net assets of the entity is more than its market capitalisation.

Internal sources of information

(e) evidence is available of obsolescence or physical damage of an asset.

(f) significant changes with an adverse effect on the entity have taken place during the period, or are expected to take place in the near future, in the extent to which, or manner in which, an asset is used or is expected to be used. These changes include the asset becoming idle, plans to discontinue or restructure the operation to which an asset belongs, plans to dispose of an asset before the previously expected date, and reassessing the useful life of an asset as finite rather than indefinite.

(g) evidence is available from internal reporting that indicates that the economic performance of an asset is, or will be, worse than expected.

The prescribed asset impairment standards are AASB 136 *Impairment of Assets*, equivalent to IAS 36 and parts of AASB 6. For simplicity's sake, only AASB 136 is referenced in this discussion. Impairment loss is the shortfall of the recoverable amount net of the carrying amount, with the recoverable amount being defined as; 1) fair value net of cost of sale and 2) value in use. If either is in excess of the carrying amount no impairment is required. If either is less than the carrying amount, however, impairment exists and needs to be recognised. The definition of recoverable amount, arguably has been tightened since the transition to IFRS in 2005.

Fair value is the price received from disposal of an asset or paid to transfer a liability between market participants at the measurement date; it also can be observed in an active market. Value in use is the present value of the future cash flows expected to be derived from continuing use of an asset or a cash-generating unit. Guidance is provided, describing the procedures for estimating future cash flows and discount rates (IAS 36 para.30). As for AASB 136, this requires the cash flow assessed in the determination of recoverable amount to be discounted either at pre-tax rates - current market rate with a weighted average cost of capital or at incremental borrowing rates, reflecting the time value of money. Value in use is considered but its adoption by explorers is rather limited since exploration assets are pre-production assets. Hence, the resulting cash inflow and outflow derived from the continued use of the asset is nil and the asset has a non-zero cash inflow only upon disposal. Rarely do explorers have a constant stream of cash flows allowing them to estimate recoverable amount via value in use, except perhaps where an explorer is entitled to a production royalty on a mineral tenement that it has previously farmed-out.

Prior to the transition to IFRS via IAS 36, asset impairment was subject to AASB 1010 *Recoverable Amount of Non-Current Assets* and AASB 1041 *Revaluation of Non-*

Current Assets, both of which required non-current assets to be recorded at no more than their recoverable amount. When the prior Australian standards are compared with IAS 36, they applied to a narrower range of non-current assets. The Australian standard did not specify an acceptable method to determine recoverable amount, but only required the disclosure of the assumption used to determine recoverable amount and to say whether the net cash flows are discounted to present value.

Since 2000, a regulatory requirement in Australia has stipulated that non-current assets must be recognised at no more than the recoverable amount. And yet 'recoverable amount' was not precisely defined, merely described as the 'net amount of cash flows expected to be recovered from disposal and continued use of assets together' (Bond et al. 2016). Very little explanation was provided as to how this amount should be determined. Nor was the discounting of cash flows specifically addressed, with anecdotes of net cash flows not being discounted.

Since the transition to IFRS, the requirements for asset impairment prescribed by IAS 36 were replicated in AASB 136 *Impairment of assets*. In contrast to the prior standard, the impairment requirements harmonized in 2005 though adoption of the IFRS version of AASB 136 are highly prescriptive in terms of how decisions on asset impairment should be made, and of how the 'recoverable amount' is measured. In terms of volume of regulation, there are 40 paragraphs addressing the determination of 'recoverable amount', and 28 of those paragraphs address the estimation of value in use (Bond et al., 2015). The standard includes detailed requirements on indicators of impairment such as significant decline in firm value, significant changes in technology, market, economic, or legal environment, changes in market interest rates, asset obsolescence or changes in asset utilization (AASB 136, para.12).

When it is not possible to determine the recoverable amount for individual

assets because assets are not generating cash independent of others in value in use, then the asset is allocated to a cash-generating unit (CGU). Similarly, goodwill can arise from acquisition of another explorer with the assets in such a case being booked as EE capitalized assets. Goodwill, along with other intangible assets having an indefinite useful life, must be allocated to a CGU for impairment testing. However, as suggested, mergers and acquisitions occur typically amongst larger mineral producers that buy into MDSEs whereas merger and acquisition activity between MDSEs is less common.

A CGU is defined as the smallest identifiable group of assets that generate cash flows independent of the cash flows emanating from other assets or groups of assets (AASB 136, para.6). An order is prescribed for the impairment of assets within a CGU group. Goodwill regarded as an intangible asset with an indefinite useful life, must be allocated to CGU for impairment testing. Goodwill within a cash-generating unit is impaired first, and then, subject to conditions, the remaining assets are impaired on a pro-rata basis (AASB 136, para.104). However, the impairment loss allocated to the CGU cannot bring the carrying amount of an individual asset within the CGU below the highest individual asset's fair value, less costs to sell, value in use, or a negligible balance that is 0. The impairment loss that otherwise would have been allocated to the asset is allocated on a pro-rata basis to the other assets of the CGU (IAS 36, para.105 see Appendix 5).

It can be seen that a number of issues arise when evaluating asset impairment where there is more than one cash-generating unit within a business. This may not pose a problem for MDSEs, however since MDSEs are typically pre-development and do not generate cash flow and income to incur amortization and depreciation under AASB 6 paras.18 and 20. Projects in the exploration phase are not cash generating. On that

basis, the asset impairment rules associated with CGU are less relevant to the MDSE setting.

Impairment loss recognition under cost and revaluation models

To recap, accounting treatments for impairment losses on EE assets vary, subject to whether the cost or the revaluation model is adopted when the EE assets are first recognised. For the cost model, under AASB 136, para.60, an impairment loss is recognised immediately in the form of a debit in the Statement of Comprehensive Income with a credit to the corresponding asset.

Under the revaluation model, an impairment loss is posted to a revaluation surplus held in equity via a debit, with a credit to the asset. If the revaluation surplus account is non-existent, an impairment loss is recognised as an expense in the P&L. Depreciation is subject to adjustment proportionately, while the associated assets are impaired so that the remaining carrying amount is allocated systematically over its remaining useful life. This is an issue for studies evaluating impairment of goodwill only (Ramona and Watts 2012) whereas this thesis focuses on non-goodwill-related impairments.

Asset revaluation under cost and revaluation models

With respect to the revaluation accounting treatments, an asymmetry exists between downward impairment and upward revaluation. Besides measuring assets at cost, a fair value measurement approach can be taken provided there is an active market, a potential sale is being transacted on an arm's length basis, and the entity is a going concern. The fair value approach is believed to provide more relevant measures of asset value. As opposed to downward revaluation or asset impairment, upward revaluation does not use value in use measurement, for it is potentially subject to

arbitrary discount rates for cash flow calculations. Under AASB 1041, entities need to choose between measuring all assets in a class of some or all non-current assets on either a cost or a fair value basis. Under AASB136, fair value is the net disposal cost selling price or payment to transfer a liability in an orderly transaction between market participants on the measurement date.

Under AASB 1041.1b, the fair value basis revaluations must be made with sufficient regularity to ensure the carrying amount of each asset in the class aligns with the corresponding fair value as of the last reporting date. In addition, under AASB136, the upward revaluation can stem from opposite changes in the indicators associated with asset impairment discussed previously. After assessing at each reporting date whether an indication of assets subject to impairment loss, other than goodwill, no longer exists or has been reversed, the same estimate of recoverable amount i.e. fair value net cost or value in use, previously used in calculating impairment loss is examined.

Consistent with the conservatism principle, in Australia there is no requirement to perform an upward revaluation when the non-current asset has a recoverable amount in excess of the carrying amount. In addition, AASB 1041, *Revaluation of Non-Current Assets* prohibits revaluation of some non-current assets including inventories, foreign currency monetary assets, goodwill and investments in associates, some internally generated intangible assets like mastheads and interests in joint venture entities via the use of equity accounting methods.   Revaluation of intangible assets is permitted only when there is an active market. Non-current asset revaluation occurs mostly amongst PP&E.

Under the revaluation model, where the asset is revalued upward, the incremental amount is recorded as a revaluation surplus within other comprehensive

income. The resulting revaluation surplus will reverse a revaluation decrement previously posted for other comprehensive income. This constitutes an impairment loss reversal. The resulting net revaluation increment is recorded as part of the P&L. Under the cost model, the impaired amount or the write down to recoverable amount is not subject to reversal of the sort permitted by the revaluation model (AASB 1041: 5.1.5, AASB1010 & AAS10).

On that basis, a reversal of impairment loss is permitted by the revaluation model but it must not exceed the original carrying amount along with a credit in P&L. Loss reversal will be allocated to assets in CGU on a pro rata basis, excluding goodwill. The revised carrying amount should not exceed the original carrying amount or the recoverable amount, which is even lower. Reversal of an impairment loss for an intangible (in particular, goodwill) is not permitted in subsequent periods, because any increase in the recoverable amount of goodwill is likely to be an increase in internally generated goodwill rather than a reversal of an impairment loss for acquired goodwill (AASB 136, paras.124-125).

When a depreciable asset is subject to revaluation, an entity will credit accumulated depreciation against the non-current asset being revalued and debit the non-current assets in keeping with the magnitude of revaluation increment. Revaluation is a process of maintaining the carrying amount in line with fair value and it depends upon the frequency and the materiality changes in the fair values of assets within the class of non-current assets. Adjustments to asset valuations are required to maintain value relevance. Disclosure is required for each class of assets, for impairment losses and reversals with details including events, circumstances and the nature of the individual assets. The associated depreciation expense must be adjusted accordingly.

In summary, it is possible that exploration firms will boost the recoverable amount by upgrading their feasibility plans or by establishing ties with stronger joint venture partners. Both such actions would tend to increase the valuation, resulting in a higher fair value less the costs of disposal at sale. Explorers are assumed to make limited use of value in use as a way of estimating recoverable costs. Since relatively few MDSEs engage in acquisitions, impairment of associated goodwill is considered limited, due to the lack of cash generating units during the pre-development and pre-production phase. In addition, as already suggested, the cost method is overwhelmingly adopted by MDSEs to account for EE costs, with the fair value approach seldom utilized.

International comparison

Measuring and recognising asset impairment for US mining and the oil and gas companies differs from treatment in AASB 6. Asset impairment rules in the US are similar across industries with standards having built in clauses for asset impairment. A different terminology is used in the mining industry, with value beyond proven and probable reserves used to test for impairment in mineral resource assets. Estimates of future cash flow is used to test if mineral assets are impaired calculated using current cash flow associated with value beyond proven and probable reserves. The estimation of future cash flow can be different in the US for the mining industry. Future cash flow estimates considers current, historical average and forward prices.

FASB 932 has impairment rules specific to the varying accounting methods whereas AASB 6 does not. The asset impairment rule in FASB 932 applies only to proven oil and gas reserves "measured" or "deduced" under the SE method and not applicable to unproved oil and gas (SE method), or proved and unproved oil and gas (under the FC method). Regardless of the calculation of free cash flow, using year-end

prices and year-end quantities of proved reserves or future prices based on contractual arrangements at year-end, the discount rate is standardised at 10%. Thus, the impairment rules are conditioned by choice of accounting method.

The SE method allows certain types of costs to be capitalised as construction in progress pending the gathering of information on probable future economic benefits. As soon as the information becomes available, costs are either, classified as amortised assets or expense. Capitalised costs include properties, plant and related equipment and facilities, support equipment and facilities, incomplete plant, equipment and facilities. Similar to AOI, FASB 932-360-25-3 mandates explicit disclosure requirements at the first year anniversary of capitalised costs. Full costs refer to all cost incurred to acquire, explore, and develop oil and gas exploration assets resulting in production of oil and gas. All capitalised costs are capped or measured at the threshold – the country-wide cost centre. One obtains the present value of estimated future revenues by using current prices and by estimating future production of proved oil and gas reserves at balance sheet date, including income tax effects. The estimated future expenditure is based on current costs incurred to develop and produce reserves. The excess of countrywide cost centres, amounts above the ceiling with are written off as loss on impairment of long-lived assets in income statement. The shortfall of countrywide centres may be subject to amortisation.

Write-offs of EE assets are required to be undertaken in accordance with AASB 136, para. 12 and AASB 6, para. 20. The guideline stipulates an asset should not be carried more than its recoverable amount when the carrying amount exceeds the amount to be recovered through value-in-use or sale of the asset. The write-off amount is fungible stemming partly from managerial incentives. There are instances, which may create asymmetric information, which has an impact on the asset quality. Operationally,

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firms often use the criteria of asset recoverability as a benchmark for write-offs. A key question in this chapter is what type of firms undertakes impairment of capitalized EE costs?

In this chapter of the thesis, variables pertinent to the MDSE setting and supported by accounting theory are constructed. Exploration asset write-offs are an interesting setting in which to observe why firms decide to write off EE assets to resolve uncertainty. MDSEs have homogeneous business objectives. Further, there is only one material asset account where managers have any discretion, and that is capitalized EE costs. Accordingly, this setting may be less noisy and yield better insights into the drivers of impairment than in prior studies, which can contribute to our understanding of managerial incentives and other contracting parties like auditors. This thesis considers the propensity to impair and not the timing of impairment.

To provide evidence on the determinants of exploration write-offs, a logistics regression modeling approach on the full sample of MDSEs from 1995-2015 is utilised. The sample is subject to the same accounting standards applicable to all firms, which report or do not report write-offs. Sensitivity tests are conducted on both the pre- and post-IFRS adoption periods and pre- and post-mining boom. As the write-off literature typically focuses on goodwill, inventory and fixed assets, namely property, plant and equipment, examining the attributes of write-offs specific to EE assets at the firm level, can increase our understanding of why firms report the way they do.

The remainder of this chapter is structured as follows: Section 4.3 develops the hypotheses on the characteristics of firms and the quality of the assurance mechanism in association with write-offs. Sample selection, variable measurement and the research model are outlined in Section 4.4. Section 4.4 discusses the determinants for the

propensity to write off in various economic context and cycle. Conclusions from this chapter are summarised in Section 4.5.

4.2 Literature review and hypothesis development
4.2.1 Financial reporting determinants of write-off decisions

Under AASB 6 Section 7.2b (ii), pre-production firms are permitted to capitalize EE costs pending ongoing exploration activity. Although it fits the asset recognition criteria of the Conceptual Framework by providing more information on exploration activities, agency costs may lead to potential opportunism. In the Conceptual Framework, the process of recognizing and adjusting for asset impairment can provide information about the effects of transactions and their causes. To that end, this thesis considers EE asset impairment and examines the associated determinants noting incentives vary across different types of write-offs. Apart from the limited studies in the Australian setting, write-offs of this type have not been considered in prior literature and thus this study can add to the body of literature on asset impairment. Write-off decisions can be discretionary or mandatory. Francis et al (1996) define an asset as impaired when its carrying value falls materially below its economic value. Managers make write-off decisions. The extent of the impairment[17] is the difference between carrying value and economic value when the former exceeds the latter.

The term discretionary refers to the absence of authoritative guidance provided to management along with substantial flexibility in deciding when and how much to write off. SFAS 121 *Accounting for Long Lived Assets and for Long Lived Assets to be Disposed of* was effective for fiscal years beginning after December 15, 1995. Prior to that, write-offs were voluntary. Examples include pre- and post-SFAS 121 comparison

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[17] In this section, the terms 'impairment', 'write down' and 'asset impairment' are used interchangeably.

studies (Francis et al 1996 and Riedl 2004) and the unverifiable discretion in the SFAS

142 goodwill impairment study (Ramanna and Watts 2012). The implications of

discretionary impairment are that the flexibility to report write-offs, if exploited, can

give rise to private incentives and earnings management opportunities. This may result

in distortion in financial statement comparability and consistency. However, whether

authoritative guidance can completely eliminate private incentives governed by agency

theory, that remains an open question. Nevertheless, the FASB subsequently

reconsidered the impairment test requirements and abolished the amortization for

goodwill and impairment assets and issued SFAS 142 *Goodwill and Other Intangible*

Assets in June 2001. According to AASB136, when the asset is described as impaired, the

standard requires entities to recognize an impairment loss.

At a macro level in most instances, high economic growth suggests stronger net

earnings growth. Return on assets (ROA) and industry adjusted ROA are used as proxies

for economic growth. In early write-off studies, Elliott and Shaw (1988) and Zucca and

Campbell (1992) observe a negative association between ROA and write-offs. In

particular, Zucca and Campbell (1992) observe evidence of earnings management with

22 out of 77 smoothers and 44 out of 77 bathers. Francis et al (1996) do not observe

evidence of a negative association between ROA and write-off decisions. This indicates

ROA is negatively but insignificantly associated with asset impairment. The implication

of the Francis et al., (1996) finding that poorly performing firms decrease write-offs and

strongly performing firms increasing write-offs suggests managerial incentives such as

bath-taking and smoothing rather than external efficiency related factors such as

economic growth. Francis et al. (1996) conclude that management incentives carry

more weight in explaining asset impairment. The difference in results between the

earlier studies and Francis et al. (1996) may reflect the sample period and profitability

measures used. Although Francis et al (1996) use a sample of 674 US firms presumably with higher generalizability, compared to 240 for Elliot and Shaw (1988) and 77 for Zucca and Campbell (1992), the Return on Assets (ROA) (defined as the mean change in the ROA ratio over the past five years), differed from other studies, potentially giving rise to differing results. The evidence for the association between profitability and impairment is mixed.

In the MDSE setting, ROA may be less important as a measure of profitability given that its denominator may include assets with high asymmetric information embedded by the flexibility in the accounting standards. Further, the numerator, is a poor measure of performance given MDSEs are systematically loss making. Further, a MDSE might report more losses simply because it is engaged in more exploration on promising projects. Consequently, ROA has little utility in predicting propensity to write off EE assets.

External efficiency related factors such as a decline in commodity price levels could possibly exacerbate the economic viability of the project leading to a write-off. A negative association between commodity prices and the propensity to impair is considered using both the strength of the currency AUD vs. USD and commodity prices in sensitivity tests.

AASB 136 Section 12 (d) suggests that when the carrying amount of the net assets of the entity is more than its market capitalization, asset may be impaired. The book to market (BTM) ratio if greater than 1 can indicate the extent of potential impairment and the same is true when market to book (MTB) is less than 1. The margin of difference between book value and market capitalisation suggests a potential impairment. Its persistence over a prolonged period of time indicates firms' reluctance to report write-offs. Francis et al., (1996) state BTM is significant in explaining the

amount and timing of asset impairments. In one of the discretionary impairment studies considering a sample predating SFAS121, Francis et al., (1996) observe evidence of the change in BTM being significantly positively associated with restructuring impairment but significantly negatively associated with goodwill impairment.

In subsequent mandatory impairment studies, Jarva (2009) and Abugahzhek et al., (2011) observe evidence on the positive association between goodwill impairment reporting and higher levels of BTM, if it is greater than 1. However, using a sample of 124 potentially impaired firms, Ramanna and Watts (2012) observe 69% of the firms with high levels of BTM and unverifiable goodwill balances do not report write-offs. The difference in results can be explained by the different samples. Ramanna and Watts (2012) use potentially impaired firms only in the sample selection whereas other researchers use both potentially impaired and control firms in their samples. Ramanna and Watts (2012) use a sample of 124 firms compared with 327 in Jarva (2009). However, the implication of Ramanna and Watts' findings that only 29% of the firms report write-offs is that if accounting standards require difficult-to-verify estimates, discretion enters into measurement. Accordingly, agency theory predicts management may make opportunistic use of this discretion. To the extent opportunism is available in accounting method choice, this may explain the negative association between market capitalization and book value.

Alternatively, many MTB impairment studies observe evidence of the negative association between write-offs and MTB (Cotter et al 1998, Reidl 2004, Beatty and Webber 2006). Riedl (2004) also consider impairment effects pre- and post-SFAS 121. The post-SFAS 121 period characterizes stronger economic growth hence the buffer between market and book values may be greater in the post-SFAS 121 regime. The implication of Reidl's (2004) findings regarding MTB indictors across different periods

is that asset value can be affected by economic conditions and may increase during economic growth and decrease during economic decline in an earlier study, using a paired case analysis to examine the discretionary write-off decisions, Strong and Meyer (1987) observe insignificant mean differences in MTB between impairment and control firms.

It is important to note, the recoverable value is based on estimates. However, it is difficult to ascertain if there is an active market for MDSE assets. "Value in use" is unlikely to apply given firms are in a pre-production phase with no marketable inventory on hand or product revenue. Hence, no operating cash flow is available to assess present values. As already mentioned, to boost the market value of MDSEs, firms might upgrade feasibility plans, conduct further resource drilling to enlarge their resources and or to establish ties with stronger joint venture partners. However, MTB and BTM can be considered noisy measures. The evidence for using BTM can indicate the extent to which write-offs explain market valuations. The outcome is mixed depending on the types of asset impaired. In this setting, BTM is expected to be positive because market capitalization is typically smaller than reported book value.

Firm size proxies for the firm's exploration resources. Watts and Zimmerman (1990) state larger firms are more likely to disclose information and comply with financial reporting requirements than smaller firms due to political pressure and public scrutiny. Many studies lend support to the political cost hypothesis and observe a positive association between firm size and magnitude of asset impairment (Francis et al 1996, Beatty and Webber 2006, Zang 2008 and Jarva 2009). On the contrary, Chan and Chen (1991) and Cotter et al (1998) observe smaller firms report a greater magnitude of write-downs than larger and more stable firms since the inherent riskiness of their

operations increases the probability of experiencing value declines and asset impairment.

Firm size is positively related to compliance for IFRS voluntary adopters with higher quality of disclosure (Cooke 1989, 1991, Street and Bryant 2000, Street and Gray 2001, Glaum and Street 2003 and Al Shammari 2008). In contrast, inconsistent results are found in Abughazneh (2011) and Glaum et al (2012) who report size is not significantly related to IFRS 3 and IAS 36 compliance in the first year of IFRS adoption for large listed European firms. Again, mixed findings in prior studies could be due to sample size differences. In this setting, MDSEs are relatively small and of high risk. They are less likely to have extensive resources, compared with larger firms. The evidence for the positive association between firm size and asset impairment is mixed. Consistent with some of the prior impairment literature, larger MDSEs are expected to report larger write-offs.

Capital raisings may require more transparency of risk hence a higher level of impairment reporting and disclosure of information by managers to reduce information asymmetry and lower cost of capital. Many studies observe evidence of higher standard of reporting and disclosure when seeking external funding (Tarca et al. 2013, Healy and Palepu 2001, Francis et al. 2005). Fama (1980) indicates a firm's shareholders provide an indirect assistance to the labour market to value the firm's management. With the stronger reliance on equity funding relative to debt financing amongst MDSEs, tighter compliance with standards and more disclosure may be expected. Equity rising firms may be less inclined to report write-offs by showing a seemingly better exploration results and larger body of exploration assets, in order to attract fresh funding.

4.2.2 Monitoring mechanism determinants of write-off decisions

Watts (1977) considers the function of financial statements is to present numbers for monitoring covenants. Watts (1977) argues the function of audited financial statements in an unregulated economy is to reduce agency costs due to the varying number of firm's present financial statements and varying content across different firms.

When shares are not widely held, some shareholders are always able to exercise their rights and interests over financial reporting decisions. Several studies on ownership concentration observe the negative association between concentration of shareholding and dissemination of company information including impairment reporting (Porta et al 1999, Al-Shammari et al. 2008, Glaum et al 2012). Luez and Wysocki (2008) observe little or no interest in disclosure. Greater ownership concentration can discourage dissemination of company information leading to information asymmetry eroding investors' confidence. Hence, market prices may not truly reflect firm specific risks (Fama 1980).

Auditors are an important monitoring mechanism ensuring financial statements to be in conformity with accounting standards. Francis et al (1996) argue write-off incentives are a function of independent sources of information and authoritative guidance, but do not mention the auditor's role in monitoring. Big 4 auditors are generally associated with higher audit quality (De Angelo 1981).[18] The large client base of the Big 4 effectively reduces fee dependence on any single client, therefore enabling larger suppliers to maintain independence. Strong internal controls within the clients, better audit systems, training, and reputation effects can attribute to auditors'

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[18] Big 4 auditors refers to Big 8, 6, 5, 4 respectively.

independence (Francis & Wang 2008; Boone, Khurana & Raman, 2010). Many studies observe evidence of the positive association between standard compliance and the Big 4 auditors (Glaum et al 2012), even in voluntary settings (Street & Bryant 2000, Street & Gray 2001). Auditors who are industry specialists should perform better when it comes to error detections (Bonner and Lewis 1990, Owhoso et al 2002). Clients of auditor industry specialists have lower earnings management (Krishnan 2003), lower fraud (Carcello and Nagy 2004) and better disclosure (Dunn and Mayhew 2004). Zucca & Campbell (1992) and Strong and Meyer (1987) investigate auditors' role in influencing management's recognition of impairment in their financial statement while GAAP requires voluntary write down and this thesis considers if specialist auditors' have a bearing over EE asset impairment.

In summary, in the MDSE setting, it is important to note that leverage is not considered an important determinant of impairment choices since MDSEs, apart from developers, are all equity financed.

Prior impairment study evidence suggests an association between CEO change and the propensity to impair (Strong and Meyer 1987, Francis et al. 1996, Beatty and Weber 2006, Masters-Stout et al. 2008, Zang 2008, and Abughazaleh et al. 2011). The implications of Strong and Meyer's (1987) finding in the sample of 120 firms during pre-SFAS 121 period is that firms undertaking impairment are not the financially strongest or weakest in their industry with factors like management change being more important in explaining write-off decisions. CEO tenure is used in prior impairment research as a measure of managerial incentives to undertake impairment. Both Beatty and Weber (2006) and Ramanna and Watts (2012) observe the negative association between the length of tenure and amount of write-offs. US CEOs with a shorter period of tenure are more likely to record a goodwill write-off, as they are less likely to have

made the decision on the original acquisition that gives rise to goodwill. Thus, long tenure has been found to be a negative and a significant predictor of goodwill impairment propensity. In all, both factors of CEO change and Top 20 shareholders are considered and examined in the robustness test of this thesis.

4.2.3 Hypotheses development

Information asymmetry characterises this setting. Information asymmetry gives rise to adverse selection (ex-ante) and moral hazard (ex-post). In the study of the Markets for Lemons, Akerlof (1970) addresses the issues of quality of uncertainty referring to buying second hand cars. Often, the buyer is not aware of the nature of the purchase until after the event. The pre-production status of MDSEs means there are no debt contracting implications due to the lack of cash flow to justify borrowing (Malmquist 1990). A strong reliance on equity funding from investors gives rise to adverse selection and moral hazard. Given the residual claimant status with shareholders ranking last in the case of insolvency, there is a demand for assurance from auditors and competent persons as monitoring mechanisms in order to reduce information asymmetry in financial reporting.

This thesis focuses on write-downs of exploration assets with no prior empirical study examining this type of impairment. Prior write down studies exploring corporate restructuring, goodwill and inventory, indicate information asymmetry effects with management having discretion in determining the size and timing of write downs (Elliott & Shaw 1988 and Strong & Meyer 1987). Francis et al. (1996) point out management can take advantage of the discretion permissible in the accounting rules to manipulate earnings either by not recognizing impairment when it has occurred or by recognizing it when it is consistent with self-interest.

Levy (2015) examines the information asymmetry effect on accounts receivable (AR) which are open accounts owed to firms by trade customers and are used by firms to facilitate the sale of goods. Different from other assets held by the firms, AR has different information characteristics dependent specifically on customers' performance. Firms' day to day dealings with customers are likely to grant managers an informational advantage over other counterparties like lenders, investors or suppliers who have no relations with the specific customers. With the superior information about the customers, firms have discretion to decide the size and timing of write-offs relating to uncollectible AR in order to reflect true AR. In the study by Levy (2015), firms with sizable AR balances can monetise this asset via securitization to other lenders as a way of protecting themselves from the failure to collect AR, safeguard shareholders' interests and to mitigating agency costs.

Another typical example of a write-off decision characterised by information asymmetry effects is non-recurring corporate restructuring (big baths), which co-exist with earnings smoothing particularly in negative earnings surprises[19] (Haggard, Howe & Lynch, 2015). Companies taking big baths, typically large and highly leveraged, may be accumulating problems for some time before recognising them in financial reports. Such delays may serve to avoid violations of debt covenants or delays in recognition of tax loss carry forwards, but are less timely, creating information asymmetry. Big baths can also be a result of changes in management. With fresh and new perspectives, a new management team may recognise problems or opportunities ignored by their predecessors. Old management may seek to mitigate takeovers by managing earnings or

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[19] Managers are less inclined to report positive earnings surprises (smoothing) to reserve incomes for future periods and to create cushion to increase the inferred precision of earnings announcements. When large negative earnings surprises occur, managers tend to introduce additional noise into announcements by maximising losses via taking a bath that, in turn, helps to preserve discretionary income for future smoothing.

disposing corporate resources, against the best interest of the shareholders (Elliott & Shaw 1988). Such actions are a result of moral hazard.

In this MDSE setting, mineral exploration is a risky venture. Moral hazard occurs when ex-post (after an equity capital raising) managers act consistent with self-interest at the expense of shareholder wealth maximisation (Jensen & Meckling 1986). After successful capital raisings, managers, ex-post, may break the implicit contracts intended to spend on value-enhancing exploration, and instead spend on non-value maximising non-exploration expenses. This hypothesis is tested using an innovative measure of exploration efficiency in the form of the ratio of the amount of non-exploration (administration) spending on exploration activities. Administration expenditure includes amounts expended on executive remuneration, travel and office rentals where moral hazard issues may be present. The following hypothesis in relation to managerial incentives is proposed.

H1: The spending on non-exploration related activities relative to exploration expense is negatively associated with the write-off decisions.

Information asymmetry is present not only in the reporting of EE assets but also in the write-off amount reported. There are firms with high operating cost structures due to the locations of the mineral deposits being far away from the existing infrastructure. Hence, it is difficult, time consuming and costly to gain access to the sites. Firms with high cash-burn rates will need to go out more often to raise equity financing. Hence, managers are incentivised to defer any write-down or minimise the amount of

write-downs, prior to undertaking a raising capital. The reluctance to undertake

impairment decisions can lead to risks of adverse selection for investors[20].

H2: High cash burn rate is negatively associated with the write-off decisions.

Strong and Meyer (1987) state the recession of the early 1980s and the

subsequent poor financial performance of many firms meant that auditors may not have

been aggressive in forcing firms to report write downs when problems first became

evident. In the areas where managers have discretion over losses with respect to timing

and magnitude, auditors may limit this discretion (Elliott and Shaw 1988). To reduce

asymmetric information in reporting, the primary role of assurance is to enhance the

reliability of the accounting figures to facilitate the role of financial reporting and to

enable accounting information to be useful for decision-making (Maines and Wahlen

2006).

De Angelo (1981) asserts that Big 4 auditors provide higher audit quality to

clients. Due to the large client base, they are less financially dependent on any single

client for quasi rents, enabling them to both identify and report accounting breaches. By

failing to report an audit breach, larger audit firms tend to have more to lose and will in

effect place their reputations at risk. Many studies observe evidence of the positive

association between standard compliance and Big 4 auditors. Glaum et al., (2012) find

consistent positive results on the association between Big 4 auditors and IFRS standard

compliance for IFRS 3 business combination and IAS 3 impairment of assets of listed

companies across 17 European countries. Consistent with this prior literature, higher

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[20] As discussed in Collins and Dent (1979), the switch from full cost to successful efforts method – an elimination of full cost accounting - have substantially reduced reported earnings and stockholder's equity and the switch may hinder access to capital market a reduction in exploration activities.

quality assurance provided by Big 4 auditors will lead to a greater incidence of EE asset impairment in reducing information asymmetry. Accordingly, H3a is posed as follows;

H3a: The presence of Big 4 auditors is positively associated with the propensity to impair EE assets.

Ferguson, Pündrich and Raftery (2014) examine specialist auditor assurance in the Perth MDSE setting. Perth is a remote Australian city with the characteristic that it is a mining dominated city. In Australia, most of the MDSEs are located in Perth. Perth is a resource hub that is the epicenter of the vast majority of the Australian iron-ore export trades. Interestingly, Ferguson, Pündrich and Raftery (2014) find in their descriptive evidence that non-Big 4 suppliers audit most MDSEs. This research study focuses on the effectiveness of auditors namely Big4 or the non-Big4 specialist auditors in detecting asset impairment in the financial reporting context. There is a large presence of Non-Big 4 auditors for MDSEs over the sample period examined. This hypothesis is tested using a specialist auditor group, reflecting their respective market shares in auditing MDSEs across the 21- year sample period. The following hypothesis in relation to Non-Big4 specialist auditors is proposed.

H3b: The presence of auditor industry specialists in the MDSE setting is positively associated with the write-off decisions.

4.3 Research Design
4.3.1 Characteristics of write-off firm model

Following Francis et al (1996), I utilize a logistics regression model to examine write-offs of EE assets in association with financial and non-financial reporting control variables including a dummy variable controlling for pre-IFRS and post-IFRS adoption periods. The dependent variable is equal to one if the firm reports write-off and zero otherwise, signifying a propensity to undertake an EE asset impairment. To reiterate, it is important to note, the reported write-offs under examination is of current period and this thesis does not examine accounting choice switches nor the historical patterns of accounting choices' impacts on write-off decisions.

MDSE firm years with capitalized EE assets are included in the sub-sample. The impairment model includes factors considered to proxy for moral hazard and adverse selection problems (refer to the detailed discussion of model specification in relation to Equation 1). The specialist auditor variable is constructed by ranking the 133 auditors in terms of client years (refer to Appendix 10). The auditors are ranked by the number of audit clients year by year, which is then pooled. The client-year approach demonstrates the duration of the audit relationships and the depth of specialist knowledge gained through more MDSE the audit assignments. This measure includes Big 4 auditors.

The following model specification is used to test impairment propensity hypotheses, with variables defined below. The logistics regression model for write-off propensity is specified as follows:

$$WO = b0 + b1NON\_EXPL + b2CASH\_BURN + b3BIG4 + b4SPECIALIST + b5LEV$$

$$+ b6EQUITY\_RAISING + b7LN\_CASH + b8LN\_LAGGED\_EXPL\_ASSET +$$

$$b9LN\_LAGGED\_TA + b10AUDIT\_OPIN\_EOM + b11JORC +$$

$$b12PERCENT\_COMM\_CUR + b13IFRS + u \; (1)$$

Where:

WO	=	*indicator variable coded 1 for write off reported, otherwise 0;*
NON_EXPL	- =	*ratio of payment to suppliers and employees to exploration expenditure;*
CASH_BURN	- =	*absolute value of operating cash flow divided by cash balance;*
BIG4	+ =	*indicator variable coded 1 for Big 4 auditor, otherwise 0;*
SPECIALIST	+ =	*indicator variable coded 1 for Non Big 4 industry specialist auditor, otherwise 0;*
LEV	? =	*natural log of total liabilities divided by total assets;*
EQUITY_RAISING	+ =	*natural log of equity raising;*
LN_CASH	+ =	*natural log of cash balances;*
LN_LAGGED_EXPL_ASSET	+ =	*natural log of exploration assets closing (t - 1);*
lN_LAGGED_TA	- =	*natural log of total assets closing (t - 1);*
AUDIT_OPIN_EOM*	+ =	*indicator variable coded 1 for emphasis of matter - asset recoverability; cash flow and net liability;*
JORC	+ =	*indicator variable coded 1 for JORC resource, otherwise 0;*
PERCENT_COMM_CUR	- =	*exchange rate of AUD vs. USD - currency (t) minus currency (t-1) / currency (t-1);*
IFRS	? =	*indicator variable coded 1 for post IFRS adoption, otherwise 0;*

The error term e is assumed to have normal OLS regression properties.

* includes variables namely EOM_ASSET_RECOVER, EOM_CASHFLOW and EOM_NET_LIAB

The dependent variable *WO* is a binary variable equal to one if firms report write-offs on day t and 0 otherwise. The independent variables are: as a proxy for moral hazard, the ratio of non-exploration payments to exploration spending (*NON_EXPL*) is used as a relative measure of spending preference of firms. It is conceivable that higher spending on non-exploration related activities reflects moral hazard considerations. In such situations, managers have incentives to understate the extent of write-offs in an attempt to conceal poor performance. Expenditures associated with finding specific mineral resources are listed under AASB 6, Section 9. The list of exploration expenditures include but are not limited to, acquisition of rights to explore, geological, geophysics and geochemical studies, drilling, trenching, sampling and activities in

relation to feasibility studies including commercial viability of mineral deposits. Thus, a negative coefficient on *NON_EXPL* is expected.

The cash burn rate (*CASH_BURN*), measures the absolute value of operating cash divided by cash balance, to assess the need to raise equity capital. As firms with high operating costs will have stronger needs for capital, they would have more incentives not to impair. *CASH_BURN* is used as a proxy for a company's need to raise further equity finance, so a negative coefficient on *CASH_BURN* is expected.

A number of additional factors potentially impacting write-off decisions of mining firms are controlled for including leverage (*LEV*), defined as the natural logarithm of the ratio of total liabilities to total assets, in the model. The expectation is firms with borrowing will experience bank monitoring, which will encourage write-offs due to conservatism engendered by banks. On the contrary, firms may be inclined to defer write downs in order to avoid covenant breach. Thus, the coefficient on *LEV* is expected to be non-directional. Equity raising (*EQUITY_RAISING*) is a proxy for a key avenue of financing for MDSEs. With more financial resources made available, firms may be less concerned about understating or delaying the posting of write-offs. The same applies to cash *(CASH)* which is the main source of equity raising particularly in the exploration phase. The signs for both coefficients expect to be positive.

Firm size (*SIZE*) is measured as the log of total exploration assets (t-1). This measure is slightly different from Ramanna and Watts (2012) who use the log of total assets (t-1) and the respective study results in negative coefficients. However, the majority of studies find a positive coefficient on *SIZE*, (Francis et al (1996), Beatty and Weber (2006), Zang (2008) and Jarva (2009). Likewise, in this thesis, the coefficient on *SIZE* is expected to be positive.

Another control variable included in the model specification is book-to-market equity (*BTM*), given it is argued by the prior accounting literature to be positively associated with write-offs. In terms of monitoring mechanisms, a dummy variable for *BIG4* auditors is included in the model. The coefficient on BIG4 is expected to be positive consistent with (De Angelo 1980) and (Glaum et al 2012). Consistent with tests of H3a, the presence of MDSE specialists is controlled for with the dummy variable *SPECIALIST*.

Auditor's opinion (*AUDIT_OPINION_EOM*) is also considered with the expectation that more write-offs will occur where auditors issue modified opinions. Hence, a positive coefficient is expected for *AUDIT_OPINION_EOM*. Disclosure of auditor opinions in Australia permits auditors to express various forms of modified opinions i.e. an emphasis of matter addressing firms' lack of profitability, cash flow or working capital. A going concern opinion may include the signals of asset quality questions assumptions of asset recoverability of deferred EE assets. Once again, a positive coefficient on *EOM_ASSET_RECOVER, EOM_CASHFLOW, EOM_LOSS and EOM_NET_LIAB* is expected.

In addition, given minerals are largely exported overseas, a control for commodity price fluctuations (*PERCENT_COMM_CUR*)[21] for the AUD vs. USD is included in the model. When the AUD is strong, it suggests strong commodity prices (Bishop et al. 2013) and that implies lower levels of EE asset impairment. A more direct measure of commodity price change (*PERCENT_COMM_PRICE*) uses changes in the Commodity Research Bureau BLS Metals Sub Index. As expected, this variable is highly correlated with *PERCENT_COMM_CUR* and is included in the main model but this variable is subsequently replaced by *PERCENT_COMM_PRICE* as part of further tests.

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[21] Given the Australian dollar (AUD) is known as a 'commodity currency' the exchange rate movement is used as to control for commodity price changes. In further analysis, a direct commodity measure is used.

Other control variables included in the model specification are

TOP_20_SHAREHOLDERS and *MGT_CHANGE,* it is argued by the prior accounting

literature to be negatively and positively respectively associated with write-offs.

4.3.2 Data collection

Data are sourced from DatAnalysis Premium, Connect 4, SIRCA along with

extensive hand-collection from annual reports. Market capitalizations are obtained from

DataStream. Where necessary, missing data from database sources are collected by

hand. Only firm years in the materials sector associated with firms listed on the ASX,

excluding oil and gas firms and production firms, are included in the full sample. As

suggested, MDSEs are classified according to the presence of COGS disclosure.

4.4 Results
4.4.1 Firm descriptive statistics

Table 4.1 Descriptive Statistics Related to Write-off Decisions

VARIABLES	N	mean	median	sd	min	max	skewness	kurtosis
WO	7,097	0.45	0.00	0.50	0.00	1.00	0.20	1.04
EXPL_WO	7,097	1,135,000.00	0.00	5,706,000.00	0.00	233,700,000.00	18.58	543.30
NON_EXPL_ABS	7,097	18.99	0.56	765.70	0.00	63010.00	79.00	6,463.00
CASH_BURN	7,097	91.52	0.61	3912.00	0.00	259405.00	55.65	3,329.00
BIG4	7,097	0.06	0.00	0.25	0.00	1.00	3.54	13.50
SPECIALIST	7,097	0.47	0.00	0.50	0.00	1.00	0.14	1.02
LEVERAGE	7,097	1.70	0.07	94.15	0.00	7885.00	82.79	6,928.00
EQUITY_RAISING_ABS	7,097	7,564,000.00	1,252,000.00	42,220,000.00	0.00	1,716,000,000.00	21.37	624.80
LOSS	7,097	0.87	1.00	0.18	0.00	1.00	-5.08	26.77
CASH	7,097	10,820,000.00	1,870,000.00	6,270,000.00	0.00	2,226,000,000.00	19.96	515.70
LAGGED_EXPL_ASSET_CLOSING_ABS	6,134	9,020,000.00	2,593,000.00	26,820,000.00	0.00	853,100,000.00	12.05	241.00
EXPL_ASSET_CLOSING	7,097	9,478,000.00	2,527,000.00	27,670,000.00	0.00	853,100,000.00	10.80	196.30
LAGGED_TA_ABS	6,134	84,600,000.00	8,633,000.00	714,500,000.00	0.00	22,860,000,000.00	21.49	550.70
TA	7,097	99,480,000.00	8,831,000.00	734,200,000.00	0.00	22,860,000,000.00	18.65	442.00
BTM_ABS	7,097	1.24	0.61	5.56	0.00	337.90	40.75	2,157.00
IFRS	7,097	0.74	1.00	0.44	0.00	1.00	-1.10	2.20
CLEAN	7,097	0.68	1.00	0.47	0.00	1.00	-0.79	1.62
UNCLEAN	7,097	0.32	0.00	0.47	0.00	1.00	0.79	1.62
EOM_ASSET_RECOVER	7,097	0.27	0.00	0.45	0.00	1.00	1.02	2.03
EOM_CASHFLOW	7,097	0.11	0.00	0.31	0.00	1.00	2.57	7.62
EOM_LOSS	7,097	0.18	0.00	0.39	0.00	1.00	1.65	3.73
EOM_NET_LIAB	7,097	0.05	0.00	0.23	0.00	1.00	3.93	16.44
JORC	7,097	0.76	1.00	0.43	0.00	1.00	-1.23	2.50
PRE_PROJ_FIN	7,097	0.79	1.00	0.41	0.00	1.00	-1.42	3.00
PERCENT_COMM_PRICE	6,118	6.67	6.99	28.40	-54.02	100.60	0.48	3.02
PRECENT_COMM_CUR	6,118	0.67	1.56	13.27	-30.37	33.26	0.28	2.22
TOP_20_SHAREHOLDERS	6,674	58.80	58.75	18.15	0.00	100.00	-0.18	3.15
MGT_CHANGE	7,097	0.20	0.00	0.40	0.00	1.00	1.46	3.15

Table 4.1 summarises MDSE descriptive statistics. The average MDSE has AUD

$9.47mm in exploration assets with a median of AUD $2.52mm. 45% of the firms report

a write-off. The mean write-off magnitude is AUD $1.135mm. The proportion of non-

exploration asset relative to exploration spending stands at 18.9%. The cash burn rate

being the absolute value of operating cash flow divided by cash balance comes to 91.5%.

This high cash burn rate indicates a strong need to raise equity capital to replenish cash

balances.

MDSEs are less likely to be audited by the Big 4 auditors (6.48%) but

predominately audited by Non Big 4 specialist auditors (47%). This is consistent with

MDSEs spending money on exploration activities in the ground rather than paying

money for expensive auditing. Consequently, Big 4 auditors are less likely to be used.

Firms audited by the Big 4 make fewer losses than clients of Non Big 4 specialists. In un-

tabulated results, EY was the market leader from 1995-2006 with BDO has been the

audit leader from 2007-2015 (calculated based on market shares by the number of

audit clients). The mean leverage for MDSEs is 1.70x which is low consistent with

MDSEs not having cash generating capability, due to limited bank borrowing in the pre-

production phase. The average amount raised by each sample firm is $7.56m. Clean

opinions are issued for 4,826 firm years representing 68% of the full sample. Modified

auditor opinions are issued for 2,271 firm years (32%). The 2,271 firm years are

comprised of modified opinions relating to asset recoverability (85.2%), cash flow

(32.8%), net loss (56.5%) and net liabilities (16.9%).

4.4.2 Correlation Matrix

Table 4.2 Correlation Matrix of Variables of Write-off Determinants

CATEGORY	VARIABLES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
1	WO	1																				
2	LN_NON_EXPL	-0.0185	1																			
3	LN_CASH_BURN_RATE	-0.0424	0.1098	1																		
4	BIG4	-0.0244	0.0243	-0.0071	1																	
5	SPECIALIST	0.0553	-0.013	0.0137	-0.2466	1																
6	LN_LEV	-0.0575	0.0675	0.3568	-0.0026	0.0025	1															
7	LN_EQUITY_RAISING	0.043	-0.0593	-0.0194	0.0055	0.014	-0.0648	1														
8	IFRS	0.1075	-0.0637	-0.0887	-0.0227	0.1892	-0.0538	0.0287	1													
9	LN_CASH	0.0237	-0.0269	-0.4285	0.0629	-0.0842	-0.1527	0.1559	0.0748	1												
10	LN_LAGGED_EXPL_ASSET	0.4015	0.0387	-0.0171	-0.0085	0.0054	-0.084	0.1001	0.0358	0.0246	1											
11	LN_LAGGED_TA	0.0396	0.0395	0.0286	0.0449	-0.1134	-0.003	-0.0116	0.004	0.4068	0.1698	1										
12	LN_BTM	0.0849	0.0082	0.0294	-0.031	-0.0069	-0.0422	-0.1436	-0.0011	0.0702	0.1654	0.2027	1									
13	EOM_ASSET_RECOVERABILITY	0.0632	0.0363	0.2914	-0.0274	0.0455	0.1682	0.0001	0.0974	-0.2774	0.0382	-0.0529	0.0809	1								
14	EOM_CASHFLOW	0.0602	0.023	0.1945	0.0471	0.0416	0.0885	-0.0056	0.1458	-0.1974	0.054	-0.0261	0.0604	0.5351	1							
15	EOM_LOSS	0.0492	0.032	0.2472	0.0158	0.0626	0.138	0.0012	0.1499	-0.2365	0.032	-0.0508	0.0524	0.7105	0.6753	1						
16	EOM_NET_LIAB	0.0211	0.0536	0.2629	-0.0002	0.046	0.2734	-0.0135	0.0697	-0.1947	0.0176	-0.0289	0.0243	0.3673	0.2398	0.3577	1					
17	JORC	0.077	-0.0607	-0.1078	0.0082	-0.0163	-0.1241	0.0653	0.0864	0.0903	0.1659	0.011	-0.0019	-0.009	0.0141	0.014	-0.0422	1				
18	PERCENT_COMM_CURRENCY	-0.0445	-0.0078	-0.0791	0.0161	-0.0306	-0.051	0.1553	-0.0196	0.1347	-0.0229	-0.0214	-0.1524	-0.144	-0.1507	-0.1775	-0.0733	0.0258	1			
19	PERCENT_COMM_PRICES	-0.0408	-0.0162	-0.0848	0.0166	-0.022	-0.0555	0.18	0.0746	0.1335	-0.0327	-0.0321	-0.154	-0.1298	-0.1229	-0.1465	-0.0594	0.0117	0.6979	1		
20	TOP_20_SHAREHOLDERS	-0.1016	0.0294	0.0399	0.0454	-0.0327	0.1244	-0.1482	0.0096	0.0289	-0.0612	0.1124	0.0164	0.0125	-0.0061	0.0155	0.0419	-0.0241	-0.0421	-0.0392	1	
21	MGT_CHANGE	0.036	0.0513	0.0217	-0.003	0.0036	0.0249	0.003	0.0393	-0.0167	0.0166	-0.0217	0.0142	0.0391	0.0286	0.0436	0.0353	-0.0159	-0.035	-0.0226	0.026	1

Table 4.2 reports a correlation matrix between the logit regression variables,

with Pearson correlations reported above and below the diagonal, respectively. There

are several pairs of variables with an absolute value of correlation greater than 0.5. The correlated pairs are *EOM _loss, EOM_asset_recoverability, EOM_loss, EOM_cf and EOM_asset_recoverability*. Having run the VIF diagnostics, I remove *EOM_loss* with a magnitude of 2.63, above 2.5 to mitigate the multi-collinearity concerns while *EOM_cf* stands at 1.78 only. As a result, I rerun all regressions without the correlated variables to ensure coefficients are not biased by multi-collinearity.

4.4.3 Characteristics of write-off firms

Logit regressions are used to estimate the effects of various firm characteristics on their propensity to write off EE assets.

Table 4.3 Regression Analysis on Determinants of Write-off Decisions

MODEL	Predicated Sign	Treatment Var. 1	Control Var. 2	During Resource Boom Until 2012 3	Post Resource Boom 4
NON_EXPL	-	-0.00734	-0.0373	-0.0688**	0.143**
		(0.0242)	(0.0294)	(0.0328)	(0.0723)
CASH_BURN_RATE	-	-0.0130	-0.0440	-0.150***	0.102
		(0.0236)	(0.0344)	(0.0436)	(0.0646)
BIG4	+	-0.109	-0.152	-0.156	-0.0662
		(0.101)	(0.121)	(0.134)	(0.280)
SPECIALIST	+	0.219***	0.183***	0.118*	0.341***
		(0.0494)	(0.0600)	(0.0690)	(0.126)
LEV	?		-0.151	-0.210	-0.0776
			(0.0924)	(0.129)	(0.147)
EQUITY_RAISING	+		-0.00149	-0.00362	0.0121
			(0.00452)	(0.00533)	(0.00896)
LN_CASH	+		0.0329**	-0.0141	0.0979***
			(0.0134)	(0.0181)	(0.0226)
LN_LAGGED_EXPL_ASSET	+		0.161***	0.145***	0.217***
			(0.00598)	(0.00661)	(0.0149)
LN_LAGGED_TA	-		-0.0445***	-0.0232	-0.112***
			(0.0134)	(0.0151)	(0.0320)
EOM_ASSET_RECOVER	+		0.223***	0.247***	0.0536
			(0.0786)	(0.0926)	(0.158)
EOM_CASHFLOW	+		0.0875	0.223	-0.0461
			(0.107)	(0.158)	(0.163)
EOM_NET_LIAB	+		0.0871	0.221	-0.115
			(0.134)	(0.181)	(0.209)
JORC	+		0.0376	0.0403	-0.0173
			(0.0718)	(0.0821)	(0.155)
PRECENT_COMM_CUR	-		-0.00579***	-0.00421*	-0.000373
			(0.00220)	(0.00252)	(0.00777)
IFRS	?		0.409***	0.377***	
			(0.0690)	(0.0740)	
Constant		-0.280***	-2.224***	-1.544***	-2.606***
		(0.0433)	(0.235)	(0.282)	(0.496)
Observations		7,097	6,118	4,564	1,554
Pseudo R-squared		0.00258	0.148	0.130	0.214
LR Chi-squared		25.22	1251	816.6	456.9

Table 4.3 (Cont.) Regression Analysis on Determinants of Write-off Decisions

	Predicated Sign	Listed Firms	Delisted Firms	Capitalised Firm Post IFRS	Combined Method Firms Post IFRS	No Accounting Choice Post IFRS	Capitalised Firm During Resource Boom Post IFRS	Capitalised Firm Post Resource Boom Post IFRS
MODEL		5	6	7	8	9	10	11
NON_EXPL	-	-0.0462	0.0313	-0.169***	-0.226***	0.168*	-0.185***	-0.125
		(0.0348)	(0.0564)	(0.0445)	(0.0794)	(0.0899)	(0.0497)	(0.107)
CASH_BURN_RATE	-	-0.0251	-0.165**	-0.0639	-0.266**	0.0268	-0.162**	0.163
		(0.0403)	(0.0791)	(0.0591)	(0.113)	(0.108)	(0.0733)	(0.114)
BIG4	+	-0.149	-0.278	-0.426**	0.102	-0.556	-0.457**	-0.140
		(0.138)	(0.266)	(0.172)	(0.330)	(0.474)	(0.191)	(0.407)
SPECIALIST	+	0.116*	0.268*	0.143	-0.0492	0.411**	0.0634	0.291
		(0.0675)	(0.140)	(0.0902)	(0.162)	(0.206)	(0.103)	(0.191)
LEV	?	-0.0880	-0.796**	0.357*	-0.0306	-0.553	0.292	0.451
		(0.0964)	(0.338)	(0.192)	(0.352)	(0.389)	(0.236)	(0.333)
EQUITY_RAISING	+	-6.88e-05	-0.00248	-0.000758	-0.00456	-0.0117	0.000662	0.00194
		(0.00515)	(0.00987)	(0.00704)	(0.0124)	(0.0152)	(0.00835)	(0.0136)
LN_CASH	+	0.0376**	0.0565**	-0.0172	-0.147**	0.114***	-0.0253	0.0188
		(0.0165)	(0.0255)	(0.0267)	(0.0584)	(0.0382)	(0.0331)	(0.0428)
LN_LAGGED_EXPL_ASSET	+	0.165***	0.145***	0.0399***	0.109***	0.143***	0.0343***	0.0559*
		(0.00672)	(0.0135)	(0.0116)	(0.0189)	(0.0180)	(0.0125)	(0.0331)
LN_LAGGED_TA	-	-0.0421**	-0.0291	-0.00919	0.117**	-0.0207	0.00744	-0.148**
		(0.0164)	(0.0241)	(0.0207)	(0.0466)	(0.0369)	(0.0221)	(0.0714)
EOM_ASSET_RECOVER	+	0.194**	0.413**	0.113	0.429*	-0.0789	0.105	-0.0591
		(0.0895)	(0.171)	(0.118)	(0.235)	(0.267)	(0.140)	(0.232)
EOM_CASHFLOW	+	-0.00806	0.353	0.243	-0.392	-0.292	0.210	0.129
		(0.116)	(0.337)	(0.162)	(0.285)	(0.393)	(0.235)	(0.243)
EOM_NET_LIAB	+	0.140	0.0770	-0.113	-0.186	0.463	0.326	-0.756**
		(0.149)	(0.329)	(0.196)	(0.356)	(0.456)	(0.276)	(0.296)
JORC	+	0.0530	-0.0200	0.0189	-0.313	0.554**	-0.00184	0.0606
		(0.0805)	(0.166)	(0.114)	(0.197)	(0.248)	(0.131)	(0.245)
PRECENT_COMM_CUR	-	-0.00546**	-0.00230	-0.0153***	-0.00431	-0.000834	-0.0116***	0.00241
		(0.00248)	(0.00507)	(0.00331)	(0.00585)	(0.00781)	(0.00380)	(0.0118)
IFRS	?	0.396***	-0.0363	-0.266**	-0.373	0.311	-0.395***	
		(0.0873)	(0.132)	(0.117)	(0.243)	(0.212)	(0.123)	
Constant		-2.272***	-2.617***	1.017**	0.367	-5.084***	1.074**	2.390**
		(0.283)	(0.457)	(0.413)	(0.721)	(0.752)	(0.481)	(1.101)
Observations		4,809	1,309	2,781	858	1,026	1,996	785
Pseudo R-squared		0.151	0.130	0.0254	0.0783	0.180	0.0248	0.0269
LR Chi-squared		1007	222.3	84.31	86.89	152.1	61.70	21.47

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results are reported in Table 4.3, model 1. First, including treatment variables, *NON_EXPL, CASH_BURN, BIG4 and SPECIALIST* only, the adjusted R^2 (the explanatory power of the model) is 0.2%. This compares with the much improved 14% as in Table 4.3, model 2 with control variables included.

The propensity to write-offs is higher amongst firms with low profitability and smaller asset size. Firms with a higher proportion of spending on non-exploration activities relative to exploration are found not to be significantly associated with write-offs as in Table 4.3, model 1. But when examining the accounting method used, I find evidence that capitalizing and combined method firms tend to understate write downs creating a higher degree of asymmetric information i.e. moral hazard as in Table 4.3, models 7 and 8. The same holds for capitalized firms during resource boom period where exploration spending expects to be high as in Table 4.3, model 10.

Moreover, I find firms with high cash burn rates are not significantly associated with write-offs as in Table 4.3, model 1. When additional control variables like leverage, equity raising, cash balances, lagged exploration assets, total assets, auditor opinions and percentage change in commodity prices; conditional variable like JORC at the stage where resources are defined and IFRS adoption are included, firms with high cost operating structures have a high degree of asymmetric information i.e. adverse selection, especially during resource boom. However, I find no evidence post mining boom that high cost structures impact the propensity to undertake write-offs as in Table 4.3 model 4. It suggests the level of exploration activities is the attributing factor.

Coefficient on Non Big4 Specialist is significant at 99% confidence level suggesting specialist auditors are positively associated with the propensity to undertake write-offs. This may be better explained by the underlying firm characteristics of the specialist auditors' clients with lower profitability and smaller

asset size, prone to write-offs signaling failures for economic recoverability of exploration assets or discovery. In summary, the results can be due to small firm effect given the auditing practice of large and small firms is subject to the same auditing standards. Big 4 auditors show no evidence of significant association with write-offs reported except in capitalised firms subsampling. Next, after other factors are controlled for, the explanatory power (adjusted R^2) of the models increases substantially to the range of 14%. I interpret the results on treatment variables as significant and consistent with the hypotheses with the exception for the Big 4.

However, I find no evidence the financial structure has any impact on the propensity to post write-offs. When using exploration assets as a proxy for firm size (*LN_LAGGED_EXPL_ASSET*), firms are positively associated with the propensity to undertake write-offs, consistent with prior studies. This indicates a larger pool of EE assets available to be written-off or potentially impaired.

I find evidence of auditors' opinions positively associated with the propensity to impair. Breaking out the unclean auditors' opinions, I find evidence of Emphasis of Matter (*EOM*) asset recoverability, a proxy for asset quality, in the post-IFRS adoption period, consistent with the tighter impairment requirements in the post-IFRS harmonization period.

Evidence is found of commodity prices have an impact on the propensity to undertake write-offs. High commodity prices incentivize MDSEs to engage and profit from exploration discovery as evidenced by the increased number of listed firms on the exchange and a negative impact on write-off decisions. Many newly listed firms are younger and smaller and they tend to capitalize their exploration costs when incurred, particularly during periods of mining boom with increasing commodity prices.

To ensure the main results are not driven by outliers, all the Logit regressions

are re-run on winsorised observations (outlying 1% and 5%), followed by replacing control variable(s) which have similar or high correlations to avoid multi-collinearity. To address unobserved heterogeneity, I proceed with fixed effects on year. The main difference is some main variables like *NON_EXPL & CASH_BURN* that are significant in the main models, are no longer significant when variables are winsorised at 1% significance level (un-tabulated) and *NON_EXPL* is no longer significant winsorised at 5% in Table 4.5. When winsorising the observations at 1% and 5% levels, I find similar results for subsamples in the post-resource boom periods after IFRS adoption. The same results hold for firms using capitalizing and combined method. Including year dummies, the regression produces similar results.

Table 4.4 Regression Analysis on Determinants of Write-off Decisions - Fixed Effects

MODEL	Predicated Sign	Binary Ind. Variable (WO) 1	Continous Ind. Variable (LN_EXPL_ASSET_WO) 2
NON_EXPL	-	-0.0258	-0.000842
		(0.0413)	(0.00564)
CASH_BURN_RATE	-	0.0734	-0.00662
		(0.0494)	(0.00444)
BIG4	+	-0.272	-0.0684*
		(0.271)	(0.0360)
SPECIALIST	+	0.0354	0.000908
		(0.142)	(0.0178)
LEV	?	-0.0573	0.0622***
		(0.118)	(0.0177)
EQUITY_RAISING	+	-0.000679	-0.000426
		(0.00621)	(0.000900)
LN_CASH	+	0.0675***	0.00229
		(0.0192)	(0.00154)
LN_LAGGED_EXPL_ASSET	+	0.141***	0.00911***
		(0.00929)	(0.00148)
LN_LAGGED_TA	-	0.0205	-0.00158
		(0.0194)	(0.00248)
EOM_ASSET_RECOVER	+	0.209*	0.0233
		(0.118)	(0.0163)
EOM_CASHFLOW	+	0.436***	0.0224
		(0.164)	(0.0231)
EOM_NET_LIAB	+	0.128	-0.00333
		(0.181)	(0.0213)
JORC	+	0.0404	0.00193
		(0.130)	(0.0136)
PRECENT_COMM_CUR	-	-0.00718***	-0.00110***
		(0.00275)	(0.000377)
IFRS	?	0.161	-0.000867
		(0.113)	(0.0118)
Constant			0.0194
			(0.0409)
FIXED EFFECTS		YES	YES
CLUSTERED STANDARD ERROR			YES
Observations		4,332	6,118
Pseudo R-squared		0.109	
LR Chi-squared		420.1	
Adjusted R-squared			0.0211
F-stats			9.126

Table 4.5 Regression Analysis on Determinants of Write-off Decisions –

Winsorised Highest and Lowest at 5%

	Predicated Sign	Treatment Var.	Control Var. + Auditor Opin.	Pre-IFRS Adoption (Partitioning)	Post-IFRS Adoption (Partitioning)	During Resource Boom Until 2012	Post Resource Boom
		(1)	(2)	(3)	(4)	(5)	(6)
NON_EXPL	-	0.0345	-0.00875	0.0351	-0.0242	-0.0610	0.235***
		(0.0313)	(0.0381)	(0.0687)	(0.0461)	(0.0432)	(0.0866)
CASH_BURN_RATE	-	-0.00866	-0.0682	0.0288	-0.0827	-0.189***	0.104
		(0.0310)	(0.0549)	(0.114)	(0.0642)	(0.0689)	(0.0980)
BIG4	+	-0.111	-0.119	-0.0273	-0.164	-0.142	-0.00242
		(0.101)	(0.121)	(0.227)	(0.144)	(0.135)	(0.280)
SPECIALIST	+	0.219***	0.135**	0.197	0.130*	0.0667	0.327***
		(0.0494)	(0.0604)	(0.130)	(0.0690)	(0.0697)	(0.126)
LEV	?		-0.492**	-0.871**	-0.302	-0.504**	-0.323
			(0.196)	(0.383)	(0.234)	(0.233)	(0.390)
EQUITY_RAISING	+		0.000531	-0.0189*	0.00608	-0.00251	0.0150*
			(0.00462)	(0.00966)	(0.00530)	(0.00547)	(0.00901)
LN_CASH	+		0.0236	0.162***	-0.0130	-0.0177	0.0969**
			(0.0257)	(0.0564)	(0.0298)	(0.0324)	(0.0458)
LN_LAGGED_EXPL_ASSET	+		0.168***	0.151***	0.171***	0.152***	0.225***
			(0.00644)	(0.0139)	(0.00727)	(0.00710)	(0.0160)
LN_LAGGED_TA	-		-0.143***	-0.310***	-0.0967***	-0.119***	-0.199***
			(0.0289)	(0.0659)	(0.0329)	(0.0351)	(0.0568)
EOM_ASSET_RECOVER	+		0.204**	0.128	0.217**	0.238**	0.0232
			(0.0795)	(0.158)	(0.0934)	(0.0934)	(0.160)
EOM_CASHFLOW	+		0.0703	0.856**	-0.0512	0.212	-0.0507
			(0.107)	(0.360)	(0.115)	(0.158)	(0.163)
EOM_NET_LIAB	+		0.127	0.348	0.0409	0.250	-0.0745
			(0.134)	(0.355)	(0.147)	(0.182)	(0.212)
JORC	-		0.0324	0.145	-0.00980	0.0226	0.0234
			(0.0721)	(0.139)	(0.0854)	(0.0825)	(0.154)
PRECENT_COMM_CUR	-		-0.00605***	0.00403	-0.00865***	-0.00472*	-0.00107
			(0.00224)	(0.00474)	(0.00257)	(0.00257)	(0.00779)
IFRS	?		0.456***			0.420***	
			(0.0702)			(0.0757)	
Constant		-0.314***	-0.593	0.403	-0.408	0.0132	-1.397*
		(0.0463)	(0.395)	(0.816)	(0.468)	(0.461)	(0.848)
FIXED EFFECTS		NO	NO	NO	NO	NO	NO
CLUSTERED STANDARD ERROR		NO	NO	NO	NO	NO	NO
Observations		7,097	6,118	1,485	4,633	4,564	1,554
Pseudo R-squared		0.00266	0.151	0.131	0.153	0.134	0.212
LR Chi-squared		26.01	1281	258.6	981.4	841.1	453.7
Adjusted R-squared							
F-stats							

Table 4.5 (Cont.) Regression Analysis on Determinants of Write-off Decisions - Winsorised Highest and Lowest at 5%

	Predicated Sign	Listed Firms	Delisted Firms	Capitalised Firms	Combined Method Firms	No Accounting Choice	BINARY IND. VARIABLE	CONT. IND. VARIABLE
		(7)	(8)	(9)	(10)	(11)	(12)	(13)
NON_EXPL	-	-0.0244	0.0547	-0.199***	-0.227**	0.192	-0.0109	0.00286
		(0.0450)	(0.0734)	(0.0598)	(0.102)	(0.123)	(0.0546)	(0.00468)
CASH_BURN_RATE	-	-0.0933	-0.0827	-0.0703	-0.370**	0.270	0.0974	-0.00536
		(0.0640)	(0.115)	(0.0961)	(0.174)	(0.167)	(0.0777)	(0.00532)
BIG4	+	-0.119	-0.232	-0.409**	0.0700	-0.507	-0.281	-0.0312
		(0.139)	(0.267)	(0.172)	(0.326)	(0.477)	(0.271)	(0.0216)
SPECIALIST	+	0.0884	0.163	0.120	-0.0466	0.303	0.0336	0.000237
		(0.0678)	(0.141)	(0.0906)	(0.163)	(0.207)	(0.142)	(0.0119)
LEV	?	-0.428*	-0.392	0.431	-0.291	-1.179*	0.0240	0.148***
		(0.227)	(0.423)	(0.323)	(0.561)	(0.654)	(0.290)	(0.0259)
EQUITY_RAISING	+	0.00276	-0.00382	-0.000607	0.00285	-0.0204	0.00308	-0.000789*
		(0.00524)	(0.0102)	(0.00716)	(0.0128)	(0.0158)	(0.00636)	(0.000475)
LN_CASH	+	0.000337	0.137***	-0.0196	-0.286***	0.259***	0.0467	-0.000337
		(0.0308)	(0.0519)	(0.0467)	(0.0871)	(0.0757)	(0.0373)	(0.00250)
LN_LAGGED_EXPL_ASSET	+	0.168***	0.160***	0.0526***	0.106***	0.153***	0.140***	0.00984***
		(0.00716)	(0.0148)	(0.0121)	(0.0198)	(0.0190)	(0.00945)	(0.000716)
LN_LAGGED_TA	-	-0.0932***	-0.228***	-0.107**	0.218***	-0.305***	0.0635	-0.00824**
		(0.0340)	(0.0595)	(0.0501)	(0.0806)	(0.0903)	(0.0453)	(0.00376)
EOM_ASSET_RECOVER	+	0.178**	0.398**	0.0826	0.302	-0.0192	0.192	0.0162*
		(0.0905)	(0.173)	(0.119)	(0.236)	(0.271)	(0.118)	(0.00902)
EOM_CASHFLOW	+	-0.0173	0.362	0.253	-0.380	-0.259	0.420**	0.0126
		(0.116)	(0.335)	(0.162)	(0.287)	(0.390)	(0.164)	(0.0124)
EOM_NET_LIAB	+	0.190	-0.0739	-0.0861	-0.243	0.543	0.0915	-0.00732
		(0.150)	(0.322)	(0.198)	(0.358)	(0.450)	(0.180)	(0.0137)
JORC	-	0.0536	-0.0204	0.0120	-0.282	0.555**	0.0890	-0.00460
		(0.0806)	(0.166)	(0.114)	(0.197)	(0.247)	(0.129)	(0.00949)
PRECENT_COMM_CUR	-	-0.00545**	-0.00392	-0.0158***	-0.00367	-0.000579	-0.00685**	-0.00102***
		(0.00252)	(0.00519)	(0.00337)	(0.00594)	(0.00799)	(0.00279)	(0.000186)
IFRS	?	0.459***	0.0469	-0.213*	-0.301	0.273	0.153	0.00440
		(0.0894)	(0.135)	(0.119)	(0.241)	(0.214)	(0.118)	(0.00935)
Constant		-0.967**	-0.861	2.436***	0.743	-2.700**		0.122**
		(0.476)	(0.802)	(0.633)	(1.083)	(1.336)		(0.0589)
FIXED EFFECTS		NO	NO	NO	NO	NO	YES	YES
CLUSTERED STANDARD ERROR		NO	NO	NO	NO	NO	NO	YES
Observations		4,809	1,309	2,781	858	1,026	4,332	6,118
Pseudo R-squared		0.152	0.133	0.0265	0.0783	0.189	0.106	
LR Chi-squared		1015	228.5	88.09	86.92	160	406.9	
Adjusted R-squared								0.0732
F-stats								19.04

Table 4.6 Robustness Tests: Regression Analysis on Write-off Determinants –

Winsorised Highest and Lowest at 5%

VARIABLES	Predicated Sign	COMMODITY PRICE CHANGE	BTM		CAPITALISED FIRMS	MIXED METHOD	NO ACCOUNTING CHOICE	RESOURCE BOOM	POST RESOURCE BOOM
					TOP 20 SHAREHOLDERS & MANAGEMENT				
		1	2	3	4	5	6	7	8
NON_EXPL	-	-0.00811	-0.00828	-0.0282	-0.181**	-0.214*	0.186	-0.0935	0.266***
		(0.0539)	(0.0539)	(0.0556)	(0.0885)	(0.124)	(0.143)	(0.0651)	(0.0987)
CASH_BURN_RATE	-	-0.0678	-0.0821	-0.118	-0.0795	-0.491**	0.295	-0.262***	0.0503
		(0.0683)	(0.0689)	(0.0730)	(0.119)	(0.235)	(0.185)	(0.0920)	(0.119)
BIG4	+	-0.117	-0.104	-0.0469	-0.366	0.249	-0.595	-0.0846	0.152
		(0.195)	(0.193)	(0.197)	(0.306)	(0.394)	(0.593)	(0.230)	(0.344)
SPECIALIST	+	0.132	0.132	0.120	0.121	-0.120	0.245	0.0630	0.281*
		(0.106)	(0.106)	(0.108)	(0.137)	(0.236)	(0.321)	(0.120)	(0.162)
LEV	?	-0.485*	-0.326	-0.208	0.561	-0.534	-1.327*	-0.369	0.130
		(0.267)	(0.271)	(0.273)	(0.402)	(0.737)	(0.735)	(0.329)	(0.483)
EQUITY_RAISING	+	0.00121	0.00259	-0.00128	-0.00912	0.0120	-0.0268	-0.00632	0.0154
		(0.00541)	(0.00550)	(0.00549)	(0.00827)	(0.0141)	(0.0190)	(0.00653)	(0.00977)
LN_CASH	+	0.0250	0.0235	0.0112	-0.0133	-0.357***	0.269***	-0.0428	0.0788
		(0.0348)	(0.0347)	(0.0367)	(0.0636)	(0.118)	(0.0809)	(0.0474)	(0.0545)
LN_LAGGED_EXPL_ASSET	+	0.168***	0.167***	0.165***	0.0527***	0.112***	0.153***	0.149***	0.224***
		(0.00993)	(0.00995)	(0.0102)	(0.0146)	(0.0193)	(0.0338)	(0.0107)	(0.0201)
LN_LAGGED_TA	-	-0.147***	-0.163***	-0.124***	-0.0594	0.216*	-0.280**	-0.0639	-0.242***
		(0.0421)	(0.0414)	(0.0440)	(0.0682)	(0.112)	(0.130)	(0.0525)	(0.0715)
EOM_ASSET_RECOVER	+	0.201*	0.189*	0.210*	0.145	0.271	-0.0349	0.248**	0.0402
		(0.105)	(0.105)	(0.108)	(0.149)	(0.262)	(0.345)	(0.124)	(0.192)
EOM_CASHFLOW	+	0.0715	0.0680	0.0348	0.230	-0.412	-0.163	0.178	-0.114
		(0.137)	(0.138)	(0.141)	(0.202)	(0.350)	(0.423)	(0.186)	(0.199)
EOM_NET_LIAB	+	0.127	0.112	0.0757	-0.0974	-0.195	0.522	0.255	-0.195
		(0.151)	(0.151)	(0.155)	(0.220)	(0.410)	(0.466)	(0.208)	(0.247)
JORC	-	0.0280	0.0291	0.000402	0.0247	-0.370	0.502*	-0.0204	0.0211
		(0.107)	(0.106)	(0.109)	(0.144)	(0.263)	(0.303)	(0.123)	(0.188)
PERCENT_COMM_PRICE	-	-0.00357***							
		(0.00108)							
IFRS	?	0.473***	0.465***	0.466***	-0.202	-0.306	0.234	0.403***	
		(0.114)	(0.114)	(0.115)	(0.168)	(0.299)	(0.262)	(0.117)	
LN_BTM	+		0.217**	0.162	-0.0881	0.179	-0.249	-0.0411	0.383**
			(0.109)	(0.109)	(0.136)	(0.312)	(0.277)	(0.133)	(0.166)
PERCENT_COMM_CUR	-		-0.00512**	-0.00540**	-0.0178***	-0.00302	0.00223	-0.00430*	-0.00174
			(0.00207)	(0.00211)	(0.00334)	(0.00524)	(0.00770)	(0.00222)	(0.00631)
TOP_20_SHARESHOLDERS	-			-0.0105***	-0.0219***	0.00677	-0.00939	-0.0109***	-0.0102**
				(0.00309)	(0.00408)	(0.00705)	(0.00754)	(0.00351)	(0.00462)
MGT_CHANGE	+			0.157**	0.180	0.310	0.0497	0.235***	-0.0696
				(0.0750)	(0.115)	(0.212)	(0.251)	(0.0840)	(0.145)
Constant		-0.557	-0.410	-0.126	2.925***	1.274	-2.378	0.231	-0.0745
		(0.640)	(0.653)	(0.664)	(0.888)	(1.257)	(2.026)	(0.776)	(1.059)
FIXED EFFECTS		NO	YES	YES	YES	YES	YES	YES	YES
CLUSTERED STANDARD ERROR		YES	YES	YES	YES	YES	YES	YES	YES
Observations		6,118	6,118	5,889	2,707	825	975	4,402	1,487
Pseudo R-squared		0.152	0.152	0.151	0.0455	0.0924	0.187	0.136	0.216
LR Chi-squared		378.5	387.8	357.9	95.60	73.24	54.42	272.9	189.9

4.4.4 Robustness testing

A variety of sensitivity and further tests are undertaken. To address endogeneity of missing omitted variable, I replace *PERCENT_COMM_CUR* with *PERCENT_COMM_PRICE* in Table 4.6 model 1. When replacing *PERCENT_COMM_CUR* with *PERCENT_COMM_PRICE,* similar results are observed. Change in commodity prices

shows no statistical significant evidence in influencing the propensity to undertake write-offs.

In another robustness test, I rerun regression using alternative and different control variables on winsorised observations. Controlling for BTM, similar results are obtained and it shows no statistical significant evidence in influencing the propensity to undertake write-offs.

The inclusion of *TOP_20_SHAREHOLDERS* reduces the total number of observations to 5,889 due primarily to non-disclosure in audited annual reports and foreign listings. Controlling for both *TOP_20_SHAREHOLDERS* and *MGT_CHANGE*, I find significant results amongst capitalized and mixed method firms with higher proportion of non-exploration spending and high non-exploration spending firms post-resource boom in Table 4.6 models 4, 5 & 8. The same result holds for mixed method firms with high cash burn rate and for high cost explorers during resource boom in Table 4.6 models 5 & 7 respectively.

4.5 Conclusions

This chapter examines what types of firm choose to write off EE assets. Firms, with a higher proportion of non-exploration spending relative to exploration spending, exhibit a lower propensity to report write-down during the resource boom. The same result holds for firms using capitalizing and combined method, consistent with H_1. In general, capitalised firms are significantly associated with high proportion of non-exploration spending during resource boom after IFRS adoption. High cost explorers, during the boom and while the commodity prices are strong, are less inclined to have write-offs reported, consistent with H_2. The same result holds for capitalized firms with

high cash burn rate during resource boom after IFRS adoption. To be less inclined to have write-offs reported, specialist auditors have a positively significant association with write-offs reported, consistent with H_3. However, it is not clear if the results are due to strong governance with tighter monitoring mechanism or merely the firm characteristics. Big 4 auditors show no evidence of significant association with write-offs reported except for capitalised firms.

CHAPTER 5 - MARKET REACTIONS AND WRITE-OFFS
5.1 Introduction

The objective of this chapter is to examine whether there is a market reaction to write-offs. The abnormal returns are examined using a sample of 5,520 firm years comprising 714 firms. This analysis is conducted in two ways. First, audited financial reports from the release of the annual report are used, as they capture write-off magnitudes and auditors' opinions being disseminated for the first time. Secondly, the analysis is conducted using preliminary final reports. This analysis applies a reduced sample of 569 firm years of 117 firms. Preliminary final reports are unaudited financial statements released prior to fully audited financial statements in the annual report.

The large disparity between the samples for audited annual reports and the preliminary final reports is due to the reporting standards. Unlike mineral producers, MDSEs are not required to file ASX preliminary annual reports and half yearly reports. The explorers' business objectives are expending funds on mining exploration and typically do not have material product revenues. Hence they are exempted from providing the market with financial information to value the entity's securities as stated in Listing Rule 4.3A.[22]

There are several motivations for examining the market reactions to announcements of EE asset impairment. Announcements of write-offs are important market events. A market reaction can suggest that the information content of write-offs is "used" by investors (Ball and Brown 1968; Beaver, 1968). Furthermore, the announcement of write-offs in the MDSE setting can provide insight into the performance of MDSE exploration activities. Operationally, impairment of EE assets is

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[22] The listing rule 4.3A states "Following the end of the financial year of an entity (except a *mining exploration entity or an *oil and gas exploration entity), the entity (in the case of a trust, the responsible entity) must give ASX the information set out in Appendix 4E".

associated with mineral prospects or deposits that form the basis of mining projects failing to achieve an economic viability. Firms decide to impair EE assets to resolve uncertainty. Write-offs in MDSEs do not result in leverage effects since MDSEs are non-cash generating in the pre-production development phase and not in the position to justify borrowing. In terms of asset quality, MDSEs are generally lower than the production firms' asset quality. Production firms tend to have greater knowledge of mineral deposits from a production perspective, hence it is easier to ascertain the market value of mineral producers (Harris & Ohlson 1987, 1990). Valuing producers is more transparent owing to the presence of commodity price futures and forward sales facilities, meaning commodity prices can typically be forecast with great accuracy. As outlined in earlier chapters, there is a diversity of different types of asset write-offs. I contribute to the literature by examining the market reactions to EE asset impairment announcements.

The remainder of this chapter is structured as follows. Section 5.2 reviews the research on market reaction to write-offs and develops hypotheses for the market reaction to write-offs. Section 5.3 outlines the research design for testing the hypotheses and potential research issues. Section 5.4 presents evidence on the market reaction to write-offs. A summary of the main findings is in Section 5.5.

5.2 Literature review and hypothesis development

SAC 4, para. 15 states the Conceptual Framework allows for the recognition of assets as long as they generate probable future economic benefits. Barker and Penman (2013) indicates the Framework understates the importance of uncertainty that is, in turn, pervasive in practice. The Framework does not say how to handle uncertainty over the life of the assets. Certainty refers to expected cash flow and has no variance

around them. Cash flows are perfectly matched to time period. The opposite occurs for uncertainty. It is important for uncertainty to exist to convey useful information to investors with respect to the amount, timing and uncertainty of future net cash flow (Barker and Penman 2013). In the MDSE setting, uncertainty can be resolved with success or failure to achieve an economically viable discovery. The former allows the assets to progress into development phase and the latter prompts firms to proceed with write-offs. Expenditures on exploration do not guarantee the discovery of economically viable reserves with only a very small proportion of exploration programs culminating in the mine development (Wise & Spear 2002). It is of interest to consider what valuation implications arise when EE impairment is undertaken. That is when uncertainty is resolved.

There are different types of write-offs. Typically, many academic studies consider the impairment of goodwill but Francis et al (1996) and Reidl (2004) provide evidence on different types of impairment. The combined list ranges from goodwill, inventory, PP&E, capitalized expenses, oil properties to restructuring (bath-taking). The latter is examined in studies by Elliott & Shaw (1988) and Zucca and Campbell (1992). Each impairment type is in association with varying incentives, but not all asset impairment generates negative market reactions. Francis et al (1996) states incentives play very limited roles in determining PP&E and inventory write-offs. Particularly for inventory, there are clear reporting guidance that the availability of market inventory values and inventory are required to be stated at lower of cost or market. Due to the lack of explicit accounting guidance nor independent measure of economic values, incentives play substantial roles in explaining other write-offs, of discretionary nature, such as goodwill and restructuring charges. Incentives can include management compensation, management changes and or due to management's perceptions on asset

values where managers decide to "clear the deck". Francis et al (1996) suggests write-off decisions can be influenced by impairment effects and signaling effects. The observation of negative stock price reactions to impairments of tangible assets in Francis et al (1996), lends support to consideration of capital market reactions to EE asset impairments. Prior evidence suggests investors respond negatively to inventory write-offs (Francis et al 1996). In contrast, prior evidence suggests investors respond positively to restructuring charges, indicating restructuring charges signal improved future performance (Elliott & Shaw 1988, Francis et al. 1996).

In the context of extractive industry, Collins and Dent (1979), Collins et al (1981) and Zhou et al (2015) all examine the association of accounting choices and the associated stock price reactions. The former two investigate the oil and gas industry in the US setting, while Zhou et al. (2015) investigates the Australian extractive firm setting. However, the accounting methods under investigation are similar. A study with some similarities to this thesis is Zhou et al (2015), who examine the value relevance of the line items of EE expenditure including costs capitalized and costs expensed. The study also examines accounting choice impacts on stock prices. They observe evidence that investors perceive the information provided by the expensing method relevant in assessing firm value. However, none of the studies goes as far as examining write-offs in extractive industry as such.

Elliott & Shaw (1988) provide evidence of significant 1- and 2-day industry, adjusted negative share returns when the write-offs are reported. The study highlights the limitation of write-off studies related to the timeliness and accuracy of disclosures that are hard to determine. They also introduce biases in return estimates. Elliott & Shaw (1988) also examines the association of dividend levels, bond ratings and takeover measures with stock prices. However, I do not investigate the association

between write-off magnitudes and dividends given almost all MDSEs are loss making and unlikely to pay dividends until production has commenced.

To reduce market noise, like Ferguson and Pündrich (2015), a buy-and-hold abnormal return (*BHAR*) approach is used. The BHAR is measured as the difference between the compounded actual return and that of the benchmark (proxied by the Australia Mining Index) to capture the market's reaction to firms reporting EE asset write-offs.

In summary, the literature suggests the market will react to EE asset write-offs. Current evidence documents negative market reactions to write-off announcements (Francis et al 1996). Expectations of future earnings reduce with EE asset write-downs. Write-offs provide a negative signal to investors about future cash flows. Write-offs signal the likelihood of failed mining projects generating little or no value under the present market conditions. This suggests the following hypothesis in relation to EE asset impairment announcements.

H4: Write-offs of EE assets are associated with negative market reactions.

I investigate several event windows and firm level attributes of write-off announcements that may prompt different market reactions. First, I investigate whether there is a different market reaction to write-offs over various event window lengths including the 3- to 5- day event windows. Both the announcement types are considered and they are the preliminary final announcements and annual report announcements. Apart from differing event windows and differing announcement types, auditor opinion information is examined. Such opinions include modifications in relation to cash balances, net working capital and negative cash flow positions.

Second, I investigate the market reactions to write-offs on the same day of price-sensitive announcements from preliminary financial reports. I expect a negative market reaction for the write-offs reported when the same day model is used.

Write-offs can occur either pre- or post-IFRS adoption. Write-offs reported post-IFRS adoption are expected to have a stronger market reaction than write-offs in the pre-IFRS period due to more explicit reporting guidelines for asset impairment for pre-production mining firms with an objective to reduce asymmetric information. Given the tighter requirements, more precision may result from any write-off announcement during the post-IFRS adoption period. Accordingly, I pose the following hypothesis in relation to IFRS adoption.

H5: Market reactions to EE asset impairment are greater in the post-IFRS adoption period compared to the pre-IFRS adoption period.

5.3 Research design
5.3.1 Multivariate analysis on cross sectional variations in abnormal returns

Based on the samples from statutory reports (5,520 firm years) and preliminary final reports (569 firm years), I use a 3-day (5-day) buy-and-hold abnormal return (*BHAR*) measured from the closing price of the first (second) trading day prior to the actual write-off announcement date to the closing price of the first (second) day following the announcement date. For the event date test, I measure BHAR from the closing price of the first (second) trading day before the actual write-off announcement date to the closing price of first (second) day after.

BHAR is defined as the difference between the compounded realized buy-and-hold return and the compounded expected buy-and-hold return over the same period.

Non-synchronous trading is mitigated, by using BHAR. The effects of non-trading may not be detectable in the individual stock's return as the daily return may be insignificant. This is consistent with Lo and MacKinlay (1990) who find portfolio returns being more pronounced. In the presence of non-synchronous trading, the standard estimate of beta is not representative of its true sensitivity to the market (Scholes and Williams 1977). Hence, the expected buy-and-hold return is computed using the average return of all write-off and non-write-off firms. Therefore, BHAR is used in this study as it is closer to the actual investment experience of the investor.

The dependent variable is calculated as follows:

$$BHAR\ (-1, +1) = \prod_{t=1}^{+1}\ (1 + R_{it}) - \prod_{t=1}^{+1}\ (1 + BR_i)$$

Where R_i is the short term buy-and-hold return of firm i and BR_i is the short term return for a benchmark measured by the average return of the FTSE Australia Mining Index.

5.3.2 Market reaction determinants

This thesis prior event studies research assuming market efficiency in testing the information content of the annual earnings announcements by firms (Ball and Brown, 1968), new issues and large block of secondary issues of common stock (Scholes, 1969) and stock splits (Fama et al, 1969). The ordinary least square (OLS) regression approach is used to provide evidence on attributes of write-offs affecting market reactions and to assess whether write-offs are value destroying or value enhancing to shareholders. I consider three broad firm characteristics in modelling, namely financial characteristics, auditor opinions and mine life cycle stages. The model is specified as follows:

$$BHAR_{it} = b1EXPL\_ASSET\_WO_{it} + b2\,CASH_{it} + b3MKT\_CAP_{it} +$$

$$b4AUDIT\_OPIN\_EOM_{it} + b5PERCENT\_CHANGE\_NPAT\_ADJ_{it} + b6JORC_{it} +$$

$$b7PERCENT\_COMM\_CUR_{it} + b8IFRS_{it} + u$$

Where:

BHAR it		=	*compound abnormal return over day -1 (-2) and day +1 (+2) measured as the difference between the actual return and the benchmark Australia FTSE Mining Index.*
EXPL_ASSET_WO it	-	=	*natural log of exploration and evaluation asset write off at closing (t);*
CASH it	+	=	*natural log of cash balances (t)*
MKT_CAP it	+	=	*natural log of market capitalisation (t);*
AUDIT_OPIN_EOM it	-	=	*indicator variable coded 1 for emphasis of matter - asset recoverability; cash flow and net liability otherwise 0;*
PERCENT_CHANGE_NAPT_ADJ it	+	=	*NPAT with write-offs added back (t) minus NPAT with write-offs added back (t-1) / NPAT with write-offs added back (t-1);*
JORC it	+	=	*indicator variable coded 1 for JORC resource, otherwise 0;*
PERCENT_COMM_CUR	+	=	*exchange rate of AUD vs.USD - currency (t) minus currency (t-1) / currency (t-1);*
IFRS	?	=	*indicator variable coded 1 for IFRS adoption, otherwise 0;*

The error term e is assumed to have normal OLS regression properties.

As stated before, the independent variable, *BHAR* is the 3- and 5- day buy-and-hold abnormal return as well as the return on the announcement date. In explaining the cross-sectional variation in abnormal returns, the treatment variable used is *EXPL_ASSET_WO*. It serves to capture the underlying incentive to report impairments and the extent to which financial information can explain a firm's value. *EXPL_ASSET_WO* captures the magnitude of the impairment reported. Negative associations between abnormal returns and reported write-offs, giving rise to the impairment effect in the cross-section, consistent with Francis et al (1996).

Control variables are used to capturing firms' financial attributes. The control variables are specified as follows: *AUDIT_OPIN_EOM, MKT_CAP, CASH* and *PERCENT_CHANGE_NPAT_ADJ.*

5.3.3 Confounding effects

Preliminary final reports can release new information or explain existing information. However, concurrently released information content can have a confounding effect (Beaver, 1968). The audited annual reports and unaudited preliminary final reports accompanied by financial statement information can release on the same day.

Another potential concern is that non-write-off announcements made several days before the write-off announcement may have a significant effect on the calculation of abnormal market reactions particularly over the 3-day and 5-day windows. It acknowledges that noise may exist in longer windows around the preliminary annual report announcement dates and that is a common methodological issue permeating many event studies.

Using 233 sample firms reporting impairments in the preliminary final reports, the percentages of firms experiencing stock price declines 90 and 180 days prior to the announcement dates are 46% and 48% respectively (un-tabulated results). The stock price decline suggests the market anticipates news of write-downs, possibly through the release of prior information. Further search has been conducted on announcements pertaining to impending write-downs prior to the preliminary final statement release dates. However, no specific financial reporting related disclosures have been identified prior to the release of the preliminary final report. Other possible confounding factors contributing to the stock price declines prior to the impairment announcements, as indicated in AASB6, para. 20 or AASB 136, para. 12, can be operational issues i.e. the expiration of exploration license, lack of funds or failing to discover economically viable minerals.

5.4 Results
5.4.1 Market reaction to preliminary final reports

Table 5.1 Abnormal Returns

FTSE AUSTRALIA MINING INDEX				
Event day	mean	standard deviation	N	t stat
-2	0.0009	0.0615	888	0.436
-1	0.0027	0.0524	888	1.544 *
0	0.0025	0.0532	888	1.396 *
1	0.0026	0.0572	888	1.335 *
2	-0.0002	0.0457	888	-0.101

AUSTRALIA DATASTREAM MINING INDEX				
Event day	mean	standard deviation	N	t stat
-2	0.0009	0.0613	888	0.432
-1	0.0025	0.0522	888	1.453 *
0	0.0022	0.0529	888	1.254
1	0.0026	0.0570	888	1.342 *
2	-0.0001	0.0484	888	-0.070

Tests on the significance of abnormal returns reported in Table 5.1, on the announcement date, abnormal returns are positive at 0.25% (significant at $p<0.0823$) at 90% confidence level. There is a significant abnormal return on day -1 of 0.27%, and on day +1 of 0.26% (significant at $p<0.0918$). There are significant buy-and-hold abnormal returns (*BHAR*) for the 3-day window centered on reported write-offs. There is a negative abnormal return on day +2 of -0.2%. As expected, more positive news than bad news gives rise to the net positive effect on abnormal returns.

5.4.2 Determinants of reported write-off market reaction

This study uses OLS regressions to test the association between write-off attributes and market reactions. Abnormal returns over various windows are regressed on reported write-offs and firm attributes on the market reaction on days. Un-tabulated

results show that there is no obvious multi-collinearity, as the highest correlations for binary regression variables are amongst *WO and EXPL_ASSET_WO* (in the range of 0.51 to 0.98, using Pearson correlations). Having removed *WO*, all variance inflations factors are below 1.77 (Lardado 1993). Table 5.2 reports results for the full sample based on the audited annual reports including a control for auditor opinion.

Table 5.2 Regression Analysis on Abnormal Returns (Statutory Annual Reports)

VARIABLES	(1) BHAR 0	(2) BHAR 3	(3) BHAR 5	(4) BHAR 0	(5) BHAR 3	(6) BHAR 5
LN_EXPL_ASSET_WO	-0.00251	-0.000730	-0.000583	-0.00307	-0.00179**	-0.000866
	(0.00465)	(0.000466)	(0.000648)	(0.00554)	(0.000767)	(0.00109)
LN_CASH	-0.0360***	-0.00108	0.000343	-0.00193	-0.00141	-0.000498
	(0.0117)	(0.00119)	(0.00135)	(0.0136)	(0.00142)	(0.00161)
LN_MKT_CAP	0.155***	-0.00497	-0.00540	0.162***	0.00252	0.00586*
	(0.0155)	(0.00406)	(0.00416)	(0.0291)	(0.00292)	(0.00350)
EOM_ASSET_RECOVER	0.0353	-0.00833	-0.0116	-0.0168	-0.0127	-0.0126
	(0.0674)	(0.00823)	(0.00991)	(0.0587)	(0.00903)	(0.0126)
EOM_CASHFLOW	-0.298***	0.00924	0.0171	-0.185	0.0248*	0.0243
	(0.0719)	(0.0131)	(0.0164)	(0.189)	(0.0150)	(0.0196)
EOM_NET_LIAB	0.0106	-0.00240	0.0105	-0.295	0.0177	0.0273
	(0.111)	(0.0132)	(0.0209)	(0.225)	(0.0141)	(0.0274)
PERCENT_CHANGE_NPAT_ADJ	-0.00788	-0.00414	-0.00710**	0.0107	-0.00208	-0.00531
	(0.0145)	(0.00294)	(0.00348)	(0.0118)	(0.00210)	(0.00344)
JORC	-0.149***	0.00292	0.000581	0.0528	0.0120	0.0212**
	(0.0497)	(0.00581)	(0.00735)	(0.0501)	(0.00774)	(0.00872)
PRECENT_COMM_CUR	0.000378	0.000142	6.44e-05	-0.00318***	-5.67e-06	-0.000160
	(0.00158)	(0.000210)	(0.000255)	(0.00115)	(0.000178)	(0.000235)
Constant	-1.310***	0.122	0.126	-2.106***	-0.0120	-0.0708
	(0.227)	(0.0868)	(0.0885)	(0.452)	(0.0396)	(0.0507)
FIXED EFFECTS	NO	NO	NO	YES	YES	YES
Observations	2,010	2,010	2,010	2,010	2,010	2,010
Adjusted R-squared	0.101	0.0120	0.00873	0.0907	0.00477	0.00541
F-stats	21.94	0.862	1.226	4.895	1.317	1.341

Table 5.2 shows that write-offs are not significantly associated with the abnormal return in the 3- and 5-day windows as well as on announcement date with the exception of the 3-day window when fixed effects applied. This is consistent with

expectation that markets might have anticipated new information captured earlier in the preliminary reports.

Table 5.3 Regression Analysis on Abnormal Returns (Preliminary Annual Report)

VARIABLES	(1) BHAR 0	(2) BHAR 3	(3) BHAR 5	(4) BHAR 0	(5) BHAR 3	(6) BHAR 5
LN_EXPL_ASSET_WO	0.0192*	-0.00136**	-0.00150**	-0.00919	-0.00200**	-0.00237**
	(0.0103)	(0.000543)	(0.000694)	(0.00809)	(0.000909)	(0.00115)
LN_CASH	-0.0146	0.00324**	0.00246	-0.00437	0.00309	0.00318
	(0.0183)	(0.00150)	(0.00155)	(0.0114)	(0.00219)	(0.00211)
LN_MKT_CAP	0.119***	-0.000908	0.000509	0.224***	-0.00695	-0.00369
	(0.0198)	(0.00109)	(0.00112)	(0.0408)	(0.00494)	(0.00660)
PERCENT_CHANGE_NPAT_ADJ	-0.0346	-0.00496**	-0.00668**	-0.00139	-0.00425**	-0.00418
	(0.0319)	(0.00201)	(0.00272)	(0.0140)	(0.00209)	(0.00304)
JORC	-0.191*	0.00782	0.0126	-0.139	0.00671	0.0260*
	(0.103)	(0.00687)	(0.00859)	(0.132)	(0.0118)	(0.0157)
PRECENT_COMM_CUR	-0.00212	-0.000130	4.55e-05	-0.00241*	7.08e-06	0.000115
	(0.00398)	(0.000218)	(0.000306)	(0.00143)	(0.000268)	(0.000320)
Constant	-0.726**	-0.00601	-0.0117	-2.834***	0.102	0.0335
	(0.353)	(0.0232)	(0.0271)	(0.654)	(0.0852)	(0.114)
FIXED EFFECTS	NO	NO	NO	YES	YES	YES
Observations	567	567	567	567	567	567
Adjusted R-squared	0.0673	0.0244	0.0186	0.162	0.0194	0.0184
F-stats	11.28	2.309	1.980	10.08	1.657	1.509

The results in Table 5.3 indicate a negative market reaction to the information pertaining to write-offs in preliminary final reports on the announcement date and over 3- and 5-day windows. Uncertainty is resolved with a negative market reaction to write-offs. However the explanatory power of the tests decreases as the window broadens, with adjusted R_2 decreasing from 6.73% for announcement date (Model 1), 2.44% for 3-day (Model 2) and 1.86% for 5-day (Model 3), probably due to noise. The inference for the negative coefficient on *EXPL_ASSET_WO* is that the markets jointly react to the reporting of *EXPL_ASSET_WO* and consistently to other information sources. The results are consistent with H$_4$. In Table 5.3, evidence of a negative association between the

returns and *EXPL_ASSET_WO* for announcement date, 3-day and 5-day windows. The results are consistent across the 3- and 5-day windows after controlling for both firm and year fixed effects.

I find strong evidence that firm characteristics (*MKT_CAP*) are associated with abnormal return on announcement date. I infer that firm characteristics do drive the market reaction around the release of write-offs in the preliminary annual reports. On that basis, write-offs are equally valuable to firms with respect to size. In other words, the proposition that firm size which seems to matter likely holds.

I also conduct a range of other tests including winsorisation, fixed effects and adjusting abnormal returns to the Australia Datastream Mining Index. The results are not sensitive to winsorisation at 1% and 5% when outliers are removed. Rerunning regressions including year and firm fixed effects produce similar results. When adjusting abnormal returns to Australia Datastream Mining Index, similar results occur.

5.4.3 Robustness test

The following discussion refers to all models in Table 5.4 to 5.7. In examining the subsamples, during the resource boom up to 2012 and after, *EXPL_ASSET_WO* is the most important variable, significantly associated with abnormal returns across all three event windows (document these). This may suggest the increased level of exploration activities and the build-up of exploration assets creating a large pool of resources for potential write-offs that produce a signaling effect.

Table 5.4 Robustness Tests: Regression Analysis on Abnormal Returns - IFRS Adoption

	Post IFRS Adoption		
	(1)	(2)	(3)
VARIABLES	BHAR 0	BHAR 3	BHAR 5
LN_EXPL_ASSET_WO	-0.00932	-0.00201**	-0.00236**
	(0.00713)	(0.000876)	(0.00119)
LN_CASH	-0.00554	0.00305	0.00322
	(0.0110)	(0.00213)	(0.00215)
LN_MKT_CAP	0.301***	-0.00441	-0.00684
	(0.0498)	(0.00538)	(0.00728)
PERCENT_CHANGE_NPAT_ADJ	0.00785	-0.00395*	-0.00455
	(0.0142)	(0.00212)	(0.00301)
JORC	-0.103	0.00787	0.0246
	(0.115)	(0.0121)	(0.0153)
PRECENT_COMM_CUR	-0.00287**	-7.30e-06	0.000134
	(0.00138)	(0.000263)	(0.000325)
IFRS	-0.444***	-0.0145	0.0180
	(0.155)	(0.0106)	(0.0149)
Constant	-4.040***	0.0624	0.0825
	(0.784)	(0.0919)	(0.123)
FIXED EFFECTS	YES	YES	YES
Observations	567	567	567
Adjusted R-squared	0.250	0.0221	0.0207
F-stats	9.169	1.590	1.598

In the post-IFRS adoption period, write-offs are negatively associated with abnormal return in the 3- and 5-day windows.

Table 5.5 Robustness Tests: Regression Analysis on Abnormal Returns - Mining Boom Partitioning

VARIABLES	Pre Resource Boom Until 2012			Post Resource Boom		
	(1)	(2)	(3)	(4)	(5)	(6)
	BHAR 0	BHAR 3	BHAR 5	BHAR 0	BHAR 3	BHAR 5
LN_EXPL_ASSET_WO	-0.0111	-0.00179**	-0.00230**	-0.00344**	-0.00340	0.00235
	(0.00908)	(0.000795)	(0.00109)	(0.00134)	(0.00297)	(0.00364)
LN_CASH	-0.0105	0.00312	0.00336	0.0150***	0.0133***	0.00702
	(0.0152)	(0.00271)	(0.00312)	(0.00346)	(0.00304)	(0.00433)
LN_MKT_CAP	0.246***	-0.00399	-0.00127	0.0534**	-0.00752	-0.0264
	(0.0461)	(0.00372)	(0.00556)	(0.0210)	(0.0319)	(0.0312)
PERCENT_CHANGE_NPAT_ADJ	-8.90e-05	-0.00478**	-0.00423	-0.0336	0.00942	0.0131
	(0.0141)	(0.00208)	(0.00304)	(0.0424)	(0.0189)	(0.0136)
JORC	-0.167	0.00553	0.0247	-0.0261	-0.106*	-7.15e-05
	(0.142)	(0.0116)	(0.0164)	(0.102)	(0.0515)	(0.0508)
PRECENT_COMM_CUR	-0.00350**	-0.000104	5.66e-05	0.00592**	0.00458*	0.00144
	(0.00134)	(0.000234)	(0.000299)	(0.00253)	(0.00244)	(0.00239)
IFRS						
Constant	-3.077***	0.0515	-0.0114	-0.486	0.0378	0.315
	(0.719)	(0.0572)	(0.0915)	(0.419)	(0.603)	(0.544)
FIXED EFFECTS	YES	YES	YES	YES	YES	YES
Observations	523	523	523	44	44	44
Adjusted R-squared	0.170	0.0149	0.0169	0.249	0.258	0.0182
F-stats	11.96	1.821	1.301	36.66	4.642	1.138

Table 5.6 Robustness Tests: Regression Analysis on Abnormal Returns - Mining Boom Partitioning during Post-IFRS Adoption Period

	Pre Resource Boom Until 2012			Post Resource Boom		
	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	BHAR 0	BHAR 3	BHAR 5	BHAR 0	BHAR 3	BHAR 5
LN_EXPL_ASSET_WO	-0.0116	-0.00181**	-0.00227**	-0.00344**	-0.00340	0.00235
	(0.00837)	(0.000783)	(0.00110)	(0.00134)	(0.00297)	(0.00364)
LN_CASH	-0.0110	0.00311	0.00338	0.0150***	0.0133***	0.00702
	(0.0138)	(0.00270)	(0.00305)	(0.00346)	(0.00304)	(0.00433)
LN_MKT_CAP	0.330***	-0.00173	-0.00542	0.0534**	-0.00752	-0.0264
	(0.0548)	(0.00418)	(0.00596)	(0.0210)	(0.0319)	(0.0312)
PERCENT_CHANGE_NPAT_ADJ	0.00875	-0.00454**	-0.00467	-0.0336	0.00942	0.0131
	(0.0144)	(0.00210)	(0.00300)	(0.0424)	(0.0189)	(0.0136)
JORC	-0.141	0.00622	0.0234	-0.0261	-0.106*	-7.15e-05
	(0.122)	(0.0119)	(0.0154)	(0.102)	(0.0515)	(0.0508)
PRECENT_COMM_CUR	-0.00353***	-0.000104	5.79e-05	0.00592**	0.00458*	0.00144
	(0.00134)	(0.000231)	(0.000303)	(0.00253)	(0.00244)	(0.00239)
IFRS	-0.463***	-0.0125	0.0230*			
	(0.161)	(0.00938)	(0.0129)			
Constant	-4.400***	0.0157	0.0544	-0.486	0.0378	0.315
	(0.863)	(0.0692)	(0.0995)	(0.419)	(0.603)	(0.544)
FIXED EFFECTS	YES	YES	YES	YES	YES	YES
Observations	523	523	523	44	44	44
Adjusted R-squared	0.263	0.0166	0.0219	0.249	0.258	0.0182
F-stats	10.32	1.735	1.835	36.66	4.642	1.138

During the resource boom from mid-2000s up to 2012, write-offs are negatively associated with abnormal returns in the 3- and 5-day windows as well as on announcement date in the post-resource boom period. Controlling for the effect of IFRS adoption, the results continue to hold during the IFRS adoption period while commodity demand is strong. During the mining boom period up to 2012, controlling for the IFRS adoption, the magnitudes of market reactions to write-offs in Table 5.6, models 7, 8 & 9 are quite similar to that of in Table 5.5, models 1, 2 & 3 which do not control for the IFRS adoption. It concludes the market reactions to EE asset impairment are not greater

in the post-IFRS adoption period compared to the pre-IFRS adoption period, inconsistent with H_5.

Table 5.7 Robustness Tests: Regression Analysis on Abnormal Returns - Accounting Method Partitioning

| | Capitalised Firms | | | Capitalised Firms Post IFRS Adoption | | |
| | (1) | (2) | (3) | (4) | (5) | (6) |
VARIABLES	BHAR 0	BHAR 3	BHAR 5	BHAR 0	BHAR 3	BHAR 5
LN_EXPL_ASSET_WO	-0.00386	-0.000848	-0.000848	-0.00429	-0.000811	-0.000811
	(0.00982)	(0.00141)	(0.00141)	(0.0101)	(0.00146)	(0.00146)
LN_CASH	0.00213	0.00758	0.00758	0.00343	0.00747	0.00747
	(0.0203)	(0.00952)	(0.00952)	(0.0210)	(0.00973)	(0.00973)
LN_MKT_CAP	0.245***	0.00680	0.00680	0.251***	0.00629	0.00629
	(0.0623)	(0.00837)	(0.00837)	(0.0674)	(0.00719)	(0.00719)
PERCENT_CHANGE_NPAT_ADJ	-0.00139	-0.0119**	-0.0119**	0.000210	-0.0120**	-0.0120**
	(0.0173)	(0.00475)	(0.00475)	(0.0165)	(0.00470)	(0.00470)
JORC	-0.160	-0.0582***	-0.0582***	-0.149	-0.0592***	-0.0592***
	(0.140)	(0.0129)	(0.0129)	(0.128)	(0.0140)	(0.0140)
PRECENT_COMM_CUR	0.000226	-0.000351	-0.000351	0.000257	-0.000353	-0.000353
	(0.00264)	(0.000597)	(0.000597)	(0.00264)	(0.000598)	(0.000598)
IFRS				-0.0663	0.00574	0.00574
				(0.122)	(0.0224)	(0.0224)
Constant	-3.127***	-0.126	-0.126	-3.223***	-0.118	-0.118
	(0.925)	(0.160)	(0.160)	(1.002)	(0.152)	(0.152)
FIXED EFFECTS	YES	YES	YES	YES	YES	YES
Observations	120	120	120	120	120	120
Adjusted R-squared	0.406	0.0663	0.0663	0.404	0.0585	0.0585
F-stats	4.204	7.172	7.172	3.585	6.956	6.956

I find no evidence amongst capitalizing firms and combined method firms suggesting that accounting methods do not make strong inferences for abnormal returns.

5.5 Conclusion

This chapter finds that write-offs are significant market events, followed by negative abnormal return on the announcement date, 3- and 5- day windows. There is no association between accounting method and market return regardless of what type of firms report write-offs. In the post-IFRS adoption period, write-offs are negatively

associated with abnormal returns. During the resource boom from mid-2000's up to 2012, write-offs are negatively associated with abnormal returns. The results continue to hold during the resource boom while IFRS adoption is in effect.

My results also contribute to the speculation of whether write-offs have negative effects on abnormal returns. I also contribute to the literature by documenting the negative market reaction when a resolution of uncertainty is reached in the presence of a failure in mineral discovery. This supports the value-decreasing proposition for write-offs, an indication of geological acumens and management's credibility in reflecting true asset quality.

CHAPTER 6 - SUMMARY AND CONCLUSION
6.1 Summary

This thesis empirically examines the determinants, exploration, and evaluation of write-offs amongst MDSEs. Interestingly, this particular type of asset write-offs merely affects the quality of the respective assets and has no leverage effect, as this typs of firms are generally established before the production phase often with no cash inflow generated to justify bank borrowing. This study also examines write-off determinants vis-à-vis the post-IFRS adoption effective in 2005. The Australian principles-based accounting standard AASB 6, *Exploration for and Evaluation of Mineral Resources,* is accompanied with stringent and more explicit asset impairment guidelines specific to the explorers. Furthermore, it allows for multiple accounting policy choices.

This thesis conducts tests on a full sample of 7,079 firm years by 863 firms over the 1995 – 2015 period. Chapter 3 provides descriptive statistics on the accounting choice landscape under AASB 6 and is the first comprehensive descriptive analysis since the Lourens and Henderson (1972) survey. I find in the post-IFRS adoption period, more firms choose to capitalise and use the combined treatments than to expense EE costs. The economic boom has led to more market participants in the exploration ventures and I find that these less mature firms tend to capitalise the exploration costs. Capitalising firms tend to have weaker cash balances, lower profitability and lower capability in raising equity funding. Amongst different accounting methods, it is the capitalisation and the combined treatment categories that firms use for the longest duration. Expensing method is more likely to be used by firms with stronger financial position, stronger cash balances, larger equity amounts raised and larger total asset base.

Chapter 4 examines the association between firm characteristics and the propensity to write off EE assets, subject to different conditions including post-IFRS adoption, pre- and post-resource booms and specific accounting methods. I find evidence of a lower tendency to have write-offs reported amongst firms with higher non-exploration expense vs. exploration expense, high cash burn rates, particularly when the demand for commodities is high during boom time. The same results hold for capitalised firms with high proportion of non-exploration spending and high cash burn rate during resource boom after IFRS adoption. Specialists have a positively significant association with write-offs reported. However, it is not clear if the results are due to stronger governance with tighter monitoring mechanism or merely the firm characteristics. Big 4 auditors show no evidence of significant association with write-offs reported except for capitalised firms. Firms reporting higher level of write-offs tend to have large exploration asset sizes, strong cash balances, and high leverage as well as high frequency of asset recoverability reported by auditors.

Chapter 5 examines market reactions to reported write-offs. Write-offs in EE assets are generally connected with failure to achieve an economically viable discovery. By reaching a resolution, firms decide to write-off EE (EE) assets to resolve uncertainty. Write-offs reported in preliminary annual reports are significantly associated with negative abnormal returns on the announcement date, 3- and 5- day windows. Having controlled for post-IFRS adoption period, same results hold for the 3- and 5-day windows. Accounting methods have no association with abnormal returns. Write-offs reported during the resource boom from mid 2000s up to 2012 are negatively associated with abnormal returns on the 3- and 5-day windows as well as on the announcement date, post-resource boom.

6.2 Contributions and implications

The main contribution of this thesis is empirically documenting write-offs in EE assets. This adds to our understanding of why firms choose to write off based on a different motivation. It also provides an update on the current state of play of what accounting methods have been used for reporting. Furthermore, there is a market reaction around reported write-offs that consist of information content relevant to firms' valuation. There is evidence of short-term price effects for the least negative write-offs.

This thesis also contributes to the prior literature by looking at a different type of write-offs specific to the area of EE assets. Prior literature has not focused on this category of write-offs, limiting the understanding of why firms report the decisions of write-offs. This thesis also finds in post-IFRS and pre- and post-boom periods, firms report write-offs differently subject to different accounting methods.

Furthermore, I examine whether there is any difference in the market reaction to write-offs reported in the segmented periods in varying conditions. I find no evidence of accounting methods to have an effect on stock price reactions. I find evidence for reported write-offs associated with negative abnormal return particularly concentrated in the post-IFRS adoption period and during the resource boom.

6.3 Potential limitations

One limitation with archival research is that the use of proxies as the underlying characteristics of interest is unobservable. Some variables I use have been suggested in prior literature to proxy for financial statement information content. This enables the

investigation of the underlying economic context of interest but may introduce noise in my tests. The inclusion of such noise in variables works against finding a significant association.

There are several caveats when using statistical models. First, models like OLS and logistics only function properly when required assumptions are met. This thesis has carefully checked all required assumptions and the associations are particularly weak in this regard. In addition, significance at the 90% or 95% level do imply that there is a 5% or 10% chance of a spurious association documented. However, focusing on significance levels of the tests at the 99% level can certainly alleviate this concern.

This thesis assumes market efficiency. This implies observing a market reaction suggestive of information content which will have an impact on firms' valuations, assuming the information is properly disseminated and fully absorbed in the market. To address that, this thesis asserts all write-offs and other information content in the preliminary reports are labelled as price-sensitive by the ASX.

An issue in Chapter 5 is that any market reaction may be exposed to confounding effects given the vast information content captured in the preliminary annual reports. However, I alleviate this concern by controlling for other possible financial variables reported in the preliminary annual reports to ascertain which factors are driving the stock price reactions.

6.4 Suggestions for future research

Although outside the scope of this research, the first suggestion for future research is to examine the influence of corporate governance namely independent boards and the assurance role of mining consultants, on write-off decisions and why

there are different economic consequences. Due to the limitation of data available, these variables are outside the scope of this study.

Chapter 3 finds that different types of firms use accounting methods in different ways, suggesting that there should be future research that tries to examine the accounting choices at the project level. Chapter 4 finds that different write-off determinants exist, suggesting that future research may consider other aspects of accounting for EE costs such as accounting choice switches, as well as whether resource and reserve levels, auditor brand name effect, and inside ownership as additional factors potentially influencing write-off decisions.

6.5 Conclusion

This thesis aims to raise awareness of the asymmetric information which characterises the reporting of EE assets subject to the principles-based accounting standard and the reporting of write–offs. This thesis provides evidence using financial ratios to assess write-off amounts based on specific criteria. Financial statement users can become more aware of the specific conditions enabling them to make necessary adjustments in the write-off reported by gauging the proportion of non-exploration spending, cash-burn rates and the role of auditors by providing descriptive opinions on the exploration asset quality. To that end, financial statement users are better equipped to exercise their independent judgement and make evidence-based decisions in assessing the quality of the EE assets.

REFERENCES

AASB (1989), AASB 1022: Accounting for the Extractive Industries, Australian Accounting Standard Board, Melbourne.

AASB (2004), AASB 6: Exploration for and Evaluation of Mineral Resource, Australian Accounting Standard Board, Melbourne.

AASB (2004), AASB 136: Impairment of Assets, Australian Accounting Standard Board, Melbourne.

Abughazaleh, N.M., Al‐hares, O.M. & Roberts, C. 2011, 'Accounting Discretion in Goodwill Impairments: UK Evidence', *Journal of International Financial Management & Accounting,* vol. 22, no. 3, pp. 165.

Akerlof, G. A. 1970, 'The market for "lemons": Quality uncertainty and the market mechanism' *Quarterly Journal of Economics, 84*(3), pp 488-500.

Al-Shammari, B., Brown, P. & Tarca, A. 2008, 'An investigation of compliance with international accounting standards by listed companies in the Gulf Co-Operation Council member states', *International Journal of Accounting,* vol. 43, no. 4, pp. 425,425-447.

Asekomeh, A.O., Russell, A. & Tarbert, H. 2006, 'A critical analysis of the use of accounting standards' comment letters as lobbying tools by extractive industry firms',

ASX (2010), "Investing in metals & mining", available at: www.asx.com.au/research/industry/mining/investing.htm (assessed May 2010)

Bagnoli, M. & Watts, S.G. 2005, 'Conservative Accounting Choices', *Management Science,* vol. 51, no. 5, pp. 786-801.

Ball, R., & Brown, P. R., 1968:' A retrospective, an empirical evaluation of accounting income numbers', *Accounting Review, 89*(1), pp1-26.

Barker R., Penman S. 2013, 'Moving the Conceptual Framework Forward: Accounting for Uncertainty'. Working paper.

Basu, S. 1997, 'The conservatism principle and the asymmetric timeliness of earnings', *Journal of Accounting & Economics,* vol. 24, no. 1, pp. 3.

Basu, S. 2005, 'Discussion of "Conditional and Unconditional Conservatism: Concepts and Modeling"', *Review of Accounting Studies,* vol. 10, no. 2, pp. 311-21.

Beatty, A. & Weber, J. 2006, 'Accounting discretion in fair value estimates: an examination of SFAS 142 goodwill impairments. Statement of Financial Accounting Standards 142)', *Journal of Accounting Research,* vol. 44, no. 2, pp. 257-288.

Beaver, W. H. 1968, 'The information content of annual earnings announcements', *Journal of Accounting Research, 6*, pp 67-92.

Bishop, J., Kent, C., Plumb, M. & Rayner, V. 2013, 'The resources boom and the Australian Economy: A Sectoral Analysis', Reserve Bank of Australia Bulletin, March quarter pp.39-49.

Bond, D., Giovendir, B. & Wells, P. 2006, 'An evaluation of asset impairments by Australian firms and whether they were impacted by AASB 136', Accounting and Finance, Vol 56(1), pp. 259-288

Boone, J. P., Khurana, I. K., & Raman, K. K. 2010, 'Do the big 4 and the second-tier firms provide audits of similar quality?' *Journal of Accounting and Public Policy, 29*(4), pp 330-352.

Boone, J.P. 2008, 'Audit firm tenure and the equity risk premium', *Journal of accounting, auditing & finance,* vol. 23, no. 1, pp. 115,115-140.

Bonner, S. E., & Lewis, B. L. 1990. Determinants of auditor expertise. *Journal of Accounting Research, 28*, 1-1-20.

Carcello, J. V., & Nagy, A. L. 2004. Audit firm tenure and fraudulent financial reporting. *Auditing: A Journal of Practice & Theory, 23*(2), 55.

Chan, K.K.C. & Chen, N.F. 1991, 'Structural and Return Characteristics of Small and Large Firms', vol. 46.

Chen, K.C.W. & Lee, C.J. 1995, 'Executive Bonus Plans Accounting Trade-offs: The Case of the Oil and Gas Industry, 1985-86', *Accounting Review,* vol. 70, no. 1, pp. 91-111.

Collins, D.W. & Dent, W.T. 1979, 'The proposed elimination of full cost accounting in the extractive petroleum industry: An empirical assessment of the market consequences', *Journal of Accounting and Economics,* vol. 1, no. 1, pp. 3-44.

Collins, D.W., Rozeff, M.S. & Dhaliwal, D.S. 1981, 'The economic determinants of the market reaction to proposed mandatory accounting changes in the oil and gas industry: A cross-sectional analysis', *Journal of Accounting and Economics,* vol. 3, no. 1, pp. 37-71.

Cooke, T.E. 1989, 'Disclosure in the Corporate Annual Reports of Swedish Companies', *Accounting & Business Research (Wolters Kluwer UK),* vol. 19, no. 74, pp. 113-24.

Coram, P. J. 2009. The value of assurance on voluntary nonfinancial disclosure: An experimental evaluation. *Auditing: A Journal of Practice & Theory, 28*(1), 137-137-151.

Cortese, C. 2009, 'The power of history: accounting standard setting and the extractive industries in Australia'

Cortese, C.L. 2006, *The power of the extractive industries: capturing the international accounting standard setting process.*

Cortese, C.L., Irvine, H.J. & Kaidonis, M.A. 2009, 'Extractive industries accounting and economic consequences: Past, present and future', *Accounting Forum*, vol. 33, Elsevier, pp. 27-37.

Cortese, C.L., Irvine, H.J. & Kaidonis, M.A. 2010, 'Powerful players: How constituents captured the setting of IFRS 6, an accounting standard for the extractive industries', *Accounting Forum*, vol. 34, Elsevier, pp. 76-88 .

Cortese, C. & Irvine, H. 2010, 'Investigating international accounting standard setting: The black box of IFRS 6', *Research in Accounting Regulation,* vol. 22, no. 2, pp. 87-95.

Cotter, J., Martin, T. & Stokes, D. 1995, 'Reaction To The Mandatory Write‐Down Provisions of AASB 1010: Accounting F or The Revaluation Of Non‐Current Assets', *Australian Accounting Review,* vol. 5, no. 10, pp. 64.

Cotter, J., Stokes, D., & Wyatt, A. 1998. An analysis of factors influencing asset write-downs. *Accounting & Finance, 38*(2), 157.

Cuijpers, R. & Buijink, W. 2005, 'Voluntary adoption of non-local GAAP in the European Union: A study of determinants and consequences', *European Accounting Review,* vol. 14, no. 3, pp. 487.

Daske, H. 2006, 'Economic Benefits of Adopting IFRS or US‐GAAP – Have the Expected Cost of Equity Capital Really Decreased?', *Journal of Business Finance & Accounting,* vol. 33, no. 3‐4, pp. 329.

Davis, S.W., Menon, K. & Morgan, G. 1982, 'The images that have shaped accounting theory', *Accounting, Organizations and Society,* vol. 7, no. 4, pp. 307-18.

Deakin, E.B. 1989, 'Rational economic behavior and lobbying on accounting issues: Evidence from the oil and gas industry', *Accounting review,* , pp. 137-51.

DeAngelo, H., DeAngelo, L. & Skinner, D.J. 1994, 'Accounting choice in troubled companies', *Journal of Accounting and Economics,* vol. 17, no. 1, pp. 113-43.

DeAngelo, L.E. 1981, 'Auditor size and audit quality', *Journal of Accounting and Economics,* vol. 3, no. 3, pp. 183,183-199.

Dhaliwal, D.S. 1980, 'The effect of the firm's capital structure on the choice of accounting methods', *Accounting Review,* pp. 78-84.

Doran, B.M., Collins, D.W. & Dhaliwal, D.S. 1988, 'The information of historical cost earnings relative to supplemental reserve-based accounting data in the extractive petroleum industry', *Accounting Review,* , pp. 389-413.

Dunn, K. A., & Mayhew, B. W. 2004. Audit firm industry specialization and client disclosure quality. *Review of Accounting Studies, 9*(1), 35.

Dyckman, T.R. & Smith, A.J. 1979, 'Financial accounting and reporting by oil and gas producing companies: A study of information effects', *Journal of Accounting and Economics,* vol. 1, no. 1, pp. 45-75.

Dye, R.A. & Verrecchia, R.E. 1995, 'Discretion vs. uniformity: Choices among GAAP', *Accounting Review,* pp. 389-415.

Elliott, J.A. & Shaw, W.H. 1988, 'Write-offs as accounting procedures to manage perceptions', *Journal of Accounting Research,* pp. 91-119.

Eisenhardt, K. M. 1989. Agency theory: An assessment and review. *Academy of Management Review, 14*(1), p.g.57.

Fama, E. F. 1980. Agency problems and the theory of the firm. *Journal of Political Economy, 88*(2), 288-288-307.

Fama, E. F., & Jensen, M. C. 1983. Agency problems and residual claims. (corporations and private property: Hoover institution conference: Nov. 19-20, 1982). *Journal of Law and Economics, 26*(2), 327-349.

Ferguson, A., Clinch, G., & Kean, S. 2011, 'Predicting the failure of developmental gold mining projects', *Australian Accounting Review, 21*(1), pp 44-53.

Ferguson, A., & Pündrich, G. 2015. Does industry specialist assurance of non-financial information matter to investors? *Auditing, 34*(2), 121-121-146.

Ferguson, A., Pündrich, G., & Raftery, A. 2014. Auditor industry specialization, service bundling, and partner effects in a mining-dominated city. *Auditing, 33*(3), 153. Francis, J., Hanna, D., & Vincent, L. (1996). Causes and effects of discretionary asset write-offs. *Journal of Accounting Research, 34*, 117-117-134.

Fields, T.D., Lys, T.Z. & Vincent, L. 2001, 'Empirical research on accounting choice', *Journal of Accounting and Economics,* vol. 31, no. 1, pp. 255-307.

Foster, G. 1980, 'Accounting policy decisions and capital market research', *Journal of Accounting and Economics,* vol. 2, no. 1, pp. 29-62.

Foster, G. 1980, 'Accounting policy decisions and capital market research', *Journal of Accounting and Economics,* vol. 2, no. 1, pp. 29-62.

Francis, J. 2001, 'Discussion of empirical research on accounting choice', *Journal of Accounting and Economics,* vol. 31, no. 1, pp. 309-19.

Francis, J., Hanna, J.D. & Vincent, L. 1996, 'Causes and Effects of Discretionary Asset Write-Offs', *Journal of Accounting Research,* vol. 34, pp. 117,117-134.

Francis, J.R. & Wang, D. 2008, 'The Joint Effect of Investor Protection and Big 4 Audits on Earnings Quality around the World*', *Contemporary Accounting Research,* vol. 25, no. 1, pp. 157.

Gerhardy, P.G. 1999, 'Accounting for Pre-production Costs: Extracting Consensus', *Australian Accounting Review,* vol. 9, no. 18, pp. 51-63.

Gipper, B., Lombardi, B.J. & Skinner, D.J. 2013, 'The politics of accounting standard-setting: A review of empirical research', *Australian Journal of Management,* vol. 38, no. 3, pp. 523.

Glaum, M. & Street, D.L. 2003, 'Compliance with the Disclosure Requirements of Germany's New Market: IAS Versus US GAAP', *Journal of International Financial Management & Accounting,* vol. 14, no. 1, pp. 64-100.

Glaum, M., Schmidt, P., Street, D. L., & Vogel, S. 2012, 'Compliance with IFRS 3- and IAS 36-required disclosures across 17 european countries: Company- and country-level determinants', *Accounting and Business Research,* pp 1-42.

Grossman, Sanford J.; Hart, Oliver D. (1986). "The costs and benefits of ownership: A theory of vertical and lateral integration". *Journal of Political Economy*. 94: 691–719

Harris, T. S., & Ohlson, J. A., 1990, Accounting disclosures and the market's valuation of oil and gas properties: Evaluation of market efficiency and functional fixation. (A forum on market's fixation and accounting numbers). *Accounting Review, 65*(4), 764-764.

Harris, T., & Ohlson, J., 1987, Accounting disclosures and the market's valuation of oil and gas properties. *The Accounting Review, 62*(4), 651-651.

Hart, O, 1995, Firms, Contracts, and Financial Structure. Oxford University Press.

Hart, O. D., & Moore, J. 1990, 'Property rights and the nature of the firm', *98*(6), 1119.

Haushalter, G.D. 2000, 'Financing policy, basis risk, and corporate hedging: Evidence from oil and gas producers', *Journal of Finance,* , pp. 107-52.

Healy, P.M. 1985, 'The effect of bonus schemes on accounting decisions', *Journal of Accounting and Economics,* vol. 7, no. 1, pp. 85-107.

Healy, P.M. & Palepu, K.G. 2001, 'Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature', *Journal of Accounting and Economics,* vol. 31, no. 1, pp. 405,405-440.

Hodgdon, C., Tondkar, R. H., Harless, D. W., & Adhikari, A. (2008). Compliance with IFRS disclosure requirements and individual analysts' forecast errors. *Journal of International Accounting, Auditing and Taxation, 17*(1), 1-1-13.

Holthausen, R.W. 1981, 'Evidence on the effect of bond covenants and management compensation contracts on the choice of accounting techniques: The case of the depreciation switch-back', *Journal of Accounting and Economics,* vol. 3, no. 1, pp. 73-109.

Holthausen, R.W. & Leftwich, R.W. 1983, 'The economic consequences of accounting choice implications of costly contracting and monitoring', *Journal of Accounting and Economics,* vol. 5, pp. 77-117.

IASB (2010a), Extractive Activities Discussion Paper, IASC Foundation, London.

IASB (2010b), Conceptual Framework, IASC Foundation, London.

IASC (2000), Extractive Industries Issue Paper, IASC Foundation, London

Jarva, H. 2009, 'Do Firms Manage Fair Value Estimates? An Examination of SFAS 142 Goodwill Impairments', *Journal of Business Finance & Accounting,* vol. 36, no. 9‐10, pp. 1059.

Jensen, M.C. & Meckling, W.H. 1976, 'Theory of the firm: Managerial behavior, agency costs and ownership structure', *Journal of Financial Economics,* vol. 3, no. 4, pp. 305-60.

Jeter, D.C. 2001, 'The effects of accounting choice on analysts' forecast errors in extractive industries', *Oil, Gas & Energy Quarterly,* vol. 49, no. 3, pp. 567-99.

Katz, L., 1985, Oil and gas: A compromise method of accounting. *Journal of Accountancy (Pre-1986), 159*(000006), 116-116.

Kothari, S. P. 2001, 'Capital markets research in accounting', *Journal of Accounting and Economics, 31*(1-3), pp 105-231.

Krishnan, G., 2003, Audit quality and the pricing of discretionary accruals. *Auditing, 22*(1), 109-109-126.

LaFond, R. & Watts, R.L. 2008, 'The Information Role of Conservatism', *Accounting Review,* vol. 83, no. 2,

pp. 447-78.

Larcker, D.F. & Revsine, L. 1983, 'The oil and gas accounting controversy: An analysis of economic consequences', *Accounting Review,* , pp. 706-32.

Leuz, C., Nanda, D., & Wysocki, P. D. (2003). Earnings management and investor protection: An international comparison. *Journal of Financial Economics, 69*(3), 505-505-527.

Lilien, S. & Pastena, V. 1982, 'Determinants of intra-method choice in the oil and gas industry', *Journal of Accounting and Economics,* vol. 4, no. 3, pp. 145-70.

Lourens, R. & Henderson, S. 1972, *Financial reporting in the extractive industries: an Australian survey,* Australian Society of Accountants, .

Luther, R. 1996, 'The development of accounting regulation in the extractive industries: An international review', *The International Journal of Accounting,* vol. 31, no. 1, pp. 67-93.

Lys, T. 1984, 'Mandated accounting changes and debt covenants: The case of oil and gas accounting', *Journal of Accounting and Economics,* vol. 6, no. 1, pp. 39-65.

Maines, L. A., & Wahlen, J. M. 2006, 'The nature of accounting information reliability: Inferences from archival and experimental research', *Accounting Horizons, 20*(4), pp 399-425.

Malmquist, D.H. 1990, 'Efficient contracting and the choice of accounting method in the oil and gas industry', *Journal of Accounting and Economics,* vol. 12, no. 1, pp. 173-205.

Moel, A. & Tufano, P. 2002, 'When Are Real Options Exercised? An Empirical Study of Mine Closings', The Review of Financial Studies, vol. 15(1), pp 35-64

Mohebbi, A., Tarca, A. & Woodliff, D. 2007, 'Managerial incentives and the treatment of pre-production expenditure in the mining industry',

Owhoso, V. E., Messier, J.,William F., & Lynch, J.,John G. (2002). Error detection by Industry-Specialized teams during sequential audit review. *Journal of Accounting Research, 40*(3), 883.

Porta, R., Lopez‐de‐silanes, F. & Shleifer, A. 1999, 'Corporate Ownership Around the World', *Journal of Finance,* vol. 54, no. 2, pp. 471.

Ramanna, K. & Watts, R. 2012, 'Evidence on the use of unverifiable estimates in required goodwill impairment', *Review of Accounting Studies,* vol. 17, no. 4, pp. 749.

Riedl, E.I. 2004, 'An Examination of Long-Lived Asset Impairments', *Accounting Review,* vol. 79, no. 3, pp. 823-52.

Roychowdhury, S. & Watts, R.L. 2007, 'Asymmetric timeliness of earnings, market-to-book and conservatism in financial reporting', *Journal of Accounting & Economics,* vol. 44, no. 1, pp. 2-31.

Russell, A., & Tarbert, H. 2006, 'A critical analysis of the use of accounting standards' comment letters as lobbying tools by extractive industry firms', *Petroleum Accounting and Financial Management Journal, 25*(3), pp 55-76.

Selig, M. 1980, 'The making of an accounting standard for extractive industries', *Accounting History Newsletter,* vol. 1, no. 2, pp. 9-30.

Skinner, D.J. 1993, 'The investment opportunity set and accounting procedure choice: Preliminary evidence', *Journal of Accounting and Economics,* vol. 16, no. 4, pp. 407-45.

Skinner, D.J. 2011, 'Discussion of "Accounting standards and debt covenants: Has the "Balance Sheet Approach" led to a decline in the use of balance sheet covenants?"', *Journal of Accounting and Economics,* vol. 52, no. 2–3, pp. 203-8.

Stephenson, P. R. 2000, The JORC Code–Its operation and application, In *Proceedings of the Codes Forum*, pp. 81-89.

Stephenson, P. R., Miskelly, N. 2000, Reporting standards and the JORC code." *Mineral Resource and Ore Reserve Estimation—The AusIMM Guide to Good Practice. AusIMM Monograph* 23 pg.621-630.

Stephenson, P.R. Weatherstone, N. 2006, Developments in international mineral resource and reserve reporting, http://www.crirsco.com/mine_manage2006_conf_paper.pdf

Sterling, R.R. 1970, 'On theory construction and verification', *Accounting Review,* pp. 444-57.

Sterling, R.R. 1970, *Theory of the measurement of enterprise income,* University Press of Kansas, .

Street, D.L. & Bryant, S.M. 2000, 'Disclosure Level and Compliance with IASs: A Comparison of Companies With and Without US Listings and Filings', *International Journal of Accounting,* vol. 35, no. 3, pp. 305,305-329.

Strong, J.S. & Meyer, J.R. 1987, 'Asset Write-downs: Managerial Incentives and Security Returns', *Journal of Finance,* vol. 42, no. 3, pp. 643.

Tarca, A., Morris, R.D. & Moy, M. 2013, 'An Investigation of the Relationship between Use of International Accounting Standards and Source of Company Finance in Germany', *Abacus,* vol. 49, no. 1, pp. 74.

Tsalavoutas, I. 2011, 'Transition to IFRS and compliance with mandatory disclosure requirements: What is the signal?', *Advances in Accounting, incorporating Advances in International Accounting,* vol. 27, no. 2, pp. 390,390-405.

Van Riper, R. (1994). *Setting standards for financial reporting FASB and the struggle for control of a critical process* Westport, Conn.: Quorum Books.

Verrecchia, R.E. 1986, 'Managerial discretion in the choice among financial reporting alternatives', *Journal of Accounting and Economics,* vol. 8, no. 3, pp. 175-95.

Vincent, L., Francis, J., & Hanna, J. D. (1996). Causes and effects of discretionary asset write-offs. *Journal of Accounting Research, 34*, 117-117-134.

Watts, R. L. 1976, 'The capital market, the market for information, and external accounting: Discussion', *The Journal of Finance, 31*(2), pp. 677-679.

Watts, R. L. 1977, 'Corporate financial statements, a product of the market and political processes', *Australian Journal of Management, 2*(1), 53-53-75.

Watts, R.L. 2003, 'Conservatism in accounting part I: Explanations and implications', *Accounting horizons,* vol. 17, no. 3, pp. 207-21.

Watts, R.L. & Zimmerman, J.L. 1979, 'The demand for and supply of accounting theories: the market for excuses', *Accounting Review, ,* pp. 273-305.

Watts, R.L. & Zimmerman, J.L. 1986, 'Positive accounting theory', .

Watts, R.L. & Zimmerman, J.L. 1990, 'Positive accounting theory: a ten year perspective', *Accounting review,* pp. 131-56.

Watts, R.L. 2003, 'Conservatism in Accounting Part I: Explanations and Implications', *Accounting Horizons,* vol. 17, no. 3, pp. 207-21.

Watts, R.L. 2003, 'Conservatism in Accounting Part II: Evidence and Research Opportunities', *Accounting Horizons,* vol. 17, no. 4, pp. 287-301.

Waymire, G. 1984, 'Additional evidence on the information content of management earnings forecasts', *Journal of Accounting Research, 22*(2), pp. 703-718.

Whittred, G. 1978, 'Accounting for the Extractive industries: Use or Abuse of the Matching Principle?', *Abacus,* vol. 14, no. 2, pp. 154-9.

Wise, T. & Spear, N. 2000, 'Accounting for extractive industries: An Australian perspective', *Petroleum Accounting and Financial Management Journal,* vol. 19, no. 1, pp. 30.

Wise, T. & Spear, N. 2002, 'Factors and forces of the extractive industry environment, and their implications for accounting measurement and financial reporting', *Petroleum Accounting and Financial Management Journa1008l,* vol. 21, no. 3, pp. 1-27.

Zang Y. 2008, 'Discretionary behavior with respect to the adoption of SFAS no. 142 and the behavior of security prices', *Review of Accounting and Finance,* vol. 7, no. 1, pp. 38.

Zeff, S. 1978, "The rise of "economic consequences". *Journal of Accountancy, 146*(6), 56-56.

Zhou, T., Birt, J. & Rankin, M. 2015, *TheValue Relevance of EE Expenditures. Accounting Research Journal, vol 28 (3) pp. 228-250.*

Zucca, L.J. & Campbell, D.R. 1992, 'A Closer Look at Discretionary Write-downs of Impaired Assets', *Accounting Horizons,* vol. 6, no. 3, pp. 30-41.

APPENDIX 1

DEFINITIONS

Definition		Meaning
Accounting choice	:	A diverse set of activities that affect accounting numbers including choices amongst equally acceptable rules, judgements and estimates to implement GAAP rules, disclosure decisions, timing decisions, lobbying activities, choices about display, aggregation decisions, classification decisions, decisions to structure transactions in certain ways to achieve a desired accounting outcome and real production and investment decisions.
Accounting choice decision makers	:	Include managers, auditors, audit committee members, standard setting groups, debt holders, and lenders.
Area of interest	:	An individual geological area which is considered to constitute a favorable environment for the presence of a mineral deposit or an oil or natural gas field, or has been proved to contain such a deposit or field. (AASB6 2015)
Asset recoverability	:	Recoverability of assets that are held and used is measured by comparing the sum of the future undiscounted cash flows (NPV) and the disposition is less than the carrying value. Often assets with poor quality has low levels of recoverability.
Classification	:	Categorising ore reserves and mineral resources into different types with confidence. Probable and proved for ore reserves. Inferred, indicated and measured for mineral resources.
Conditional conservatism	:	Book value is written down under adverse circumstances but not up under favorable circumstances. A bias towards understating the carrying amount of assets and overstating the carrying amount of liabilities. (Beaver and Ryan 2005)
Construction	:	Establishment and commissioning of facilities for extraction, treatment and transportation of products from deposits or fields. (AASB1022 1989)
Cracking:	:	In the 1920s, the U.S. Kansas-based Koch Industries Inc. invented a new and more efficient processing method for the thermal cracking of crude oil. Oil is heated to effect a recombination of molecules yielding higher proportions of usable compounds, especially gasoline. This process gained popularity in response to the dramatic growth in the use of the automobile in the first quarter of the 20th century.
Delisting	:	Delisting is the process by which a listed security is removed from the exchange on which it trades. A company can voluntarily ask to be delisted and become privately traded. Alternatively, a listed company may be removed from an exchange because of non-compliance with the listing requirements of the exchange.
Development	:	Establishment of access to the mineral deposit or oil fields and other preparation for commercial production.(AASB1022 1989)
Economically recoverable reserves	:	The estimated quantity of product in an area of interest that can be expected to be profitably extracted, processed and sold under current and foreseeable economic conditions. Economically recoverable reserves are the source of revenue. For example, when the commodity prices are depressed, reserves are less economically recoverable. (AASB6 2015)
Estimation	:	Estimating on the tonnage and grade
Evaluation	:	Proving the reserves
Exploration	:	Discovery of the reserves
Exploration and evaluation of assets	:	Exploration and evaluation expenditures recognised as assets in accordance with the entity's accounting policy. (AASB 6 2015)

APPENDIX 1 (CONT.)

Definition		Meaning
Exploration and evaluation of expenditures	:	Expenditures incurred by an entity in connection with the exploration for and evaluation of mineral resources before the technical feasibility and commercial viability of are demonstrable extracting a mineral resource. (AASB6 2015)
Exploration and evaluation of mineral resources	:	The search for mineral resources, including minerals, oil, natural gas and similar non-regenerative resources after the entity has obtained legal rights to explore in a specific area, as well as the determination of the technical feasibility and commercial viability of extracting the mineral resource. (AASB6 2015)
Feasibility study	:	A study conducted by mining engineers to confirm the economic confidence or the economic recoverability of exploration projects.
Government grants and rebates	:	As part of the mining incentive program to subsidies exploration activities to be conducted in an environmentally sustainable way.
Impairment	:	Impairment of assets is generally associated with long-term assets. The amount of impairment of assets is not based on the management decision rather than through accounting standards
Indicated mineral resource	:	A part of a Mineral Resource with sufficient confidence to allow the application of Modifying Factors in sufficient detail to support mine planning and evaluation of the economic viability of the deposit. With a lower level of confidence than that applying to a Measured Mineral Resource and may only be converted to a Probable Ore Reserve. (JORC 2012)
Inferred mineral resource	:	A part of a Mineral Resource for which quantity and grade (or quality) are estimated on the basis of limited geological evidence and sampling. With a low level of confidence, this type of resources must not be upgraded to ore reserve. (JORC 2012)
Insolvency	:	Inability to meet debt obligations.
Measured mineral resource	:	A part of a Mineral Resource with confidence sufficient to allow the application of Modifying Factors to support detailed mine planning and final evaluation of the economic viability of the deposit. A Measured Mineral Resource has a higher level of confidence and may be converted to a Proved Ore Reserve or under certain circumstances to a Probable Ore Reserve.(JORC Code)
Mine life cycle	:	The mine life cycle is described in the following phases including exploration and feasibility phase; planning and construction phase; mine operations phase; and mine closure phase.
Mineral resources	:	Minerals, oil, natural gas and similar non-regenerative resources. Minerals are referred to hard commodities. Oil and gas are referred to as energy commodities. (AASB6 2015)
Modifying factors	:	Considerations used to convert Mineral Resources to Ore Reserves including, but are not restricted to, mining, processing, metallurgical, infrastructure, economic, marketing, legal, environmental, social and governmental factors. (JORC 2012)
Political influence on standard setting	:	A purposeful intervention in the standard setting process by an economic entity with the goal of affecting the outcome of that process to increase that entity's economic value or wealth or achieve some other self-interested purpose inconsistent with the accounting setting body's mission. (Gipper, Lombardi and Skinner 2013)
Production	:	Obtaining marketable products from deposits or field on a commercial scale. This includes extraction and processing prior to sale.

APPENDIX 1 (CONT.)

Definition		Meaning
Proven reserves	:	An estimated quantity of all hydrocarbons namely crude oil or natural gas, which geological and engineering data demonstrate with reasonable certainty to be recoverable in future years from known reservoirs under existing economic and operating conditions.
Public reports	:	A report include company's exploration results, mineral resources or ore reserves with a description of the style and nature of mineralisation. (JORC 2012)
Scoping study	:	A scoping study used in an early stage of a project relying on inferred resources (lower level of geological confidence) with a much higher degree of uncertainty compared with the feasibility study based on measured and indicated resources (higher level of geological confidence).
Tolling	:	Tolling refers to the processing of metal concentrates into finished products i.e. ingots in a more marketable form. This terminology is originated from an international commodity trading house, Phillip Brothers aka Phibro LLC. (Waskis 1992)
Uncertainty	:	The challenges in predicting outcomes because of limited knowledge or information due to uncontrollable events which can impact future financial reporting and transactions. The context for financial reporting is that investors face uncertainty (risk) in making investments, and so they seek information about that uncertainty. Expected economic benefits are important and uncertainty may have an influence on economic benefits which may not be realized. (Barker and Penman 2013)
Uncertainty indicators	:	Varying degrees of certainty ranging from absolute certainty, less than certain to uncertainty resolved.
Unconditional conservativism	:	The book value of net assets is understated due to predetermined aspects of the accounting process. For example, expensing research costs in a R&D project. (Beaver and Ryan 2005)
Write down	:	It is an accounting treatment that recognises the reduced value of an impaired asset. Similar to write off but involves less than 100% removal of the reduced value. It is also known as impairment.
Write off	:	A write-off occurs when the carrying value can no longer be justified as fair value and is associated with short term assets and it is more of a management decision. It involves 100% removal of the write off amount from the balance sheet. Asset value is recognised at zero.

APPENDIX 2

Date of issue	Country	Document	Status	Main Requirements/Implications	Application Date
1972	Australia	Lourens & Henderson	Survey research	Provide information on accounting practices in mining industry to help formulate first set of accounting standards for extractive industries.	
Feb-73	Australia	Exposure Draft	Non-mandatory comments	Area of Interest method proposed/ Carry forward of Prospecting and Investigating costs when economically recoverable reserves exist or Prospecting and Investigating efforts must continue. Otherwise write off expenses in full.	
Oct-76	Australia	DS12/308 (AAS7)	Mandatory	Area of Interest method adopted/Terminology change from 'Prospecting' to 'Evaluating' and from 'Investigating' to 'Evaluating'/Refine exploration and evaluation cost carry forward and write off conditions/A 2-year limit on carry forward of exploration and evaluation costs proposed.	Jan 1, 1977
Dec-77	Australia	DS12/308 (AAS7-amended)	Mandatory	A 2-year limit on carry forward of exploration and evaluation costs deleted. This allows for MDSEs more latitude to defer exploration and evaluation costs indefinitely.	Jan 1, 1977
Oct-89	Australia	ASRB 1022 (designated AASB1022 in Jul 91)	Mandatory	For entities regulated under Corporation Act	Dec 31, 1989
Nov-89	Australia	AAS7	Mandatory	For entities not regulated under Corporations Act.	Dec 31, 1989
Dec-04	Australia	AASB6 (adopted from IFRS6)	Mandatory	AASB6 replaced AASB1022 and AAS7 as the requirements of the latter two standards are the same. AASB6 has relatively tighter asset impairment test requirements and it also defers to AASB136. AASB6 only applies to Exploration and Evaluation phases whereas AASB1022 also covers phases beyond. Treatments for the exploration and evaluation costs under the two standards are the same. AASB6 defines the exploration expenditure and pre-exploration activities. Any pre-exploration and evaluation expenditure before obtaining the legal rights to explore is outside the scope of the standard. AASB1022 makes no reference to the legal rights with respect to its exploration activities. As such, AASB6 allows the inclusion of legal rights to explore as expenditure. AASB6 has an explicit clause para 13 allowing for the change in accounting policies as long as it enhances relevance and reliability to the decision making needs of the financial statement users. The IFRS adoption provides more international comparability in the treatment of exploration and evaluation	Jan 1, 2005
Feb-07	Australia	AASB6 (amended)	Mandatory	Amended para. 21 - Accounting policy for exploration and evaluation cost allocation to CGUs or group of CGUs for asset impairment evaluation. The allocation to CGUs or group of CGUs should not be larger than an operating segment under AASB8.	Jan 1, 2009
Apr-07	Australia	AASB6 (amended)	Mandatory	Amended para. 9 - Elements of cost of exploration and evaluation defined. A comprehensive list of costs is provided.	Jul 1, 2007
Sep-07	Australia	AASB6 (amended)	Mandatory	Amended - Aus 7.2 is related to change from 'reporting date' to 'reporting period' hence not material. Terminology change from 'financial report(s)' to 'financial statement'.	Jan 1, 2009
Dec-07	Australia	AASB6 (amended)	Mandatory	Terminology change from 'financial report(s)' to 'financial statement'.	Jan 1, 2009
Jan-11	Canada	Adopted from IFRS6	Mandatory	Canada adopted IFRS for extractive industries	Jan 1, 2011
Jan-15	Australia	AASB6 (amended)	Mandatory	Deleted Aus 2.4 - AASB withdrew AASB 1031 Materiality post IFRS adoption. AASB 1031 appears to be redundant. Its deletion should not change the level of disclosure.	Jul 1, 2015

APPENDIX 3

Impairment loss recognition (Downward Revaluation) of Exploration and Evaluation Costs

Cost Model

Posting to:

DR statement of comprehensive income

CR corresponding asset

The write down to recoverable amount (impairment loss) cannot be reversed

Revaluation Model

Posting to:

DR revaluation Surplus

CR corresponding asset

Impairment loss (except for goodwill and other intangibles) can be reversed. The posting

Condition: not to exceed the original carrying amount.

If revaluation surplus account does not exist,

DR Impairment loss (P&L)

To mitigate impairment loss is to boost Recoverable Amount of MDSEs through 1.upgrading feasibility plans; and 2.establishing ties with stronger JV partners.

These results in higher FV less cost of disposal at sale given value in use is of limited use with the lack of operating cash flow and CGU.

Upward Revaluation of Exploration and Evaluation Costs

Conditions: There is NO requirement in Australia to perform an upward revaluation when recoverable amount in excess of carrying amount. AASB1041 prohibits some asset classes from upward revaluation including inventories, goodwill, internally generated assets and foreign exchange monetary assets. Upward revaluation mostly occurs in PP&E and involves a posting of CR revaluation surplus in comprehensive income (reverse a revaluation decrement posted prior, if any), constitute an impairment loss reversal.

APPENDIX 4

APPENDIX 5

Example: An allocation of impairment loss to a cash-generating unit (CGU)

The combined carrying value of the asset is $200,000
The value in use of the CGU is $165,000
Fair value less costs of disposal is $150,000

The impairment loss comes to $200,000 – $165000 (higher of the Recoverable Amount) i.e. $35,000.
The impairment loss is apportioned across the 4 assets based on carrying amount.

Asset Types in CGU	Carrying Amount	%	Allocation of impairment loss	Carrying Amount (ex. Asset A)	% (ex. Asset A)	Allocation of impairment loss (ex. Asset A)
Asset A	$20,000	10%	$3,500	-	-	-
Asset B	$60,000	30%	$10,500	$60,000	33%	$11,667
Asset C	$50,000	25%	$8,750	$50,000	28%	$9,722
Asset D	$70,000	35%	$12,250	$70,000	39%	$13,611
Total	$200,000	100%	$35,000	$180,000	100%	$35,000

Table A	
DR Impairment Loss $35,000	
CR Accumulated Impairment Loss - Asset A	$3,500
CR Accumulated Impairment Loss - Asset B	$10,500
CR Accumulated Impairment Loss - Asset C	$8,750
CR Accumulated Impairment Loss - Asset D	$12,250

Assuming the value in use of Asset A is $20,000 and fair value less cost of disposal is $19,000, under AASB 36, para 104, CGU cannot reduce the carrying amount of an individual asset within the CGU below the highest of value in use, fair value less of cost of disposal or zero. Otherwise, impairment loss is allocated on a pro-rata basis to other CGU assets under AASB 36, para 105 as in Table B below. The recoverable amount of asset A in Table A is $16,500 or below but above zero.

Table B	
DR Impairment Loss $35,000	
CR Accumulated Impairment Loss - Asset A	-
CR Accumulated Impairment Loss - Asset B	$11,667
CR Accumulated Impairment Loss - Asset C	$9,722
CR Accumulated Impairment Loss - Asset D	$13,611

APPENDIX 6 Accounting Treatments by Firm Year

ACCOUNTING TREATMENT	LISTING STATUS	PRE 2005 PERIOD (1995-2004)			POST 2005 PERIOD (2005 - 2015)			1995 - 2015			
		NUMBER OF FIRM YEARS	% OF EACH ACCOUNTING TREATMENT	% OF TOTAL NUMBER OF FIRM YEARS	NUMBER OF FIRM YEARS	% OF EACH ACCOUNTING TREATMENT	% OF TOTAL NUMBER OF FIRM YEARS	NUMBER OF FIRM YEARS	% OF EACH ACCOUNTING TREATMENT	% OF TOTAL NUMBER OF FIRM YEARS	CHANGE FROM PRE 2005 TO POST 2005 PERIOD
Expensing	Listed	235	41%	13%	897	81%	17%	1,132	68%	16%	282%
	Delisted	335	59%	18%	204	19%	4%	539	32%	8%	-39%
	Total	570	100%	31%	1,101	100%	21%	1,671	100%	24%	93%
Capitalising	Listed	394	65%	21%	2,272	89%	43%	2,666	85%	38%	477%
	Delisted	209	35%	11%	276	11%	5%	485	15%	7%	32%
	Total	603	100%	33%	2,548	100%	48%	3,151	100%	44%	323%
Combined Expensing & Capitalising	Listed	63	42%	3%	664	82%	13%	727	76%	10%	954%
	Delisted	87	58%	5%	148	18%	3%	235	24%	3%	70%
	Total	150	100%	8%	812	100%	15%	962	100%	14%	441%
No Expensing and Capitalising	Listed	340	65%	18%	643	81%	12%	983	75%	14%	89%
	Delisted	180	35%	10%	150	19%	3%	330	25%	5%	-17%
	Total	520	100%	28%	793	100%	15%	1,313	100%	19%	53%
Total Listed	Listed	1,032	56%	56%	4,476	85%	85%	5,508	78%	78%	334%
Total Delisted	Delisted	811	44%	44%	778	15%	15%	1,589	22%	22%	-4%
Total	Total	1,843	100%	100%	5,254	100%	100%	7,097	100%	100%	185%

APPENDIX 7 Accounting Treatments by Number of Firms

ACCOUNTING TREATMENT	LISTING STATUS	PRE 2005 PERIOD (1995-2004)			POST 2005 PERIOD (2005 - 2015)			1995 - 2015			
		NUMBER OF FIRMS	% OF EACH ACCOUNTING TREATMENT	% OF TOTAL NUMBER OF FIRMS	NUMBER OF FIRMS	% OF EACH ACCOUNTING TREATMENT	% OF TOTAL NUMBER OF FIRMS	NUMBER OF FIRMS	% OF EACH ACCOUNTING TREATMENT	% OF TOTAL NUMBER OF FIRMS	CHANGE FROM PRE 2005 TO POST 2005 PERIOD
Expensing	Listed	69	44%	21%	239	76%	30%	271	67%	31%	246%
	Delisted	87	56%	27%	75	24%	9%	131	33%	15%	-14%
	Total	156	100%	48%	314	100%	39%	402	100%	47%	101%
Capitalising	Listed	101	59%	31%	452	83%	57%	469	78%	54%	348%
	Delisted	69	41%	21%	92	17%	12%	130	22%	15%	33%
	Total	170	100%	53%	543	100%	68%	598	100%	69%	219%
Combined Expensing & Capitalising	Listed	38	48%	12%	238	79%	30%	256	74%	30%	526%
	Delisted	42	53%	13%	65	21%	8%	90	26%	10%	55%
	Total	80	100%	25%	303	100%	38%	346	100%	40%	279%
No Expensing and Capitalising	Listed	104	59%	32%	264	80%	33%	314	74%	36%	154%
	Delisted	71	41%	22%	66	20%	8%	113	26%	13%	-7%
	Total	175	100%	54%	330	100%	41%	427	100%	49%	89%
Total Listed	Listed	182	56%	56%	612	77%	77%	628	73%	73%	236%
Total Delisted	Delisted	141	44%	44%	187	23%	23%	236	27%	27%	33%
Total	Total	323	100%	100%	798	100%	100%	863	100%	100%	147%

APPENDIX 8 Average Duration of Accounting Treatments used by Each Firm

| ACCOUNTING TREATMENT | LISTING STATUS | PRE 2005 PERIOD (1995-2004) | | | POST 2005 PERIOD (2005 - 2015) | | | 1995 - 2015 | | | |
		DURATION OF ACCOUNTING TREATMENT (YR)	% OF EACH ACCOUNTING TREATMENT	% OF TOTAL NUMBER OF FIRMS	DURATION OF ACCOUNTING TREATMENT (YR)	% OF EACH ACCOUNTING TREATMENT	% OF TOTAL NUMBER OF FIRMS	DURATION OF ACCOUNTING TREATMENT (YR)	% OF EACH ACCOUNTING TREATMENT	% OF TOTAL NUMBER OF FIRMS	CHANGE FROM PRE 2005 TO POST 2005 PERIOD
Expensing	Listed	3.41	N/A	N/A	3.75	N/A	N/A	4.18	N/A	N/A	10%
	Delisted	3.85	N/A	N/A	2.72	N/A	N/A	4.11	N/A	N/A	-29%
	Total	3.65	N/A	N/A	3.51	N/A	N/A	4.16	N/A	N/A	-4%
Capitalising	Listed	3.90	N/A	N/A	5.03	N/A	N/A	5.68	N/A	N/A	29%
	Delisted	3.03	N/A	N/A	3.00	N/A	N/A	3.73	N/A	N/A	-1%
	Total	3.55	N/A	N/A	4.69	N/A	N/A	5.27	N/A	N/A	32%
Combined Expensing & Capitalising	Listed	1.66	N/A	N/A	2.79	N/A	N/A	2.84	N/A	N/A	68%
	Delisted	2.07	N/A	N/A	2.28	N/A	N/A	2.61	N/A	N/A	10%
	Total	1.88	N/A	N/A	2.68	N/A	N/A	2.78	N/A	N/A	43%
No Expensing and Capitalising	Listed	3.27	N/A	N/A	2.44	N/A	N/A	3.13	N/A	N/A	-25%
	Delisted	2.54	N/A	N/A	2.27	N/A	N/A	2.92	N/A	N/A	-10%
	Total	2.97	N/A	N/A	2.40	N/A	N/A	3.07	N/A	N/A	-19%
Total Listed	Listed	5.67	N/A	N/A	7.31	N/A	N/A	8.77	N/A	N/A	29%
Total Delisted	Delisted	5.75	N/A	N/A	4.16	N/A	N/A	6.73	N/A	N/A	-28%
Total	Total	5.71	N/A	N/A	6.58	N/A	N/A	8.22	N/A	N/A	15%

APPENDIX 9 Financial Characteristics of Firms Adopting Accounting Treatments

Accounting Treatment Firms	LISTING STATUS	PRE 2005 PERIOD			POST 2005 PERIOD			$ AMT PER AFFECTED ACCOUNTING TREATMENT FIRM			$ AMT PER FIRM YEAR IN ENTIRE SAMPLE (7079)			% CHANGE FROM PRE 2005 TO POST 2005 PERIOD	
		N	MEAN	MEDIAN	N	MEAN	MEDIAN	N	MEAN	MEDIAN	N	MEAN	MEDIAN	MEAN	MEDIAN
Amount reported for specific period															
Expensing Firms	Listed	235	1,665,174	352,112	897	2,162,101	821,652	1,132	2,058,941	726,719	5,508	650,122	-	30%	133%
	Delisted	335	6,194,978	719,205	204	10,500,000	2,548,584	539	7,812,906	1,180,710	1,589	3,254,695	-	69%	254%
	Total	570	4,327,427	531,541	1,101	3,701,402	995,148	1,671	3,914,947	834,337	7,097	1,233,279	-	-14%	87%
Capitalising Firms	Listed	394	1,605,185	651,551	2,272	3,006,839	1,437,180	2,666	2,799,693	1,291,455	5,508	1,884,851	348,157	87%	121%
	Delisted	209	2,513,254	1,069,533	276	6,678,232	2,676,521	485	4,883,427	1,704,321	1,589	2,449,431	-	166%	150%
	Total	603	1,919,922	778,223	2,548	3,404,525	1,519,438	3,151	3,120,420	1,350,162	7,097	2,011,259	229,024	77%	95%
Ratio: Exp vs. Cap (x)			2.25			1.09			1.25						
Combining Expensing and Capitalising*	Listed	63	5,458,976	1,412,758	664	5,759,056	2,224,044	727	5,733,052	2,180,339	5,508	2,534,973	871,303	5%	57%
* addition of expensing and capitalising	Delisted	87	9,452,985	2,140,360	148	11,200,000	5,158,706	235	10,600,000	3,626,000	1,589	5,704,126	964,589	18%	141%
	Total	150	7,775,501	1,745,342	812	6,755,962	2,357,337	962	6,914,934	2,261,871	7,097	3,244,538	887,541	-13%	35%
Lagged Exploration Asset (accumulated)															
Expensing Firms	Listed	200	3,378,511	2,151,105	796	2,982,971	-	996	3,062,396	151,078				-12%	-100%
	Delisted	278	7,121,713	1,733,212	180	8,099,637	7,923	458	7,506,050	883,769				14%	-100%
	Total	478	5,555,520	1,965,731	976	3,926,618	-	1,454	4,462,117	294,257				-29%	-100%
Capitalising Firms	Listed	334	4,825,092	2,245,361	2,052	10,900,000	5,312,566	2,386	10,000,000	4,671,173				126%	137%
	Delisted	164	7,025,010	2,629,893	236	20,400,000	7,407,132	400	14,900,000	4,614,027				190%	182%
	Total	498	5,549,563	2,342,390	2,288	11,900,000	5,469,157	2,786	10,700,000	4,669,579				114%	133%
Ratio: Exp vs. Cap (x)			1.00			0.33			0.42						
Combining Expensing and Capitalising	Listed	41	6,053,217	1,654,025	612	17,000,000	4,995,112	653	16,300,000	4,808,740				181%	202%
	Delisted	75	7,821,044	1,480,000	131	17,700,000	7,570,148	206	14,100,000	4,273,770				126%	411%
	Total	116	7,196,208	1,480,373	743	17,100,000	5,409,224	859	15,800,000	4,682,070				138%	265%
Lagged Total Asset															
Expensing Firms	Listed	200	8,842,628	6,458,238	796	14,200,000	4,468,904	996	13,200,000	4,999,896				61%	n/a
	Delisted	278	377,000,000	14,300,000	180	743,000,000	22,700,000	458	521,000,000	17,100,000				97%	n/a
	Total	478	223,000,000	8,297,708	976	149,000,000	5,501,304	1,454	173,000,000	6,439,023				-33%	n/a
Capitalising Firms	Listed	334	11,700,000	5,293,031	2,052	24,400,000	9,685,072	2,386	22,600,000	8,844,903				109%	83%
	Delisted	164	74,000,000	7,266,977	236	72,800,000	16,300,000	400	73,300,000	12,400,000				-2%	124%
	Total	498	32,200,000	5,723,594	2,288	29,400,000	10,100,000	2,786	29,900,000	9,277,254				-9%	76%
Ratio: Exp vs. Cap (x)			6.93			5.07			5.79						
Combining Expensing and Capitalising	Listed	41	20,100,000	5,840,422	612	33,900,000	11,800,000	653	33,000,000	11,200,000				69%	102%
	Delisted	75	245,000,000	7,456,996	131	78,700,000	22,300,000	206	139,000,000	16,700,000				-68%	199%
	Total	116	166,000,000	6,627,891	743	41,800,000	12,700,000	859	58,500,000	12,100,000				-75%	92%

APPENDIX 9 (Cont.) Financial Characteristics of Firms Adopting Accounting Treatments

Accounting Treatment Firms	LISTING STATUS	PRE 2005 PERIOD			POST 2005 PERIOD			$ AMT PER AFFECTED ACCOUNTING TREATMENT FIRM			$ AMT PER FIRM YEAR IN ENTIRE SAMPLE (7079)			% CHANGE FROM PRE 2005 TO POST 2005 PERIOD	
		N	MEAN	MEDIAN	N	MEAN	MEDIAN	N	MEAN	MEDIAN	N	MEAN	MEDIAN	MEAN	MEDIAN
Write-off															
Expensing Firms	Listed	235	221,626	-	897	441,480	-	1,132	395,839	-				99%	n/a
	Delisted	335	104,343	-	204	258,676	-	539	162,755	-				148%	n/a
	Total	570	152,697	-	1,101	407,609	-	1,671	320,655	-				167%	n/a
Capitalising Firms	Listed	394	852,648	123,494	2,272	1,861,839	175,097	2,666	1,712,694	162,774				118%	42%
	Delisted	209	1,304,172	159,752	276	1,895,129	3,521	485	1,640,469	80,374				45%	-98%
	Total	603	1,009,147	130,264	2,548	1,865,445	146,896	3,151	1,701,577	145,313				85%	13%
Ratio: Exp vs. Cap (x)			0.15			0.22			0.19						
Combining Expensing and Capitalising	Listed	63	3,771,217	81,737	664	1,814,545	106,821	727	1,984,105	106,625				-52%	31%
	Delisted	87	1,806,044	104,243	148	1,899,980	85,694	235	1,865,204	101,000				5%	-18%
	Total	150	2,631,417	102,319	812	1,830,117	104,314	962	1,955,059	103,973				-30%	2%
Leverage (TL/TA)															
Expensing Firms	Listed	235	0.39	0.06	897	0.48	0.08	1,132	0.46	0.08				23%	25%
	Delisted	335	0.37	0.16	204	0.26	0.11	539	0.33	0.13				-28%	-28%
	Total	570	0.38	0.11	1,101	0.44	0.08	1,671	0.42	0.09				16%	-24%
Capitalising Firms	Listed	394	1.91	0.05	2,272	0.49	0.05	2,666	0.70	0.05				-74%	10%
	Delisted	209	0.21	0.11	276	0.20	0.06	485	0.20	0.06				-7%	-49%
	Total	603	1.32	0.06	2,548	0.46	0.05	3,151	0.62	0.05				-65%	-14%
Ratio: Exp vs. Cap (x)			0.28			0.95			0.67						
Combining Expensing and Capitalising	Listed	63	0.30	0.05	664	0.23	0.06	727	0.24	0.05				-24%	18%
	Delisted	87	0.33	0.20	148	0.28	0.12	235	0.29	0.13				-16%	-38%
	Total	150	0.32	0.10	812	0.24	0.06	962	0.25	0.07				-24%	-36%
Equity Raising															
Expensing Firms	Listed	235	2,475,891	749,050	897	3,891,417	815,386	1,132	3,597,558	791,671				57%	9%
	Delisted	335	15,400,000	869,869	204	29,400,000	2,998,555	539	20,700,000	1,354,296				91%	245%
	Total	570	10,100,000	812,000	1,101	8,624,592	993,132	1,671	9,127,049	932,200				-15%	22%
Capitalising Firms	Listed	394	2,882,406	751,731	2,272	4,812,003	1,515,869	2,666	4,526,834	1,346,922				67%	102%
	Delisted	209	9,818,327	997,560	276	14,600,000	3,824,968	485	12,600,000	2,354,000				49%	283%
	Total	603	5,286,398	790,000	2,548	5,876,247	1,717,665	3,151	5,763,369	1,442,911				11%	117%
Ratio: Exp vs. Cap (x)			1.91			1.47			1.58						
Combining Expensing and Capitalising	Listed	63	13,600,000	449,000	664	5,331,153	2,242,050	727	6,044,532	2,030,058				-61%	399%
	Delisted	87	6,512,015	1,005,000	148	17,000,000	4,354,498	235	13,100,000	2,160,861				161%	333%
	Total	150	9,473,561	908,500	812	7,456,872	2,392,577	962	7,771,324	2,030,654				-21%	163%

Accounting Treatment Firms	LISTING STATUS	PRE 2005 PERIOD			POST 2005 PERIOD			$ AMT PER AFFECTED ACCOUNTING TREATMENT FIRM			$ AMT PER FIRM YEAR IN ENTIRE SAMPLE (7079)			% CHANGE FROM PRE 2005 TO POST 2005 PERIOD	
		N	MEAN	MEDIAN	N	MEAN	MEDIAN	N	MEAN	MEDIAN	N	MEAN	MEDIAN	MEAN	MEDIAN
						Npat									
Expensing Firms	Listed	235	-2,155,087.00	-1,218,912.00	897.00	-1,847,472.00	-1,772,002.00	1,132.00	-1,911,332.00	-1,609,140.00				-14%	45%
	Delisted	335	-3,847,540.00	-968,349.00	204.00	9,219,331.00	-3,150,155.00	539.00	1,097,992.00	-1,358,546.00				-340%	225%
	Total	570	-3,149,774.00	-1,130,513.00	1,101.00	203,052.40	-1,907,582.00	1,671.00	-940,640.70	-1,551,919.00				-106%	69%
Capitalising Firms	Listed	394	-2,688,234.00	-609,342.00	2,272.00	-3,431,948.00	-1,477,232.00	2,666.00	-3,322,037.00	-1,296,329.00				28%	142%
	Delisted	209	-5,830,376.00	-695,641.00	276.00	-712,877.00	-1,713,982.00	485.00	-2,918,150.00	-1,186,650.00				-88%	146%
	Total	603	-3,777,302.00	-639,000.00	2,548.00	-3,137,418.00	-1,501,049.00	3,151.00	-3,259,871.00	-1,280,847.00				-17%	135%
Ratio: Exp vs. Cap (x)			0.83			-0.06			0.29						
Combining Expensing and Capitalising	Listed	63	-874,215.00	-715,696.00	664.00	-4,275,929.00	-1,934,114.00	727.00	-3,981,145.00	-1,749,094.00				389%	170%
	Delisted	87	10,700,000.00	-1,471,802.00	148.00	-4,128,771.00	-2,822,053.00	235.00	1,379,505.00	-2,028,096.00				-139%	92%
	Total	150	5,867,774.00	-942,566.50	812.00	-4,249,107.00	-2,060,943.00	962.00	-2,671,631.00	-1,824,994.00				-172%	119%
						Cash									
Expensing Firms	Listed	235	2,686,316	728,792	897	6,005,433	1,868,957	1,132	5,316,393	1,565,253				124%	156%
	Delisted	335	45,600,000	1,925,107	204	69,900,000	7,722,500	539	54,800,000	3,624,000				53%	301%
	Total	570	27,900,000	1,369,688	1,101	17,800,000	2,253,057	1,671	21,300,000	1,941,797				-36%	64%
Capitalising Firms	Listed	394	1,905,364	739,962	2,272	5,504,565	1,746,143	2,666	4,972,650	1,588,424				189%	136%
	Delisted	209	9,647,816	2,022,024	276	17,800,000	4,229,933	485	14,300,000	3,207,622				84%	109%
	Total	603	4,588,901	1,066,708	2,548	6,831,501	1,920,199	3,151	6,402,339	1,739,188				49%	80%
Ratio: Exp vs. Cap (x)			6.08			2.61			3.33						
Combining Expensing and Capitalising	Listed	63	4,344,671	1,548,000	664	5,443,353	2,219,161	727	5,348,144	2,201,913				25%	43%
	Delisted	87	16,900,000	1,801,000	148	24,100,000	6,644,166	235	21,400,000	4,156,000				43%	269%
	Total	150	11,600,000	1,744,847	812	8,845,115	2,581,447	962	9,274,584	2,383,160				-24%	48%

APPENDIX 10 Auditors in the MDSE Universe from 1995 - 2015

Full list of auditors in the MDSE universe from 1995 – 2015

#	Auditor	#	Auditor
1	A S DANIELI	68	JOHNSTONE RORKE
2	ABBOTT	69	K S Black
3	ADP	70	K WESTAWAY
4	Advantage Advisors	71	KPMG
5	ALCOCK DAVIS DANIELI	72	KPMG
6	ALEXANDER & SPENCER	73	LACHLAN NIELSON
7	ANDREW FREWIN STEWART	74	LAWLER HACKETTS
8	Armitage Downie	75	LEYDIN FREYER
9	ARTHUR ANDERSEN	76	LEYDIN FREYER
10	BAKER TILLY	77	LOREN DATT
11	BARNES DOWELL JAMES	78	LUCIEOSMITH GREVLER
12	BARWICK	79	MACK & CO
13	BDJ	80	MARTIN HAGER
14	BDO	81	MAXIM
15	BENTLEYS	82	MAXIM HALL CHADWICK
16	BRENTNALLS	83	MCGOVERN HURLEY CUNNINGHAM
17	BROMLEYS	84	MCINTOSH BISHOP
18	BUTLER SETTINERI	85	MELANIE LEYDIN
19	BYFIELDS	86	MEYERS NORRIS PENNY
20	CAMPHIN BOSTON	87	MGI
21	Carbone Falconer	88	MGI BRIDGE
22	CARLTON DFK	89	MGI MEYRICK WEBSTER
23	CDTL	90	MOORE STEPHENS
24	CHAN CHAK CHUNG	91	Moores Rowland
25	CHAPMAN DAVIS	92	Moyes Yong & Co
26	CLARENCE	93	MSI
27	COLIN H JAMES	94	MSI RAGG WEIR
28	CONNECT AUDIT	95	MSI TILLEY
29	CORMAC SHARKEY	96	NEXIA
30	COWELL ABBOTT	97	NEXIA ALEXANDER & SPENCER
31	CROWE HORWATH	98	NEXIA COURT
32	D F K Carlton	99	ORD NEXIA
33	D F KAYE	100	ORD PARTNERS
34	DAVIDSON & COMPANY	101	PALMERS
35	DELOITTE	102	PARKER SIMONE
36	DESAI	103	PETER F BARNES
37	DFK LAURENCE VARNAY	104	PHILIP A JOANNOU
38	DOUGLAS HECK & BURRELL	105	PITCHER
39	DTT	106	PKF
40	DUNCAN DOVICO	107	PKF HACKETTS
41	EDWARDS VEEDER	108	PKF MACK
42	EY	109	PRIESTLEY & MORRIS
43	FAIZAL AJAMT	110	PWC
44	FRANCIS A JONES	111	R G LEDGER
45	GEORGE GEORGIOU	112	RLF BENTLEYS
46	GOULD RALPH	113	ROBERT NIELSON
47	GRAHAM ABBOTT	114	ROBERTSONS
48	GRANT THORNTON	115	RONALD SMITH
49	GREG LEDGER	116	ROTHSAY
50	HACKETTS	117	RSM
51	HACKETTS DFK	118	RT KIDD
52	Hall Chadwick	119	SCS
53	HALL PUDDY & WALES	120	SINTON SPENCE
54	HARPER WOOTON	121	SOMES COOKE
55	HAYES KNIGHT	122	SOTHERTONS
56	HEWITT TURNER GELEVITIS	123	SPENCER & CO
57	HLB MANN JUDD	124	STANTONS
58	HORWATH	125	Taylor Partners
59	HORWATH ORENSTEIN	126	TRAVIS & TRAVIS
60	HUGHES FINCHER	127	UHY HACKER YOUNG
61	I J Lamb	128	WEBB
62	IAN D RILEY	129	WHK HORWATH
63	IAN GRANT	130	WHYTE
64	IAN YOUNG	131	WIDIN & COMPANY
65	IJ LAMB & CO	132	WILLIAM BUCK
66	J F GAYNOR	133	YOUNG AND CULLEN
67	JACKSON GREEVE		

APPENDIX 10 (CONT.)

#	Specialist audit firms includ. Big 4	Years of audit appointments over 1995-2015*
1	BDO	21
2	DELOITTE	21
3	EY	21
4	GRANT THORNTON	21
5	HLB MANN JUDD	21
6	KPMG	21
7	PWC	21
8	STANTONS	21
9	RSM	20
10	PKF	19
11	SOMES COOKE	13
12	BENTLEYS	11
13	ARTHUR ANDERSEN	10
14	HORWATH	10
*If auditor consistently rank above 9.54th position, they are considered to have depth and industry knowledge and experience in the specific area		

APPENDIX 11 Descriptive Statistics for Firms with Write-Offs Reported

VARIABLES	wo 1 N	mean	median	sd	min	max	skewness	kurtosis
EXPL_WO	3,194	2,522,000.00	570,546.00	8,298,000.00	10.00	233,700,000.00	12.92	261.20
NON_EXPL_ABS	3,194	6.92	0.61	76.24	0.00	2747.00	24.34	710.70
CASH_BURN	3,194	35.87	0.61	1570.00	0.00	88580.00	56.19	3169.00
BIG4	3,194	0.06	0.00	0.23	0.00	1.00	3.80	15.42
NON_BIG4_SPECIALIST	3,194	0.50	0.00	0.50	0.00	1.00	0.01	1.00
LEVERAGE	3,194	0.65	0.06	13.57	0.00	667.60	42.38	1955.00
EQUITY_RAISING_ABS	3,194	5,553,000.00	1,292,000.00	22,640,000.00	0.00	715,500,000.00	18.22	477.10
LOSS	3,194	0.99	1.00	0.12	0.00	1.00	-8.34	70.60
LAGGED_EXPL_ASSET_CLOSING_ABS	2,931	11,540,000.00	4,500,000.00	30,930,000.00	0.00	853,100,000.00	11.92	234.90
EXPL_ASSET_CLOSING	3,194	11,780,000.00	4,632,000.00	26,690,000.00	0.00	381,100,000.00	6.97	69.21
LAGGED_TA_ABS	2,931	34,370,000.00	9,311,000.00	181,900,000.00	0.00	7,560,000,000.00	27.71	1046.00
TA	3,194	48,140,000.00	9,332,000.00	314,400,000.00	0.00	8,163,000,000.00	19.11	423.10
BTM_ABS	3,194	1.32	0.72	4.82	0.00	177.80	28.87	987.30
IFRS	3,194	0.79	1.00	0.41	0.00	1.00	-1.41	3.00
CLEAN	3,194	0.66	1.00	0.47	0.00	1.00	-0.70	1.48
UNCLEAN	3,194	0.34	0.00	0.47	0.00	1.00	0.70	1.48
EOM_ASSET_RECOVER	3,194	0.32	0.00	0.46	0.00	1.00	0.80	1.64
EOM_CASHFLOW	3,194	0.13	0.00	0.34	0.00	1.00	2.21	5.88
EOM_LOSS	3,194	0.21	0.00	0.41	0.00	1.00	1.43	3.05
EOM_NET_LIAB	3,194	0.06	0.00	0.24	0.00	1.00	3.58	13.80
PRE_DRILL	3,194	0.22	0.00	0.41	0.00	1.00	1.37	2.87
JORC	3,194	0.81	1.00	0.39	0.00	1.00	-1.56	3.44
PRE_DEV	3,194	0.11	0.00	0.32	0.00	1.00	2.43	6.90
PRE_PROJ_FIN	3,194	0.82	1.00	0.38	0.00	1.00	-1.71	3.91
PERCENT_COMM_PRICE	2,929	5.46	4.59	28.51	-54.02	100.60	0.50	3.06
PRECENT_COMM_CUR	2,929	0.07	-0.07	13.34	-25.13	33.26	0.37	2.28
TOP_20_SHAREHOLDERS	3,071	57.47	57.26	16.37	0.00	100.00	0.01	2.86
MGT_CHANGE	3,194	0.23	0.00	0.42	0.00	1.00	1.29	2.66

APPENDIX 11 (CONT.) Descriptive Statistics for Firms with Write-Offs Reported

VARIABLES	wo 0 N	mean	median	sd	min	max	skewness	kurtosis
EXPL_WO	3,903	0.00	0.00	0.00	0.00	0.00		
NON_EXPL_ABS	3,903	28.87	0.48	1030.00	0.00	63010.00	58.96	3585.00
CASH_BURN	3,903	137.10	0.62	5080.00	0.00	259405.00	44.83	2104.00
BIG4	3,903	0.07	0.00	0.26	0.00	1.00	3.35	12.22
NON_BIG4_SPECIALIST	3,903	0.44	0.00	0.50	0.00	1.00	0.24	1.06
LEVERAGE	3,903	2.56	0.08	126.40	0.00	7885.00	62.22	3881.00
EQUITY_RAISING_ABS	3,903	9,210,000.00	1,229,000.00	53,070,000.00	0.00	1,716,000,000.00	18.34	440.20
LOSS	3,903	0.95	1.00	0.22	0.00	1.00	-4.04	17.28
LAGGED_EXPL_ASSET_CLOSING_ABS	3,203	6,712,000.00	843,116.00	22,160,000.00	0.00	408,500,000.00	10.98	165.60
EXPL_ASSET_CLOSING	3,903	7,597,000.00	941,126.00	28,320,000.00	0.00	853,100,000.00	13.58	282.80
LAGGED_TA_ABS	3,203	130,600,000.00	8,032,000.00	971,200,000.00	0.00	22,860,000,000.00	16.09	304.90
TA	3,903	141,500,000.00	8,298,000.00	946,300,000.00	0.00	22,860,000,000.00	15.15	284.50
BTM_ABS	3,903	1.17	0.52	6.10	0.00	337.90	44.53	2399.00
IFRS	3,903	0.70	1	0.45	0.00	1.00	-0.87	1.77
CLEAN	3,903	0.70	1.00	0.46	0.00	1.00	-0.87	1.75
UNCLEAN	3,903	0.30	0.00	0.46	0.00	1.00	0.87	1.75
EOM_ASSET_RECOVER	3,903	0.24	0.00	0.43	0.00	1.00	1.22	2.49
EOM_CASHFLOW	3,903	0.09	0.00	0.28	0.00	1.00	2.96	9.78
EOM_LOSS	3,903	0.16	0.00	0.37	0.00	1.00	1.86	4.47
EOM_NET_LIAB	3,903	0.05	0.00	0.21	0.00	1.00	4.29	19.38
PRE_DRILL	3,903	0.16	0.00	0.37	0.00	1.00	1.81	4.29
JORC	3,903	0.72	1.00	0.45	0.00	1.00	-1.00	1.99
PRE_DEV	3,903	0.11	0.00	0.31	0.00	1.00	2.51	7.28
PRE_PROJ_FIN	3,903	0.76	1.00	0.43	0.00	1.00	-1.22	2.48
PERCENT_COMM_PRICE	3,189	7.78	6.99	28.26	-49.90	100.60	0.46	2.98
PRECENT_COMM_CUR	3,189	1.22	1.56	13.19	-30.37	33.26	0.20	2.18
TOP_20_SHAREHOLDERS	3,603	60.07	59.99	19.47	0.00	100.00	0.32	3.24
MGT_CHANGE	3,903	0.18	0.00	0.39	0.00	1.00	1.62	3.64

APPENDIX 12 Regression Analysis on Determinants of Write-offs Year-on-Year

MODEL	Predicated Sign	1995 (1)	1996 (2)	1997 (3)	1998 (4)	1999 (5)	2000 (6)	2001 (7)
NON_EXPL	-	0.181	0.107	-0.115	0.0229	0.126	-0.0535	-0.205
		(0.154)	(0.331)	(0.238)	(0.177)	(0.205)	(0.156)	(0.188)
CASH_BURN_RATE	-	-0.0619	0.455	-0.164	-0.223	0.246	-0.0622	-0.596*
		(0.132)	(0.391)	(0.274)	(0.192)	(0.249)	(0.212)	(0.328)
BIG4	+	0.297	1.265*	-1.218	1.007	-0.277	-0.620	-0.900
		(0.533)	(0.738)	(1.074)	(0.792)	(0.698)	(0.729)	(0.828)
NON_BIG4_SPECIALIST	+	0.00252	0.984**	0.497	-0.247	-0.330	0.183	0.371
		(0.239)	(0.454)	(0.449)	(0.464)	(0.410)	(0.403)	(0.479)
LEV	?	0.137	-0.664	-1.746	-1.447*	-0.0164	-0.533	0.134
		(0.184)	(1.263)	(1.287)	(0.806)	(0.680)	(0.921)	(0.925)
EQUITY_RAISING	+	0.0232	-2.91e-05	-0.0417	-0.0378	-0.00253	-0.0344	-0.0449
		(0.0177)	(0.0332)	(0.0352)	(0.0283)	(0.0283)	(0.0291)	(0.0306)
LN_CASH	+	0.0451	0.439*	0.00893	-0.0762	0.248	-0.00780	0.0573
		(0.0398)	(0.260)	(0.117)	(0.142)	(0.171)	(0.0953)	(0.127)
LN_LAGGED_EXPL_ASSET	+	0.240***	0.154**	0.160***	0.175***	0.160***	0.114***	0.303***
		(0.0291)	(0.0614)	(0.0380)	(0.0409)	(0.0471)	(0.0365)	(0.0535)
LN_LAGGED_TA	-	-0.0782	-0.765**	-0.0431	-0.0896	-0.371**	-0.0223	-0.105
		(0.0549)	(0.301)	(0.136)	(0.109)	(0.171)	(0.0941)	(0.158)
EOM_ASSET_RECOVER	+	-0.107	1.562***	-0.217	-0.725	-0.254	-0.0880	0.875*
		(0.289)	(0.590)	(0.563)	(0.514)	(0.546)	(0.531)	(0.522)
EOM_CASHFLOW	+	0.0399	-0.768	1.621**		0.828	0.260	
		(0.282)	(0.792)	(0.792)		(1.076)	(1.679)	
EOM_NET_LIAB	+	-0.133	0.168	-1.046	0.653	0.407	1.937	
		(0.379)	(1.577)	(1.185)	(0.950)	(0.935)	(1.434)	
JORC	-	-0.144	0.0310	-0.321	0.233	0.530	-0.348	-0.868*
		(0.285)	(0.567)	(0.430)	(0.521)	(0.430)	(0.427)	(0.462)
PRECENT_COMM_CUR	+	-0.170***	-0.295**	0.00743	0.0522	-0.0727	0.116	-0.135
		(0.0599)	(0.147)	(0.0444)	(0.0476)	(0.450)	(0.0870)	(0.0834)
Constant		-5.462***	5.396	-1.032	1.276	0.150	0.529	-4.227
		(1.294)	(3.393)	(2.426)	(1.907)	(3.591)	(1.645)	(2.589)
FIXED EFFECTS		NO	NO	NO	NO	NO	NO	NO
CLUSTERED STANDARD ERROR		YES	YES	YES	YES	YES	YES	YES
Observations		494	131	146	152	161	163	161
Pseudo R-squared		0.271	0.191	0.148	0.192	0.159	0.0901	0.249
LR Chi-squared		98.32	17.39	30.70	38.74	25.18	17.76	46.77

APPENDIX 12 (CONT.) Regression Analysis on Determinants of Write-offs Year-on-Year

MODEL	Predicated Sign	2002 (8)	2003 (9)	2004 (10)	2005 (11)	2006 (12)	2007 (13)	2008 (14)
NON_EXPL	-	-0.0176	-0.127	0.330*	-0.0810	0.0866	-0.0609	-0.245**
		(0.141)	(0.122)	(0.189)	(0.175)	(0.151)	(0.127)	(0.120)
CASH_BURN_RATE	-	0.0469	-0.378*	-0.286	-0.284	-0.189	-1.270***	-0.217
		(0.239)	(0.219)	(0.281)	(0.247)	(0.230)	(0.290)	(0.209)
BIG4	+	0.129	0.840	0.823	0.327	-0.620	-0.241	-0.611
		(0.721)	(0.727)	(0.968)	(0.552)	(0.564)	(0.605)	(0.495)
NON_BIG4_SPECIALIST	+	0.161	0.494	1.011**	0.561*	-0.142	-0.392	-0.117
		(0.375)	(0.370)	(0.395)	(0.328)	(0.305)	(0.281)	(0.234)
LEV	?	-0.661	0.441	-2.224*	-1.155	-0.745	1.136	-0.247
		(0.484)	(0.316)	(1.157)	(0.840)	(0.718)	(0.759)	(0.646)
EQUITY_RAISING	+	-0.00393	0.00374	0.0638	0.0508*	-0.0209	0.00192	0.00891
		(0.0284)	(0.0280)	(0.0507)	(0.0267)	(0.0276)	(0.0275)	(0.0194)
LN_CASH	+	0.175**	-0.0308	0.00377	-0.169	0.0749	-0.359***	-0.104
		(0.0825)	(0.0775)	(0.160)	(0.125)	(0.0497)	(0.119)	(0.0920)
LN_LAGGED_EXPL_ASSET	+	0.110***	0.142***	0.220***	0.112***	0.152***	0.144***	0.148***
		(0.0322)	(0.0390)	(0.0495)	(0.0252)	(0.0295)	(0.0258)	(0.0232)
LN_LAGGED_TA	-	-0.111	-0.0670	-0.139	0.0810	-0.0295	0.0818*	-0.0163
		(0.0865)	(0.0882)	(0.118)	(0.127)	(0.0823)	(0.0467)	(0.0386)
EOM_ASSET_RECOVER	+	0.668	0.163	-0.484	0.409	0.641	0.880*	0.276
		(0.417)	(0.491)	(0.689)	(0.481)	(0.423)	(0.469)	(0.331)
EOM_CASHFLOW	+				0.786	-0.703	-0.843	-0.142
					(1.082)	(0.938)	(1.083)	(0.531)
EOM_NET_LIAB	+	0.314	-0.117	2.633***	-0.756	0.412	0.339	-0.148
		(0.927)	(0.934)	(0.982)	(0.913)	(0.850)	(1.110)	(0.706)
JORC	-	0.231	0.719*	1.215**	0.587	0.180	0.0857	-0.453
		(0.353)	(0.428)	(0.513)	(0.371)	(0.339)	(0.340)	(0.300)
PRECENT_COMM_CUR	+	-0.625	-0.000322	0.333	-0.0297	-0.0519	0.0967	-0.0116
		(1.093)	(0.0342)	(0.496)	(0.0278)	(0.0422)	(0.126)	(0.0107)
Constant		4.522	-1.220	-4.198**	-1.057	-2.449*	1.462	0.565
		(12.46)	(1.561)	(2.084)	(1.367)	(1.323)	(2.523)	(1.455)
FIXED EFFECTS		NO	NO	NO	NO	NO	NO	NO
CLUSTERED STANDARD ERROR		YES	YES	YES	YES	YES	YES	YES
Observations		176	189	195	222	255	303	392
Pseudo R-squared		0.109	0.152	0.277	0.125	0.144	0.183	0.128
LR Chi-squared		21.81	29.40	49.19	37.22	37.03	57.81	51.43

APPENDIX 12 (CONT.) Regression Analysis on Determinants of Write-offs Year-on-Year

MODEL	Predicated Sign	2009 (15)	2010 (16)	2011 (17)	2012 (18)	2013 (19)	2014 (20)	2015 (21)
NON_EXPL	-	0.0369	-0.133	-0.382***	-0.0870	0.153	0.105	0.181
		(0.128)	(0.138)	(0.135)	(0.106)	(0.128)	(0.140)	(0.154)
CASH_BURN_RATE	-	-0.0557	0.160	-0.158	-0.105	0.150	0.0586	-0.0619
		(0.150)	(0.173)	(0.209)	(0.158)	(0.124)	(0.102)	(0.132)
BIG4	+	0.189	-0.366	0.0802	-0.794*	-0.294	0.128	0.297
		(0.466)	(0.452)	(0.399)	(0.406)	(0.437)	(0.444)	(0.533)
NON_BIG4_SPECIALIST	+	0.0515	0.176	0.210	-0.0770	0.413**	0.356	0.00252
		(0.237)	(0.219)	(0.230)	(0.221)	(0.205)	(0.231)	(0.239)
LEV	?	-0.00102	-0.936	-0.410	-0.0480	-0.376	-0.123	0.137
		(0.312)	(0.637)	(0.530)	(0.290)	(0.355)	(0.245)	(0.184)
EQUITY_RAISING	+	-0.00610	-0.0307*	0.0299	0.0152	0.0132	0.0102	0.0232
		(0.0171)	(0.0172)	(0.0183)	(0.0153)	(0.0144)	(0.0161)	(0.0177)
LN_CASH	+	-0.0684	0.0681	-0.0750	-0.0411	-0.0350	0.181***	0.0451
		(0.0774)	(0.0728)	(0.0835)	(0.0842)	(0.0684)	(0.0357)	(0.0398)
LN_LAGGED_EXPL_ASSET	+	0.190***	0.114***	0.174***	0.170***	0.173***	0.269***	0.240***
		(0.0231)	(0.0191)	(0.0216)	(0.0226)	(0.0213)	(0.0346)	(0.0291)
LN_LAGGED_TA	-	-0.0504	-0.0871	0.0498	0.0341	-0.00677	-0.165***	-0.0782
		(0.0708)	(0.0695)	(0.0605)	(0.0547)	(0.0671)	(0.0582)	(0.0549)
EOM_ASSET_RECOVER	+	0.796**	-0.00105	0.220	-0.0680	0.0174	0.170	-0.107
		(0.329)	(0.291)	(0.327)	(0.278)	(0.271)	(0.282)	(0.289)
EOM_CASHFLOW	+	-0.0117	-0.593	0.0564	0.289	-0.0212	-0.198	0.0399
		(0.568)	(0.484)	(0.474)	(0.334)	(0.294)	(0.284)	(0.282)
EOM_NET_LIAB	+	0.225	0.471	0.0446	0.346	-0.142	-0.0557	-0.133
		(0.501)	(0.705)	(0.608)	(0.408)	(0.375)	(0.371)	(0.379)
JORC	-	-0.0597	-0.557**	-0.651**	0.405	-0.149	0.0107	-0.144
		(0.281)	(0.270)	(0.287)	(0.270)	(0.263)	(0.280)	(0.285)
PRECENT_COMM_CUR	+	-0.00531	-0.0455*	0.0128	-0.0609	0.0433	0.0967***	-0.170***
		(0.00890)	(0.0261)	(0.0128)	(0.0433)	(0.0623)	(0.0328)	(0.0599)
Constant		-0.444	-0.113	-1.700	-2.526**	-1.346	-3.655***	-5.462***
		(1.014)	(0.901)	(1.085)	(1.192)	(1.031)	(0.949)	(1.294)
FIXED EFFECTS		NO	NO	NO	NO	NO	NO	NO
CLUSTERED STANDARD ERROR		YES	YES	YES	YES	YES	YES	YES
Observations		448	452	478	529	538	522	494
Pseudo R-squared		0.213	0.0968	0.181	0.158	0.159	0.269	0.271
LR Chi-squared		86.23	52.01	80.12	74.42	86.38	101.6	98.32

The End