UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Gordon Institute of Business Science
University of Pretoria

The relationship between mineral resource reporting, shareholder value and investor confidence.

Liaan Bosman
23195275

A research project submitted to the Gordon Institute of Business Science, University of Pretoria, in partial fulfilment of the requirements for the degree of Master of Business Administration.

11 November 2013

Abstract

Mineral resources are the most important asset of a mining company and form the basis of its economic value. The communication of mineral resource estimates is essential for investors to make informed decisions. International reporting standards have been developed to improve the governance of mineral resources and to ensure that the information is communicated in such a way that it could be understood by interested stakeholders. In spite of this, many users still do not fully understand its potential impact on shareholder value and investor confidence. The basis of this study was to explore the relationship between mineral resource reporting, shareholder value and investor confidence.

This study was exploratory in nature and followed a quantitative research design. It was conducted on data from mining companies listed in Australia, Canada, England and South Africa. The time period selected was after the perceived end of the global financial crisis. Multiple linear regression and independent t-test analyses were employed to explore the relationship between mineral resource reporting, shareholder value and investor confidence.

This study found a significant relationship between mineral resource reporting and shareholder value for gold, non-gold and small-cap companies. The results further revealed a significant relationship between mineral resource reporting and investor confidence for large-cap companies. It further confirmed that mineral resource reporting is value relevant and found that the information contained therein is not consistently interpreted when compared to published research. Several new interpretations of mineral resource reporting information were identified as being statistically significant.

Keywords

Mineral resource reporting; shareholder value; investor confidence; mining industry

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

_____ 11 November 2013

Liaan Bosman Date

Acknowledgements

Firstly, I would like to thank my Heavenly Father for providing me with the capability, opportunity and strength to complete this degree. He is truly almighty.

I would like to thank my father, Jeremy, for his financial support, words of encouragement and for always being there when I need guidance or advice. Thank you for being my role model and mentor.

I especially want to thank the love of my life, Chané, for her unwavering support and encouragement. Thank you for your understanding and for the endless cups of coffee when I needed it most.

I also wish to thank my mother, Petro, and my brother, Brett, for their emotional support over the last two years.

I am grateful to Jean Britz, from Kumba Iron Ore, who provided me with practical and invaluable insights into the field of mineral resource reporting.

Lastly, I would like to thank my supervisor, Thea Pieterse, for her guidance and support with this research project.

Contents

1 Research Problem 1
1.1 Research Title 1
1.2 Background 1
1.3 Mineral Resources 2
1.4 Relevance and Motivation 2
1.5 Summary 4
1.6 Research Aim 4
1.7 Research Purpose 4
2 Literature Review 6
2.1 Introduction 6
2.2 Agency Theory 6
2.3 Information Asymmetry and Disclosure 7
2.4 Corporate Governance 9
2.5 Resource Reporting 10
2.5.1 Introduction 10
2.5.2 International Reporting Standards 11
2.6 Shareholder Value 13
2.7 Investor Confidence 14
2.8 Conclusion 15
3 Research Questions 17
3.1 Research Question 1 17
3.2 Research Question 2 17
3.3 Research Question 3 18
3.4 Research Question 4 18
4 Research Methodology 19
4.1 Research Design 19
4.2 Population 20
4.3 Unit of Analysis 21

4.4 Sampling Method and Size 21
4.5 Data Gathering 23
4.5.1 Financial Data 23
4.5.2 Mineral Resource Reporting Data 24
4.6 Data Analysis 25
4.6.1 Phase 1: Data Preparation 25
4.6.2 Phase 2: Regression Analyses 31
4.6.3 Phase 3: Hypothesis Analyses 35
4.7 Research Assumptions 36
4.8 Research Limitations 37
5 Results 38
5.1 Introduction 38
5.2 Descriptive Statistics 38
5.2.1 Sample Characteristics 38
5.3 Key Variables 41
5.3.1 Abnormal Shareholder Return (ASR) 41
5.3.2 P/E Ratio 43
5.3.3 Change in Total Mineral Resource 47
5.3.4 Total Mineral Resource Life of Mine 49
5.3.5 Reserve to Resource Ratio 51
5.4 Analysis 54
5.4.1 Regression Analyses 54
5.4.2 Hypothesis Analyses 75
5.5 Summary of Findings 77
5.5.1 Regression Analyses 77
5.5.2 Hypothesis Analyses 79
6 Discussion of Results 80
6.1 Research Question 1 80
6.1.1 Financial Reference Point 80

6.1.2 Mineral Resource Reports....81
6.1.3 Summary of Mineral Resource Reports....83
6.2 Research Question 2....85
6.2.1 Financial Reference Point....85
6.2.2 Mineral Resource Reports....85
6.3 Research Question 3....87
6.4 Research Question 4....88
6.5 Summary of Discussions....89
6.6 Limitations....90
7 Conclusion....91
7.1 Main Findings....91
7.2 Recommendations to Stakeholders....93
7.2.1 Mining Companies....93
7.2.2 Investors in the Mining Industry....94
7.2.3 Academia....94
7.3 Recommendations for Future Research....95
7.3.1 Qualitative Research Recommendations....95
7.3.2 Quantitative Research Recommendations....96
8 References....97
9 Appendices....104
9.1 Appendix A: Extract of Gathered Data....105
9.2 Appendix B: Complete List of Sampled Companies....106
9.3 Appendix C: Descriptive Statistics on Key Variables....108
9.4 Appendix D: Significant Regression Analyses Supporting Graphs....109
9.4.1 Research Question 1....109
9.4.2 Research Question 2....113
9.5 Appendix E: Non-Significant Regression Analyses....115
9.5.1 Research Question 1....115
9.5.2 Research Question 2....119

List of Figures

Figure 1 Bre-X Stock Price Collapse (Agora Financial, n.d.) 10
Figure 2 Mineral Resource and Reserve Classifications (Weatherstone, 2008) 12
Figure 3 Resource and Reserve Components 31
Figure 4 Market Capitalisation (MC) Histogram 40
Figure 5 Market Capitalisation (MC) by Stock Exchange 40
Figure 6 Resource Indices Performance Comparison 41
Figure 7 ASR Histogram 42
Figure 8 ASR Comparison by Stock Exchange 42
Figure 9 PE_Calc_{2012} Histogram 43
Figure 10 PE_Calc_{2012} Comparison by Stock Exchange 44
Figure 11 PE_Calc_{2012} vs. ASR Scatter Plot 45
Figure 12 ΔPE Histogram 46
Figure 13 ΔPE Comparison by Stock Exchange 46
Figure 14 ΔPE vs. ASR Scatter Plot 47
Figure 15 ΔTOT_RESO Histogram 48
Figure 16 ΔTOT_RESO Comparison by Stock Exchange 48
Figure 17 TOT_RESO_LOM Histogram 49
Figure 18 TOT_RESO_LOM by Stock Exchange 50
Figure 19 ΔTOT_RESO_LOM Histogram 50
Figure 20 ΔTOT_RESO_LOM by Stock Exchange 51
Figure 21 RESE_RESO_RATIO Histogram 52
Figure 22 RESE_RESO_RATIO by Stock Exchange 52
Figure 23 ΔRESE_RESO_RATIO Histogram 53
Figure 24 ΔRESE_RESO_RATIO by Stock Exchange 54

List of Tables

Table 1 Higher Level Sampling Frame 22
Table 2 Financial Variables 24
Table 3 Resource Reporting Variables 25
Table 4 Resource Indices per Stock Exchange 26
Table 5 Regression Analyses Summary 33
Table 6 Research Question 1: Regression Equations 34
Table 7 Research Question 2: Regression Equations 35
Table 8 Final Disproportionate Stratified Sample 38
Table 9 Commodity Type Frequency Distribution 39

Table 10 RQ1: Observations to Independent Variables Ratio....55
Table 11 RQ1 RE1 Results: Total Sample....56
Table 12 RQ1 RE1 Results: Gold Scenario....57
Table 13 RQ1 RE1 Results: Non-Gold Scenario....58
Table 14 RQ1 RE1 Results: TSX Scenario....59
Table 15 RQ1 RE1 Results: Small-Cap Scenario....60
Table 16 RQ1 RE4 Results: Non-Gold Scenario....61
Table 17 RQ1 RE4 Results: Small-Cap Scenario....62
Table 18 RQ1 RE8 Results: Total Sample....63
Table 19 RQ1 RE8 Results: Gold Scenario....64
Table 20 RQ1 RE8 Results: Small-Cap Scenario....65
Table 21 RQ1 RE9 Results: Total Sample....66
Table 22 RQ1 RE9 Results: Non-Gold Scenario....67
Table 23 RQ1 RE9 Results: Small-Cap Scenario....68
Table 24 RQ2: Observations to Independent Variables Ratio....69
Table 25 RQ2 RE2 Results: Large-Cap Scenario....70
Table 26 RQ2 RE3 Results: LSE Scenario....71
Table 27 Pearson Correlation Results....71
Table 28 RQ2 RE3 Results: Large-Cap Scenario....72
Table 29 RQ2 RE3 Results: Large-Cap Scenario....73
Table 30 RQ2 RE6 Results: Large-Cap Scenario....74
Table 31 RQ3: Mann-Whitney U Test Results....75
Table 32 RQ4: Independent Samples t-Test Results....76
Table 33 Summary of Regression Results....78
Table 34 Statistically Significant Regression Models....79
Table 35 Summary of Hypothesis Results....79
Table 36 Summary of Significant Variables for Research Question 2....86
Table 37 Findings: Relationship between Mineral Resource Reporting and Shareholder Value....92
Table 38 Findings: Relationship between Mineral Resource Reporting and Investor Confidence....92

List of Equations

Equation 1 Abnormal Shareholder Return....26
Equation 2 Price Earnings Ratio....27
Equation 3 Change PE Ratio....27

Equation 4 Annual Change in Financial Variables 28
Equation 5 Total Mineral Resource Calculation 29
Equation 6 Annual Change in Mineral Resource Components 29
Equation 7 Total Mineral Resource LOM 29
Equation 8 Total Reserve to Total Resource Ratio 30
Equation 9 Measured and Indicated to Inferred Resource Ratio 30
Equation 10 Measured to Indicated Resource Ratio 30
Equation 11 Proven to Probable Reserve Ratio 30
Equation 12 Annual Change in the Total Reserve to Total Resource Ratio 30
Equation 13 Annual Change in the Measured and Indicated to Inferred Resource Ratio 30
Equation 14 Annual Change in the Measured to Indicated Resource Ratio 30
Equation 15 Annual Change in the Proven to Probable Reserve Ratio 30
Equation 16 Generic Regression Equation 33
Equation 17 RQ1: RE1 56
Equation 18 RQ1: RE4 60
Equation 19 RQ1: RE8 62
Equation 20 RQ1: RE9 65
Equation 21 RQ2: RE2 69
Equation 22 RQ2: RE3 70
Equation 23 RQ2: RE5 72
Equation 24 RQ2: RE6 73

Abbreviations

Δ or D – Annual Change

ASR – Abnormal Shareholder Return

ASX – Australian Stock Exchange

COM_TYPE – Commodity Type

CP – Competent Person

DIV – Dividends

GDP – Gross Domestic Product

GFC – Global Financial Crisis

GICS – Global Industry Classification Standard

IND – Contained Indicated Value

INF – Contained Inferred Value

JSE – Johannesburg Stock Exchange

LOM – Estimated Life of Mine

LSE – London Stock Exchange

MC – Market Capitalisation

MEAS – Contained Measured Value

MI – Contained Measured and Indicated Value

NP – Net Profit

O&G – Oil and Gas

OCF – Operating Cash Flow

OP – Operating Profit

P/E – Price Earnings

PROB – Contained Probable Value

PROD – Production Volume

PROV – Contained Proven Value

RE – Regression Equation

RES_IND – Resource Index

RESE – Contained Reserve Value

RESO – Contained Resource Value

RESO_INC_RESE – Resource Inclusive of Reserve

REV – Revenue

SE – Primary Stock Exchange

SP – Share Price

TSE – Toronto Stock Exchange

USD – United States Dollars

1 Research Problem

1.1 Research Title

The relationship between mineral resource reporting, shareholder value and investor confidence.

1.2 Background

The mining industry has been and remains a major force in the global economy. This is not only a result of its position at the beginning of most value chains (International Council on Mining & Metals, 2012a), but also because it forms the foundation for human development and plays an important role in meeting society's needs (International Council on Mining & Metals, 2012b). Mark Cutifani (cited in Creamer, 2012) the new CEO of Anglo American, highlighted that the global mining industry's revenue contributes 11.5% to global gross domestic product (GDP) while its total direct and indirect contribution is above 45%. South Africa, as the sixth biggest producer in terms of value (International Council on Mining & Metals, 2012a), is in a similar situation where the economy is "highly dependent on the export of minerals and metals" (Kantor, 2013, para.7).

Camisani-Calzolari (2004) explains that the mining industry requires large amounts of capital in order to exploit resources and that external financing is either necessary or preferred. The global financial crisis (GFC) has however lessened the attractiveness of rapid growth opportunities. This has resulted in a new number one business risk for mining companies namely access to capital and the allocation thereof (EY, 2013).

Koven (2013) explains that historically, successful companies were trying to boost their reserves and production through big acquisitions because a bad growth profile was punished by investors. Koven (2013) further explains that companies overpaid for acquisitions in order to grow their mineral resource profile and that this has resulted in a number of write-downs over the past year amounting to nearly $50 billion. Investors are subsequently no longer rewarding the growth through acquisitions.

This indicates that the mineral resources of mining companies are important to investors but also indicates how much shareholder value can be destroyed if the mineral resources are not clearly understood. The following section explains why

mineral resources are important to mining companies and explores why it has historically provided value for shareholders but in more recent times destroyed it.

1.3 Mineral Resources

The most important asset for any mining company is arguably its mineral resources. Although it forms the basis of future cash flows (Deloitte, 2003) and the economic value of a mining company (Davis, 2002; Taylor, Richardson, Tower & Hancock, 2012) it does not appear on the balance sheet. The communication of mineral resource estimations is however important since it is essential for investors to make informed decisions (Taylor *et al*., 2012).

Olsen (2010, p.1) cautions that mineral resource estimations "are inherently subjective and subject to estimator biases" and that this poses a risk to investors. This is due to the nature of mineral resources which occur beneath the earth's surface and therefore cannot be estimated exactly (Deloitte, 2003). The consequence of this is that any estimation and resulting financial analysis contains some degree of error (Morley, Snowden & Day, 1999).

The associated subjectivity combined with its influence on cash flows and economic value led to a number of corporate scandals similar to Bre-X Minerals (Brown & Burdekin, 2000) where companies exploited the uncertain nature of mineral resources to the detriment of investors. This illustrates the uncertainty and risk associated with the mining industry's most important asset and how it can adversely affect companies and shareholders. This has made transparent reporting a prerequisite for investment since the late 1990s (Camisani-Calzolari, 2004), and has led to reporting standards of which many are "linked to regulatory bodies whose role [it] is to protect such investors" (Weatherstone, 2008, p.4).

1.4 Relevance and Motivation

Improving investor confidence is critical to mining companies who need investments to withstand the increasing volatility in the industry (Deloitte, 2013). The importance of this is illustrated by investors who, after a decline in investor confidence, are calling for increased shareholder returns (PwC, 2012a). The mining companies however desperately need the money to invest in new projects for the future (PwC, 2012a).

This is also relevant to business in South Africa, where cautious investments can severely affect the industry's ability to ramp up production to take advantage of future commodity price increases (PwC, 2012b).

Although the disclosure and reporting of mineral resources has been the subject of several academic studies, only a few have explored its relationship with shareholder value and no study was identified that explored investor confidence. According to Mirza and Zimmer (2001) several studies in the oil and gas industry concluded that the mandatory disclosure of reserves influence share price.

The study by Donker, Ng and Rai (2006) explored the relationship between abnormal returns and the changes in proven and probable reserves. Donker *et al.* (2006) found that the changes in proven and probable reserves were significant and positively related to the abnormal returns. This study however focused on the oil and gas industry and only considered Canadian companies. Bird, Grosse and Yeung (2010, p.5) indicate that the "most voluminous literature on mining company disclosure undoubtedly lies in studies of the accounting reporting requirements for oil and gas companies." Taylor *et al*. (2012, p.376) provided support that this has not yet changed and observed that the "Research on the mineral and petroleum reserve accounting of firms is negligible." This indicates that limited research is available for the mining industry.

According to Bird *et al*. (2010, p.1), a surprisingly small number of market-based studies that use data from the mining industry exist and suggest that their study is "the first to conduct an event study on the market response to exploration, resource and reserve announcements made by mining firms." Their study however only categorised announcements and did not look at the quantitative change reported in the announcement.

In a recent study, Taylor *et al*. (2012) examined the determinants of reserves disclosure of mining companies in Australia. Although they did not investigate the relationship of reserve disclosure with share price they accepted that the reserve value and quantity information can potentially impact on share prices based on the work done by Donker *et al*. (2006). This suggests that the relationship between reserve changes and abnormal returns will also hold for the mining industry although no study was found to corroborate this.

Olsen (2010, p.60) recommends in his thesis that additional research is required in the "areas of quantifying investor risk due to reserves overstatements". This suggests that the relationship between mineral resources, shareholder value and investor confidence is not yet fully understood.

1.5 Summary

It is surprising that the study by Donker *et al*. (2006) is referenced in academic research from other countries but has not yet been repeated or expanded upon. This is especially unexpected considering that the information used by Donker *et al*. (2006), i.e. annual data from 2002 to 2004, is becoming dated. Additionally, Taylor *et al*. (2012) observed that limited research is available that consider which types of mineral resource information are value relevant to stakeholders.

The majority of the existing literature is based on the oil and gas industry and the studies that build on this focused solely on single countries for example, Australia in Bird *et al*. (2010) and Taylor *et al*. (2012), and Canada in the case of Donker *et al*. (2006). There is therefore a gap in the literature and a need exists for a multi-country analysis on the relationship of mineral resource reporting with shareholder value and investor confidence.

1.6 Research Aim

The aim of this research is therefore to build on the existing research base in order to better understand how mineral resource reporting affects shareholder value and investor confidence in the mining industry by adopting a multi-country approach.

1.7 Research Purpose

The knowledge gained from this research is expected to benefit mining companies, investors/shareholders and academia.

Firstly, this research can potentially assist mining companies to better understand the value relevant components of mineral resource reporting and how it affects shareholder value and investor confidence. This can potentially assist them to improve their investor's confidence and provide them with access to the investments needed for future development.

Secondly, this research can potentially assist investors by enhancing their understanding of mineral resource reporting, the inherent uncertainty it contains as well as the resulting risks they may be exposed to. This will enable investors to better evaluate their resource investments in order to protect and improve their shareholder value.

Lastly, this research can potentially assist academia by extending the current research to explore the relationships between mineral resource reporting, shareholder value and investor confidence from a multi-country approach. This research further extends the current research by focusing on the post GFC period. It is expected that the knowledge gained from this research will benefit academia by identifying new relationships that can be used in future research.

2 Literature Review

2.1 Introduction

This chapter describes the theory and literature that were reviewed as a theoretical base for this study. Taylor *et al*. (2012, p.379) found that "Agency theory provides a theoretical framework for examining reserve disclosures in the annual report of listed resource firms." Agency theory was therefore adopted as the theoretical base for this study and formed the foundation of the literature review. The following section introduces agency theory before the closely related theories of information asymmetry and disclosure, and corporate governance are reviewed. This is followed by a review of mineral resource reporting and shareholder value before concluding with a review of investor confidence.

2.2 Agency Theory

According to Firer, Ross, Westerfield and Jordan (2012), agency theory is the relationship between the management of an organisation and its shareholders where the shareholders (principals) appoint the management (agents) to represent their interest. Dey (2008, p.1144) however cautioned that the "relationship between shareholders and corporate managers is fraught with conflicting interests". These conflicts of interest arise because of the separation of ownership and control, divergent objectives and information asymmetry (Dey, 2008). This was relevant to the mining industry where investors were calling for increased shareholder returns which were in conflict with management's desire to invest in new projects (PwC, 2012b).

Although agency theory has been the subject of empirical research for more than 75 years the three resulting corporate governance principles (independence, equity and market for control) to mitigate the agency problem remain contentious (Dalton, Hitt, Certo & Dalton, 2007). Dalton *et al.* (2007) further explained that as the market for control diminished in recent years a new problem was observed in the market for acquisitions, namely overvalued equity. One of the reasons for the overvaluation of assets was the agency problem where assets were misrepresented in the cases like WorldCom and Enron (Dalton *et al.,* 2007). The mining industry also fell prey to the agency problem where the mineral resource assets were misrepresented in the case of Bre-X Minerals (Brown & Burdekin, 2000).

The other reason provided for the overvaluation of equity was irrational exuberance by investors (Dalton *et al.,* 2007) which might explain why companies historically overpaid for acquisitions (Koven, 2013) as this was valued by investors, albeit irrationally. This indicated that investors valued and were more confident in companies with growing mineral resource portfolios but suggested that neither the investors nor the companies truly understood the information and signals communicated by the mineral resource reports.

Agency theory therefore provided an appropriate theoretical base for studying mineral resource reporting as indicated by Taylor *et al*. (2012). It further highlighted the existence and impact of information asymmetry between shareholders and management. The next section provides an overview of information asymmetry and how it related to this research study.

2.3 Information Asymmetry and Disclosure

Information asymmetry is defined as the scenario where "one or more investors possess private information about the firm's value while other uninformed investors only have access to public information" (Brown & Hillegeist, 2007, p.443).

Investors need to make decisions on information that is at best incomplete but can also be biased or inaccurate (Hirschey & Nofsinger, 2010). They compensate for this by demanding a premium for bearing the information risk that result from information asymmetry (Healy & Palepu, 2001). It is therefore in the company's best interest to reduce information asymmetry as this would lead to a reduction in their cost of capital (Lundholm & Van Winkle, 2006).

Mirza and Zimmer (2001) observed that the problem of asymmetric information also applies to mineral resource information. Bird *et al*. (2010) provided a possible explanation for this, namely that the market struggles to interpret the information provided in announcements made by mining companies.

Information asymmetry can however be reduced by making greater disclosures (Buskirk, 2011; Core, 2001; Lundholm & Van Winkle, 2006). These disclosures can include non-financial information that "allows investors to better assess key areas of performance" (Cohen, Holder-Webb, Nath and Wood (2012, p.67). This is especially

true for the mining industry where mineral resource estimations that contain multiple sources of uncertainty are used to inform investors (Evatt, Soltan & Johnson, 2012).

Core (2001) provided the following examples where voluntary disclosures are of high importance:

- High growth companies that require external financing
- Mandated disclosures of low quality that result in high information asymmetry

Mirza and Zimmer (2001) explained that mineral resource uncertainty influences the decision to voluntarily disclosure mineral resource information in the annual report. Dominy, Noppe and Annels (2002) predicted that in the future, companies will have to disclose the relative accuracy and confidence of their mineral resource estimates in more detail. Njowa (2008) however found this has not yet been realised. It is however possible to improve the accuracy of mineral resource estimates but at a significant cost (Mirza & Zimmer, 2001). The information production cost (the cost of obtaining mineral resource information) was linked to the type of ore; where gold ore had a lower cost of information production than other types of ore (Mirza & Zimmer, 2001).

In their study, Mirza and Zimmer (2001) found company size and the cost of information production to be significant in explaining the voluntary disclosure of mineral resource information in annual reports. Although published in 2001, this study was conducted earlier because “data from 1995 are chosen for it was the most recent year for which company annual reports were available at the time of conducting the study” (Mirza & Zimmer, 2001, p.74). Weatherstone (2008) indicated that the mineral resource reporting standard in Australia was launched in 1989 and that the rapid proliferation in other countries only occurred from 1999. The mineral resource reporting standard was therefore fairly new and adoption of this standard was likely to be slow. This possibly explained the purpose Mirza and Zimmer’s study, to “explore why some firms in the extractive industries disclose mineral reserve quantum in their annual report and other do not” (Mirza & Zimmer, 2001, p.63).

2.4 Corporate Governance

Corporate governance is a mechanism that aligns the interests of investors and management and reduces the likelihood that management will disclose unreliable information (Kanagaretnam, Lobo & Whalen, 2007). Good corporate governance can therefore reduce agency costs and information asymmetry (Hutchinson & Gul, 2004).

According to Aglietta (2000) corporate governance is the formal procedures that represent the agency relationship which requires transparent reporting, credible information and quantified prospects of future profits. In short, “Corporate governance is the set of behaviours which induce the firm to maximise shareholder value” (Aglietta, 2000, p.149).

The King III report, separate from any mineral resource reporting standard, indicated that the board should include commentary that enables stakeholders to not only assess the economic value but also gain insight into the future value creation prospects and their key risks (Institute of Directors Southern Africa, 2009). In the case of the mining industry the commentary would include the mineral resource estimations and through the inclusion of the key risks implicitly also refer to the accuracy and confidence of such estimates. This provides support for the prediction made by Dominy *et al.* (2002), that the relative accuracy and confidence of mineral resources will have to be disclosed in more detail, albeit it only from a South African perspective.

The corporate scandals in the mining industry, for example Bre-X Minerals in Canada and Noble Minerals in South Africa (Camisani-Calzolari, 2004), led to the development of several reporting codes. The goal of these reporting codes was to strengthen the governance in the industry by standardising and improving the information communicated to shareholders. Weatherstone (2008, p.4) indicates that many of these codes are “linked to regulatory bodies whose role [it] is to protect such investors”. In South Africa the reporting codes are enforced by the Johannesburg Stock Exchange (JSE) which requires companies to issue a Competent Persons (CP) report and to comply with one of the reporting codes (JSE, 2012).

El Mir and Seboui (2008) argued that as one of the firm’s performance drivers, corporate governance can affect the firm’s market value and by logical extension the shareholder value.

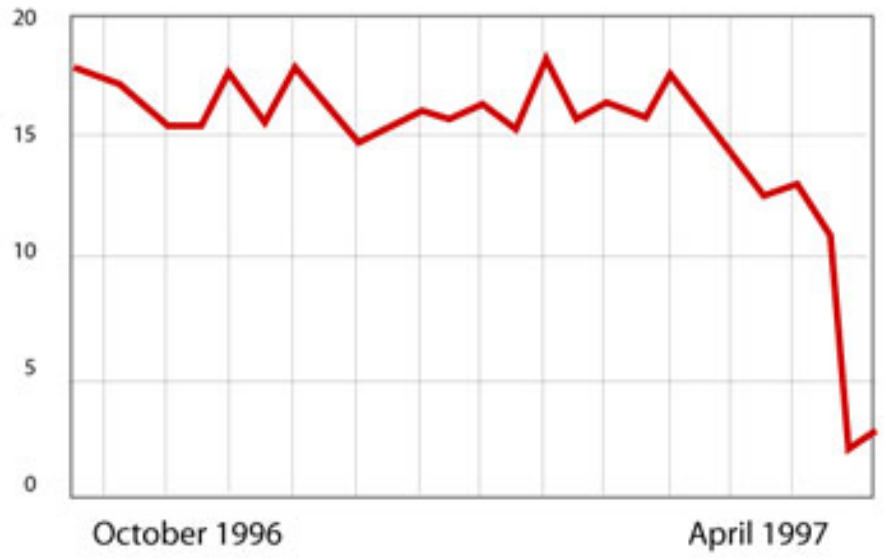
2.5 Mineral Resource Reporting

2.5.1 Introduction

According to Healy and Palepu (2001, p.406) the “demand for financial reporting and disclosure arises from information asymmetry and agency conflicts between managers and outside investors.” Goldsmith (2002) explained that although mineral resources are critical to the financial results of a mining company, many users of this information do not fully understand the importance of this estimate or its associated risk. The main reason behind mineral resource reporting is therefore “to communicate company results to the interested stakeholders in such a way that could be understood by everyone with some knowledgeable *(sic)* in the field of mineral exploitation” (Njowa, 2008, p.1).

Camisani-Calzolari (2004, p.301) described that “In 1997 the need for international standards and stronger control on the reporting of mineral information was made painfully obvious by the Bre-X scandal”. Bre-X’s share price improved based on the increasing estimate of the Busang gold deposit but plummeted when it came to light that the drill core samples were fraudulently “salted” with gold (Brown & Burdekin, 2000, p.279). Bre-X was therefore a perfect mining industry example where the agency problem, information asymmetry and lack of corporate governance resulted in the destruction of shareholder value. Figure 1 illustrates how quickly the shareholder value was destroyed.

Figure 1 Bre-X Stock Price Collapse (Agora Financial, n.d.)



2.5.2 International Reporting Standards

Weatherstone (2008, p.2) explained that although reporting standards originated in the USA, “Australia took the lead in providing a Code and Guidelines for defining and classifying Mineral Reserves, Mineral Resources and Exploration Results.” This has resulted in the development of several reporting standards for example JORC in Australia, SAMREC in South Africa, CIM in Canada, SME in the USA and PERC in Europe. “All these codes are 90% or more JORC Code compatible” (Camisani-Calzolari, 2004, p.302) which were intended to enable the widespread understanding and comparability of mineral resource reports.

Dominy *et al*. (2002) however argued that compliance with one of the reporting standards only implies that a clear and transparent process was followed and that this does not necessarily result in a quality estimate. This provided a possible reason as to why some companies make voluntary disclosures regarding their mineral resource estimates.

The uncertainty in the mineral resources is however mostly ignored and the estimates are assumed to be precise and accurate (Morley *et al*., 1999). Evatt *et al*. (2012) conversely argued that uncertainty is not ignored and that all reporting standards distinguish between probable and proven reserves which communicate a degree of certainty around the estimates. According to Evatt *et al*. (2012) the JORC code made it mandatory to report a level of confidence. Despite this Njowa (2008) found that mineral resource reports did not include additional disclosures around the inherent errors of estimates. Njowa (2008, p.13) further argued that in the rare occasion where confidence limits are quoted they ignore “the factors that cause uncertainty in the grade and tonnage estimates.”

Evatt *et al*. (2012) elaborated on these factors and distinguished between physical and economic uncertainties. Evatt *et al*. (2012) further explained that the methodologies that account for physical uncertainties were better developed than the methodologies that account for economic uncertainties (which include uncertainties in commodity prices, interest rates and foreign exchange rates). Morley *et al*. (1999) however argued that capital and operating cost, commodity price forecasts and financial discount rates enjoyed a lot of focus while the resource or physical uncertainty was overlooked.

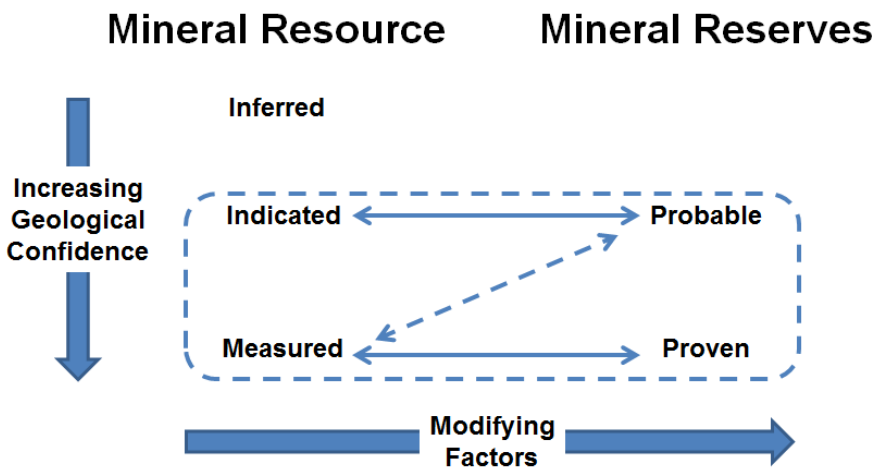
Spear (1994) found that, in the oil and gas industry, the components of net annual reserve quantity change conveys more information than the summary net change

value. This supported the Financial Accounting Standards Board's position "to require O&G firms to disclose these components in spite of the inherent uncertainty (and possible bias) associated with this information" (Spear, 1994, p.400). The components of the mineral resource estimates are therefore important as indicated by additional information conveyed over the summary value and degree of confidence communicated by the probable and proven reserves.

2.5.2.1 Mineral Resource Components

Figure 2 illustrates the standard classifications that are used in mineral resource reports.

Figure 2 Mineral Resource and Reserve Classifications (Weatherstone, 2008)



Weatherstone (2008) explained that the mineral resource reporting standards distinguish between mineral resources and mineral reserves. A mineral resource is defined as a deposit of economic interest where there is a reasonable prospect of eventual economic extraction (SAMREC, 2007). The mineral resource's classification changes between inferred, indicated and measured as the geological confidence in the mineral resource changes. Inferred mineral resources have the lowest confidence; indicated mineral resources have reasonable confidence while measured mineral resources are of the highest geological confidence (SAMREC, 2007). Although given only as an example, Dominy *et al*. (2002) illustrated the difference in confidence as follows:

- Inferred mineral resource: ± (35-100%)
- Indicated mineral resource: ± (15-25%)
- Measured mineral resource: ± (5-10%)

A mineral reserve refers to the economically mineable material and is obtained by applying certain modifying factors to the measured or indicated resources (SAMREC, 2007). The reporting standards allow companies to either report their mineral resources inclusive of, or exclusive of mineral reserves (Camisani-Calzolari, 2004). Taylor *et al*. (2012, p.375) explained that "proven and probable reserves include assumptions about commodity prices, exchange rates, discount rates, production and transportation costs for future cash flows."

According to Donker *et al.* (2006) the oil and gas industry has associated the following probabilities of recovery:

- Probable reserves: greater than 50%
- Proven reserves: greater than 90%

Although the SAMREC code does not provide probabilities it does indicate that proven mineral reserves have a higher level of confidence than probable mineral reserves (SAMREC, 2007). The preceding points indicated the richness of the mineral resource reporting information, albeit at a very high level. This however also illustrated the huge uncertainty that is embedded in mineral resource estimations.

2.6 Shareholder Value

Kyereboah-Coleman (2007, p.353) defined shareholder wealth or value as "the total benefit to shareholders from investing in a company. This includes dividends and perhaps more importantly capital appreciation of the shareholders' investments." Booth (1998, p.5) explained that the "stock market looks far into the future when assessing value" and that a large portion of a company's share price is based on hard to predict future growth prospects.

The relationship between shareholder value, or return, and mineral resource information has been explored by Spear (1994), Donker *et al*. (2006) and Bird *et al*. (2010).

Spear (1994) explored whether the change in proven reserves or its components (new discoveries, production, acquisitions and revisions) are associated with unexpected shareholder returns. The change in proven reserves was found not to be informative but that the components of the change revealed more information. Changes due to new discoveries were found to be significantly and positively associated with the

unexpected returns during the release week of the annual report. This study focused on the United States oil and gas industry using data from 1984 to 1988.

In a subsequent study, Donker *et al*. (2006) expanded on the work done by Spear (1994) and examined whether the disclosure of probable reserves in addition to proven reserves affected market returns. According to Donker *et al*. (2006) companies trading on the Canadian stock exchange were mandated to disclose probable reserves, which was not required in the United States. Donker *et al*. (2006) found that changes in the probable and proven reserves were significantly and positively related to shareholder value. This study focused on the Canadian oil and gas industry, with data from 2002 to 2004, and provided conflicting results in terms of the change in proven reserves compared to those obtained by Spear (1994). This suggested that the stock exchange listing and period under consideration could potentially be important factors that were not considered.

The most recent study was that of Bird *et al*. (2010) who used an event study methodology to explore this relationship. Mineral resource announcements, excluding the quarterly and annual reports, were categorised as exploration, mineral resource or ore reserve. Bird *et al*. (2010) found evidence that the market responds positively to exploration announcement but found no evidence that the market responds to reserve announcements. This study focused on the Australian mining industry and used data from 2004 to 2008. It was not possible to compare the results of this study to that of Spear (1994) and Donker *et al*. (2006) as it categorised the announcements without considering the information contained in the announcements. This study has however expanded the research on mineral resource reports and shareholder value to the mining industry and provided evidence that mineral resource reporting was value relevant to the market.

2.7 Investor Confidence

Investor confidence was defined as the "Level of the investing public's trust in corporate information and investment industry advice" (Hirschey & Nofsinger, 2010, p.311). Todd (2007) argued that investors attain confidence in their investments by trusting management to optimise the company's performance and that the price earnings (P/E) ratio is an indicator of their trust. Todd (2007) further explains that higher P/E ratios are indicative of higher levels of trust that a company will achieve its stated future earnings. This was supported by Penman (1996) who described that P/E

ratios indicate future growth in earnings and found evidence that it was positively related to the expected future return on equity.

Taylor *et al*. (2012) described that the disclosure of mineral reserves (probable and proven) potentially reflects the firm's confidence that future cash flows will be achieved. By logical extension, this suggested that companies with more confidence in future cash flows, i.e. more mineral reserve disclosures, would enjoy more investor confidence visible through a higher P/E ratio. Feedback provided to the Australian Securities Exchange (ASX) supported this, indicating that investor confidence can be improved by transparently and consistently reporting mineral resource estimations to shareholders (ASX, 2012). No evidence was however found that this relationship has been studied.

This is important to the mining industry since investments are not guaranteed and will not be made unless investors are confident that they will obtain a better return than in other industries (Goldsmith, 2002). According to Deloitte (2013) improving investor confidence is critical to mining companies who need investments to withstand the increasing volatility in the resources industry.

2.8 Conclusion

The literature reviewed provided support for the statement by Taylor *et al*. (2012) that agency theory was a suitable theoretical base. The relationship between mineral resource reporting, information asymmetry and corporate governance was also established and helped to explain the need for mineral resource reporting standards.

Literature exists that has studied the relationship between mineral resource reports and shareholder value (Spear, 1994; Donker *et al*., 2006; Bird *et al*., 2010). The results of these studies however differ and are even conflicting in some instances which indicate that the relationship between mineral resource reporting and shareholder value is not yet fully understood. A possible reason for this might be that most of the studies were country, or stock exchange, specific with only a few exploring beyond the oil and gas industry.

The literature revealed the importance of investor confidence to the mining industry (Goldsmith, 2002; ASX, 2012; Deloitte, 2013). Despite this, no evidence was found that its relationship with mineral resource reporting has been explored. This research study

can therefore not only expand on the current literature by extending it to the mining industry through a multi-country approach but can also add to the literature by exploring the relationship with investor confidence.

3 Research Questions

This section explains the research questions that need to be answered in order to satisfy the aims of this study. The objective of this study was to determine whether a relationship exists between mineral resource reporting, shareholder value and investor confidence. This was explored using the following research questions.

3.1 Research Question 1

The literature review revealed that mineral resource estimates are subject to numerous sources of uncertainty and that the disclosure of its quantity and value can potentially impact shareholder value. Although the relationship between mineral resource reporting and shareholder value has been studied this was done either from an oil and gas perspective, focused solely on one specific country or did not consider all the components that are required by the mineral resource reporting standards. The results available to date indicate that this relationship is not yet completely understood and therefore requires further exploration.

Question

Does a relationship exist between a company's mineral resource reporting and its shareholder value?

3.2 Research Question 2

The literature review suggests that more transparent and consistent resource reporting can enhance investor confidence and that improving this is critical to mining companies. Dominy *et al*. (2002, p.95) argues that "Better methods to report and convey the confidence in the [resource] estimates are essential." and that the "aim should be to provide a degree of quantification of the risk in the reported estimate to allow for better decision-making by mining project planners, operators and investors." The mineral resource reporting standards attempt to communicate the source of future cash flows to investors as well as the confidence therein through the use of different mineral resource categories.

Question

Does a relationship exist between a company's mineral resource reporting and the investor's confidence in the company?

3.3 Research Question 3

The literature review found that company size is a determinant of voluntary reserve disclosures. The author, from experience in the mining industry, also proposes that larger companies with better funding can afford and prefer to purchase more certain and larger mineral rights than smaller (junior) companies.

Question

Is there a difference between the growth in reported mineral resource confidence of large-cap and small-cap companies?

3.4 Research Question 4

The literature review revealed that companies with low information production costs are more likely to make voluntary reserve disclosures. Additionally, it is also possible to improve the accuracy of mineral resource reports although this comes at a significant cost. This suggests the companies with low information production cost (gold) can improve the accuracy of their resource reports more than that of companies with high information production costs (non-gold).

Question

Is there a difference between the growth in reported mineral resource confidence of gold and non-gold companies?

4 Research Methodology

This chapter provides the details of the research methodology that was followed in this study by describing the employed methodology, design, unit of analysis, population, sampling method and the sample size. The data gathering and data analysis that was followed is also discussed before concluding with the associated research limitations.

The aim of this study was to determine whether a relationship exists between mineral resource reporting, shareholder value and investor confidence. The main research methodology that was used was exploratory in nature because it "is about discovering general information about a topic that is not understood clearly by the researcher." (Saunders & Lewis, 2012, p.111) This methodology was deemed to be appropriate because although the literature review suggested a relationship between the variables under consideration, the relationship is not clearly understood. This was especially true when considering the components that constitute the variables under consideration.

4.1 Research Design

The research was quantitative in nature and further utilised a cross-sectional design which refers to "the study of a particular topic at a particular time" (Saunders & Lewis, 2012, p.123). The cross-sectional design enabled the relationship between mineral resource reporting, shareholder value and investor confidence to be analysed at a single point in time which reduced the influence of time related variables.

Although the cross-sectional design reduced the influence of time related variables, its results were very dependent on the chosen time period. Even though there are some ongoing residual effects from the global financial crisis (GFC) it's major impact can be attributed to the period from December 2006 to December 2010 (Loviscek, 2013). EY (n.d.) however argues that the mining industry only emerged from the GFC by the end of 2011. It was important to conduct this research on post GFC information in order to make it more relevant to the current economic environment where according to Lee Downham (cited in EY, n.d.) mining companies have learned to live with the increased global uncertainty "albeit with more caution than witnessed during the peak of 2007."

This study required three years' data, firstly to determine the change in reported mineral resource information from $year_{t-2}$ to $year_{t-1}$ and secondly to compare the resulting change in reported mineral resource information to the shareholder value and investor confidence created from $year_{t-1}$ to $year_t$. The data analyses that were performed are further explained in the data analysis section of this chapter. The time period chosen for this study was 2010, 2011 and 2012 because it provided the most current data where all companies have already issued their final annual results and therefore constitutes the first three year period after the perceived end of the GFC.

4.2 Population

Mirza and Zimmer (2001) explained that mining operations can be classified into exploring, developing and producing and that a stronger incentive exists at the production stage to disclose reserve quantum. Because this research was exploratory it was decided to focus on producing companies which had the biggest incentive to disclose their mineral resource information.

Diversified mining companies are involved in several different commodities. These commodities can vary significantly because of their exposure to different commodity cycles. It was decided to focus only on pure play, single commodity mining companies, because of the complexity involved with the aggregation of several commodities into a single comparable figure. Pure play companies also provide the best possible chance for investors to understand and interpret the reported mineral resource information.

Publicly listed mining companies were chosen because of the readily available information that is provided to investors and analysts and because all listed companies are expected to comply with one of the international mineral resource reporting standards when disclosing mineral resource reports to shareholders and potential investors.

The population is "the complete set of group members" (Saunders & Lewis, 2012, p.132) and was therefore producing, pure play publicly listed companies that operated in the resources industry and owned mineral resources during 2010, 2011 and 2012.

4.3 Unit of Analysis

The unit of analysis was publicly listed companies because the variables under consideration in this study occurred and could be measured at this level.

4.4 Sampling Method and Size

Saunders and Lewis (2012, p.133) describe a sampling frame as the “complete list of the population”. Because the population was publicly listed organisations it was possible to obtain the sampling frame which allowed the use of probability sampling techniques.

The sampling technique used was stratified random sampling because the aim of this study was to determine whether compulsory international mineral resource reporting standards are useful to investors. It was therefore important to include different international mineral resource reporting standards in the sample. This was accomplished by dividing the sampling frame into the following strata based on the primary stock exchange the organisation is listed on:

- Australian Stock Exchange (ASX)
- Johannesburg Stock Exchange (JSE)
- London Stock Exchange (LSE)
- Toronto Stock Exchange (TSX)

The OSIRIS database was used as the source for the sampling frame as it included information on global publicly listed companies and included information for the abovementioned primary stock exchanges. It was however not possible to obtain the sampling frame for pure play producing mining companies that were publicly listed because the OSIRIS database does not contain the required detail to filter for these companies. An extensive search for alternative sources for the sampling frame revealed no other consolidated source of information. It was therefore decided to adapt the sampling frame to a higher level, namely mining companies that were publicly listed.

The author used a pilot sample of all JSE listed mining companies in comparison to the companies identified from the OSIRIS database to firstly validate the accuracy of the sample and secondly to identify the applicable global industry classification standard (GICS) codes required to filter for mining companies.

The following GICS codes were identified:

- 10102050 - Coal & Consumable Fuels,
- 151040 - Metals & Mining

The search criteria used in the OSIRIS database to obtain the higher level sampling frame was as follows:

- Status = Active
- Listed/Unlisted = Publicly listed companies
- GICS codes = 10102050 and 151040
- Main stock exchange = ASX, JSE, LSE and TSX
- Last reporting date = 2012 or 2013

Table 1 provides a summary of the higher level sampling frame per primary stock exchange strata.

Table 1 Higher Level Sampling Frame

Strata Description	Company Count
ASX	807
JSE	35
LSE	160
TSX	298
Total	**1300**

Table 1 indicates a significant difference in the number of companies per primary stock exchange data with 807 companies listed on the ASX and only 35 listed on the JSE. Because proportionate stratified sampling would result in an extremely low sample from the JSE it was decided to rather employ stratified sampling with disproportionate allocation as this would allow between strata analyses (Daniel, 2011).

The desired sample size from each stratum was 30 resulting in a total sample size of 120. This was expected to be sufficient to enable the required statistical analysis to be performed as well as allow for between-strata analyses because the central limit theorem applies for samples greater than 30 (Weiers, 2008).

Simple random sampling was used to sample from each higher level stratum and each sample was filtered on the following criteria in order to compensate for the fact that the correct sample frame (pure play producing mining companies) could not be obtained within a reasonable amount of time:

- Pure play or single commodity
- Producing during 2010, 2011 and 2012

4.5 Data Gathering

This study only used secondary data which is defined as “data used for a research project that were originally collected for some other purpose.” (Saunders & Lewis, 2012, p.84). This was deemed appropriate since the aim of this study was to determine whether a relationship exists between the reported mineral resource information available to the investing public (analysts, shareholders and potential investors), shareholder value created by the company and investor confidence. The data gathered were predominantly continuous numerical data which is “data whose values are measured numerically as quantities and can theoretically take any value” (Saunders & Lewis, 2012, p.166).

The data were gathered in two phases where the first phase focused on the required financial data and the second phase focused on the mineral resource reporting information.

4.5.1 Financial Data

The financial data were gathered from the OSIRIS database for the 2011 and 2012 period. It was decided to download all the financial data in United States Dollars (USD) to allow the different data sets to be comparable against each other.

Table 2 provides a summary of the financial variables.

Table 2 Financial Variables

Variable	Description
SE	Primary Stock Exchange
MC	Market Capitalisation
PE	Price Earnings Ratio
SP	Share Price
DIV	Dividends
REV	Revenue
OP	Operating Profit
NP	Net Profit
OCF	Operating Cash Flow

4.5.2 Mineral Resource Reporting Data

The mineral resource reporting data along with its underlying constituents were gathered from publicly available sources like company websites, annual or integrated reports, resource and reserve reports, technical reports, annual information forms and management discussions and analysis.

The resource and reserve information were normally reported as a tonnage, a quality and the contained amount which is the product of tonnage and quality. Because the contained amount is the result of the tonnage and quality it was assumed that this provided the most valuable information in terms of the resource components. Where this variable was not provided it was calculated from the tonnage and quality information provided. Many of the reports did not provide the total resource and reserve value and instead provided information per operating site or mine. The values for these reports were aggregated into the total resource and reserve value which could be compared with the other information.

Table 3 provides a summary of the different resource reporting variables that were gathered.

Table 3 Resource Reporting Variables

Variable	Description	Data Type
COM_TYPE	Commodity Type	Categorical
RESO_INC_RESE	Resource Inclusive of Reserves	Categorical
PROD	Production Volume	Continuous
RESO	Contained Resource Value	Continuous
INF	Contained Inferred Value	Continuous
MI	Contained Measured & Indicated Value	Continuous
IND	Contained Indicated Value	Continuous
MEAS	Contained Measured Value	Continuous
RESE	Contained Reserve Value	Continuous
PROB	Contained Probable Value	Continuous
PROV	Contained Proven Value	Continuous

The various mineral reporting standards allow companies to report their resource inclusive or exclusive of their reserves as long as this is defined in the report. The binary variable RESO_INC_RESE was created to capture this with a value of one indicating exclusive of the mineral reserve and a value of zero indicating inclusive of the mineral reserve.

Appendix A contains an extract of the financial and mineral resource reporting data that were gathered.

4.6 Data Analysis

The data analysis approach consisted of three phases. Phase one involved the data preparation and calculation of the variables for analyses. Phase two involved the regression analyses to determine whether any relationships exist and phase three included the hypotheses testing using the means between different variables.

4.6.1 Phase 1: Data Preparation

4.6.1.1 Missing Values

All missing values were left blank to ensure the data was not distorted with exception of the mineral resource data. Where mineral resource information were not reported it was assumed that the company did not have any as this was the message being communicated and the missing values were replaced with zero to reflect this. This is supported by the belief held by investors “that a failure to disclosure must mean that management has the worst possible news.” (Lundholm & Van Winkle, 2006, p.44)

4.6.1.2 Variable Calculation

The data gathered in its raw form conveys limited information for meaningful comparison between different companies because of the diverse nature of the companies' commodities, i.e. coal versus gold. Several variables were therefore calculated that convey more information than the raw data and allowed meaningful comparisons between companies. These variables were divided between financial variables and mineral resource variables and are explained in the following sections.

4.6.1.2.1 Financial Variables

The first research question aimed to explore the relationship between shareholder value and mineral resource reporting. The abnormal shareholder return (ASR) was chosen as a proxy for shareholder value and is similar to the approach used by Donker *et al.* (2006). Because the ASR provided the shareholder value in excess of the respective stock exchange's resource index (RES_IND), it normalised the data between the different stock exchanges.

Table 4 provides an overview of the different resource indices (RES_IND) that were used for each stock exchange.

Table 4 Resource Indices per Stock Exchange

Stock Exchange	Resource Index Code (RES_IND)	Index Description
ASX	^AXJO	S&P/ASX 200 Index
JSE	J258	FTSE/JSE SA Resources Index
LSE	^NMX1770	FTSE350 Mining
TSX	^TXGM	S&P/TSX Global Mining Index

The ASR was determined using Equation 1.

Equation 1 Abnormal Shareholder Return

$$ASR = \ln\left(\frac{SP_{2012} + DIV_{2012}}{SP_{2011}}\right) - \ln\left(\frac{RES\_IND_{2012}}{RES\_IND_{2011}}\right)$$

$Where$:

$ASR = Abnormal\ Shareholder\ Return\ from\ 2011\ to\ 2012$

$SP_t = Share\ Price\ in\ period\ t$

$DIV_t = Dividend\ per\ Share\ in\ period\ t$

$RES\_IND_t = Resource\ Index\ in\ period\ t$

The first term in Equation 1 represents the total shareholder return from 2011 to 2012 and includes the increase in the share price ($\frac{SP_{2012}}{SP_{2011}}$) as well as any dividends that were paid during the period ($\frac{DIV_{2012}}{SP_{2011}}$). The second term represents the average return of the respective stock exchange's resource index from 2011 to 2012.

The second research question aimed to explore the relationship between investor confidence and mineral resource reporting. The change in a company's price earnings (P/E) ratio was chosen as a proxy for the improvement or decline of investor confidence. P/E ratios are however normally only reported and meaningful when they are positive. It is however mathematically possible to have a negative P/E ratio and therefore possible to determine whether a company with a negative P/E ratio improved or declined further. The P/E ratio was therefore recalculated to obtain the mathematical P/E ratio using Equation 2.

Equation 2 Price Earnings Ratio

$$PE\_Calc_t = \frac{SP_t}{EPS_t}$$

$Where$:

$SP_t = Share\ Price\ in\ period\ t$

$EPS_t = Earnings\ per\ Share\ in\ period\ t$

$t = 2011, 2012$

The mathematical P/E ratio was calculated for 2011 and 2012 in order to determine the percentage change over the same period. Equation 3 was used to calculate the percentage change from 2011 to 2012 and the denominator was taken as the absolute value of the P/E ratio in 2011 to indicate whether the ratio improved or declined.

Equation 3 Change PE Ratio

$$\Delta PE = \frac{PE\_Calc_{2012} - PE\_Calc_{2011}}{ABS(PE\_Calc_{2011})}$$

$Where$:

$SP_t = Share\ Price\ in\ period\ t$

$EPS_t = Earnings\ per\ Share\ in\ period\ t$

$t = 2011, 2012$

The annual changes in the following variables were calculated to serve as a reference point against which the strength of the mineral resource relationships can be compared:

- Revenue (REV)
- Operating profit (OP)
- Net profit (NP)
- Operating cash flow (OCF)

Equation 4 was used to calculate the annual change of the financial variables.

Equation 4 Annual Change in Financial Variables

$$\Delta x = \frac{x_{2011} - x_{2010}}{ABS(x_{2010})}$$

$Where$:

$\Delta x = Annual\ Change\ from\ 2010\ to\ 2011$

$ABS(x_{2010}) = Absolute\ value\ of\ x\ in\ 2010$

$x = REV, OP, NP, OCF$

Switzer (2010) indicated that companies in the United States with a market capitalisation of between USD300 million and USD2 billion are classified as small-cap companies. Although Switzer (2010) also provided definitions of micro-cap and mid-cap it was decided to only classify the companies as either small-cap or large-cap. The binary variable MCLabel was used for the classification and companies with a market capitalisation below USD2 billion were classified as small-cap (MCLabel=0) and above USD2 billion as large-cap (MCLabel=1).

4.6.1.2.2 Mineral Resource Variables

The mineral resource report comprises of different mineral resource components that convey different types of information. The following types of mineral resource variables were calculated in order to explore the relationships with shareholder value and investor confidence:

- Annual change in mineral resource components
- Annual change in estimated life of mine (LOM)
- Mineral resource ratios
- Annual change in mineral resource ratios

Because some companies report their resources inclusive of reserves and other companies exclusive of reserves it was first necessary to calculate the total resources to make the variable comparable between companies. This was calculated with Equation 5.

Equation 5 Total Mineral Resource Calculation

$$TOT\_RESO = RESO + RESO\_INC\_RESE * RESE$$

Equation 6 was used to calculate the annual change in the various resource components. These variables provide information on the company's ability to enhance and grow their mineral resource portfolio.

Equation 6 Annual Change in Mineral Resource Components

$$\Delta x = \frac{x_{2011}}{x_{2010}} - 1$$

$Where$:

$\Delta x = Annual\ Change\ from\ 2010\ to\ 2011$

$x = TOT\_RESO, RESO, INF, MI, IND, MEAS, RESE, PROB, PROV$

The annual change in the estimated LOM for the various mineral resource components were calculated with Equation 7. The change in LOM is valuable to the investing community as this provides an indication of the remaining period for which the mine will be able to produce a saleable product.

Equation 7 Total Mineral Resource LOM

$$\Delta x\_LOM = \frac{\frac{x_{2011}}{PROD_{2011}}}{\frac{x_{2010}}{PROD_{2010}}}$$

$Where$:

$\Delta x\_LOM = Annual\ Change\ from\ 2010\ to\ 2011$

$PROD_t = Production\ in\ period\ t$

$x = TOT\_RESO, RESO, INF, MI, IND, MEAS, RESE, PROB, PROV$

Several mineral resource ratios were calculated as they provide information on the confidence or quality of the company's mineral resources and reserves. The mineral resource ratios were calculated using Equations 8 to 11.

Equation 8 Total Reserve to Total Resource Ratio

$$RESE\_RESO\_RATIO = \frac{RESE_{2011}}{RESO_{2011}}$$

Equation 9 Measured and Indicated to Inferred Resource Ratio

$$MI\_INF\_RATIO = \frac{MI_{2011}}{INF_{2011}}$$

Equation 10 Measured to Indicated Resource Ratio

$$MEAS\_IND\_RATIO = \frac{MEAS_{2011}}{IND_{2011}}$$

Equation 11 Proven to Probable Reserve Ratio

$$PROV\_PROB\_RATIO = \frac{PROV_{2011}}{PROB_{2011}}$$

Similar to the mineral resource components, it was also expected that the annual change in the mineral resource ratios might convey additional information. The annual change in the various mineral resource ratios were calculated with Equations 12 to 15.

Equation 12 Annual Change in the Total Reserve to Total Resource Ratio

$$\Delta RESE\_RESO\_RATIO = \frac{\Delta RESE\_RESO\_RATIO_{2011}}{\Delta RESE\_RESO\_RATIO_{2010}}$$

Equation 13 Annual Change in the Measured and Indicated to Inferred Resource Ratio

$$\Delta MI\_INF\_RATIO = \frac{\Delta MI\_INF\_RATIO_{2011}}{\Delta MI\_INF\_RATIO_{2010}}$$

Equation 14 Annual Change in the Measured to Indicated Resource Ratio

$$\Delta MEAS\_IND\_RATIO = \frac{\Delta MEAS\_IND\_RATIO_{2011}}{\Delta MEAS\_IND\_RATIO_{2010}}$$

Equation 15 Annual Change in the Proven to Probable Reserve Ratio

$$\Delta PROV\_PROB\_RATIO = \frac{\Delta PROV\_PROB\_RATIO_{2011}}{\Delta PROV\_PROB\_RATIO_{2010}}$$

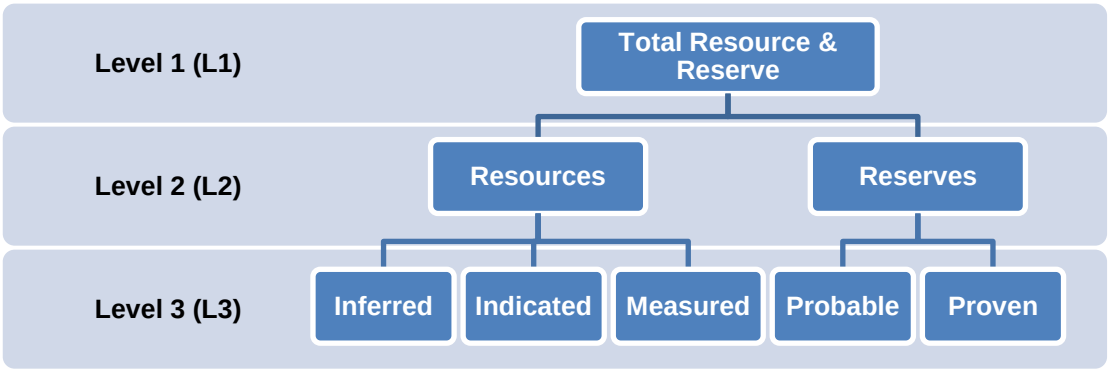
4.6.2 Phase 2: Regression Analyses

Multiple linear regression analyses, using a stepwise procedure, were conducted to explore the relationships in the first two research questions. This was similar to the approach followed by Donker *et al.* (2006) and made it possible to compare the results with his findings. The same analysis process described below was followed for the first and second research questions with an alpha value of 0.05 used to test for significance.

The strength of any significant results was interpreted according to the adjusted R^2 value. Rumsey (2009) indicated that a relationship with adjusted R^2 value above 0.7 is strong, adjusted R^2 value between 0.3 and 0.7 is moderate and an adjusted R^2 value below 0.3 is weak.

Figure 3 illustrates the underlying components of resource reports and how they are aggregated into the total resource and reserve value of a company.

Figure 3 Resource and Reserve Components



Different levels of detail exist in the resource and reserve components where the parent component is the combination of the children components. Resource and reserve components from different levels will be prone to multicolinearity which is the problem of independent variables being intercorrelated (Mendenhall & Sincich, 2003). Weiers (2008) further explain that multicollinearity can make the regression coefficients difficult to interpret as well as statistically unreliable. It was therefore decided not to mix components from different levels to reduce the likelihood of multicollinearity. This was however monitored with the collinearity diagnostics like the variance inflation factor (VIF), (Pallant, 2011).

The literature indicated that the investor community has difficulty in understanding the mineral resource reports and it is therefore unlikely that they would use a complex equation to interpret the information. Because the aim of this study was to explore the relationship of mineral resource reports with shareholder value and investor confidence and not to obtain the best possible prediction of the dependent variables, it did not make sense to combine the different types of variables in a regression equation. It was decided to conduct separate regression analyses for the following information types:

- Financial variables
- Change in mineral resource components
- Change in estimated LOM
- Mineral resource ratios
- Annual change in mineral resource ratios

The impacts of the following factors were also explored for each of the abovementioned information types:

- Commodity
- Stock exchange
- Market capitalisation

Table 5 provides a summary of the different scenarios that were explored through regression analyses.

Table 5 Regression Analyses Summary

			Regression Equation #	Total Sample	Commodity		Stock Exchange				Market Cap	
					Gold	Non-Gold	ASX	TSX	JSE	LSE	Small	Large
Financial Variables			1	x	x	x	x	x	x	x	x	x
Mineral Resource Variables	Annual Change	L1	2	x	x	x	x	x	x	x	x	x
		L2	3	x	x	x	x	x	x	x	x	x
		L3	4	x	x	x	x	x	x	x	x	x
	LOM	L1	5	x	x	x	x	x	x	x	x	x
		L2	6	x	x	x	x	x	x	x	x	x
		L3	7	x	x	x	x	x	x	x	x	x
	Ratios		8	x	x	x	x	x	x	x	x	x
	Annual Change in Ratios		9	x	x	x	x	x	x	x	x	x

Table 5 indicates how the nine regression equations (RE) were analysed in terms of the total sample, commodity type, stock exchange and market capitalisation.

Equation 16 provides the generic form of the regression equation.

Equation 16 Generic Regression Equation

$$y = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + \varepsilon$$

$Where$:

$y = Dependent\ Variable$

$x_i = Independent\ Variables$

$a = Constant$

$b_i = Regression\ Coefficients$

$\varepsilon = Error$

The next two sections define the nine regression equations for the first and second research questions.

4.6.2.1 Research Question 1

Does a relationship exist between a company's mineral resource reporting and its shareholder value?

This research question aimed to determine whether a relationship existed between the abnormal shareholder return (ASR) as the dependent variable and any of independent variables defined earlier. Table 6 defines the independent and dependent variables of the nine regression equations.

Table 6 Research Question 1: Regression Equations

RE #	y	x_1	x_2	x_3	x_4	x_5
1	ASR	ΔREV	ΔOP	ΔNP	ΔOCF	
2	ASR	ΔTOT_RESO				
3	ASR	ΔRESO	ΔRESE			
4	ASR	ΔINF	ΔIND	ΔMEAS	ΔPROB	ΔPROV
5	ASR	ΔTOT_RESO_ LOM				
6	ASR	ΔRESO_ LOM	ΔRESE_ LOM			
7	ASR	ΔINF_ LOM	ΔIND_ LOM	ΔMEAS_ LOM	ΔPROB_ LOM	ΔPROV_ LOM
8	ASR	RESE_RESO_ RATIO	MI_INF_ RATIO	MEAS_IND_ RATIO	PROV_PROB_ RATIO	
9	ASR	ΔRESE_RESO_ RATIO	ΔMI_INF_ RATIO	ΔMEAS_IND_ RATIO	ΔPROV_PROB_ RATIO	

4.6.2.2 Research Question 2

Does a relationship exist between a company's mineral resource reporting and the investor's confidence in the company?

This research question aimed to determine whether a relationship existed between the P/E ratio and any of the resource and reserve variables. The dependent variable was therefore the change in the P/E ratio from 2011 to 2012.

Table 7 defines the independent and dependent variables of the nine regression equations.

Table 7 Research Question 2: Regression Equations

RE #	y	x_1	x_2	x_3	x_4	x_5
1	ΔPE	ΔREV	ΔOP	ΔNP	ΔOCF	
2	ΔPE	ΔTOT_RESO				
3	ΔPE	ΔRESO	ΔRESE			
4	ΔPE	ΔINF	ΔIND	ΔMEAS	ΔPROB	ΔPROV
5	ΔPE	ΔTOT_RESO_ LOM				
6	ΔPE	ΔRESO_ LOM	ΔRESE_ LOM			
7	ΔPE	ΔINF_ LOM	ΔIND_ LOM	ΔMEAS_ LOM	ΔPROB_ LOM	ΔPROV_ LOM
8	ΔPE	RESE_RESO_ RATIO	MI_INF_ RATIO	MEAS_IND_ RATIO	PROV_PROB_ RATIO	
9	ΔPE	ΔRESE_RESO_ RATIO	ΔMI_INF_ RATIO	ΔMEAS_IND_ RATIO	ΔPROV_PROB_ RATIO	

4.6.3 Phase 3: Hypothesis Analyses

The third phase of the data analyses employed hypothesis testing to answer the research questions. The following sections briefly explain the statistical tests that were used for the third and fourth research questions.

4.6.3.1 Research Question 3

The third research question aimed to explore whether there is a difference in the improvement of reported mineral resource confidence of large-cap (L) and small-cap (S) companies. The two tailed independent samples t-test statistic was used because it is "designed to compare the mean scores of two different groups of people or conditions" (Pallant, 2011, p.239). The ΔRESE_RESO_RATIO was used as the proxy variable for the improvement in mineral resource confidence.

The two tailed independent samples t-test tests the following hypothesis.

$H_0: \mu_L = \mu_S$

$H_1: \mu_L \neq \mu_S$

The null hypothesis states that the mean improvement of reported mineral resource confidence (ΔRESE_RESO_RATIO) is the same for large-cap and small-cap companies. The alternative hypothesis states that the mean improvement of reported mineral resource confidence (ΔRESE_RESO_RATIO) is not the same for large-cap and small-cap companies.

4.6.3.2 Research Question 4

The fourth research question aimed to explore whether there is a difference in the improvement of reported mineral resource confidence of gold and non-gold companies. Because this is similar to research question three the two tailed independent samples t-test statistic was deemed appropriate to explore this research question. The ΔRESE_RESO_RATIO was used as the proxy variable for the improvement in mineral resource confidence.

The two tailed independent samples t-test tests the following hypothesis.

$H_0: \mu_G = \mu_{NG}$

$H_1: \mu_G \neq \mu_{NG}$

The null hypothesis states that the mean improvement of reported mineral resource confidence (ΔRESE_RESO_RATIO) is the same for gold and non-gold companies. The alternative hypothesis states that the mean improvement of reported mineral resource confidence (ΔRESE_RESO_RATIO) is not the same for gold and non-gold companies.

4.7 Research Assumptions

Several assumptions were made regarding the correctness of the gathered data. The first assumption was around the timing of company year-ends. It was assumed that the difference in company year-ends would not have a substantial influence because all the variables were still calculated over a full financial year.

This second assumption was that the stock prices downloaded from the OSIRIS database have already been adjusted for share splits. All data in the OSIRIS database have been adjusted for stock splits and per share data appear as if the equity has always existed in its present form (Bureau van Dijk, n.d.) This adjustment was necessary in order to determine the correct shareholder return.

The last assumption was made regarding the mineral resource reports that can either be inclusive or exclusive of reserves. Although this information should have been disclosed in the report it could not be identified for some companies. For these companies it was assumed that the mineral resources were reported exclusive of the mineral reserves.

4.8 Research Limitations

Although care has been taken during the research design process to reduce the potential research limitations the following limitations and concerns are recognised.

Brown and Hillegeist (2007) caution that the information included in annual reports have often already been conveyed through more timely channels by the time they are released. The mineral resource reports are usually only updated annually because of the time and effort required. Other channels, like the continuous disclosure announcements required by stock exchanges, however exist through which mining companies communicate their resource and reserve announcement as studied by Bird *et al*. (2010). This is however not expected to have a significant influence on the results because the abnormal shareholder return was calculated over a one year period and because the more frequent mineral resource announcements were project specific, it did not enable a holistic analysis of the entire company. The lack of timeliness of the annual report, where the report is only issued a couple of months after the financial year-end, means that the year-end share price and P/E ratio might not fully reflect the information of the annual report.

Hair, Anderson, Tatham and Black (1998) explained that a minimum of five observations are required for each independent variable in the regression equation in order to reduce the risk of over fitting. They further indicate that the recommended level is 50 observations for each independent variable when stepwise procedures are used. Because the resulting sample size was not big enough to follow the recommended ratio of 50 it was decided to conduct the stepwise regression analyses if the minimum requirement was achieved. This would affect the generalisability of the results and Hair *et al*. (1998) cautions that the generalisability must be validated.

5 Results

5.1 Introduction

This chapter provides the results of the analyses and is structured according to the data analysis section of the previous chapter. The sample is first described before the results of the different research questions are provided.

Due to the exploratory nature of the first two research questions, only the statistically significant results will be reported in this chapter. The results that were found not to be significant will be reported in Appendix E.

5.2 Descriptive Statistics

5.2.1 Sample Characteristics

1148 out of the total of 1300 were evaluated to obtain the final sample of 76 companies that satisfied the following required criteria:

- Producing mining company
- Pure play or single commodity
- Operational during 2010, 2011 and 2012

The randomly sampled companies were evaluated in terms of the abovementioned criteria and data were only collected on the companies that satisfied the criteria. Table 8 provides a summary of the successful companies in terms of their primary stock exchange listing. The complete list of sampled companies is provided in Appendix B.

Table 8 Final Disproportionate Stratified Sample

Strata Description	Successful Company Count
ASX	24
JSE	12
LSE	12
TSX	28
Total	**76**

Table 8 indicates that only 12 companies have been sampled from both the JSE and LSE strata. The entire JSE and LSE higher level strata were exhaustively evaluated to identify their respective samples. Although the ASX and TSX still had potential

companies in the strata that have not been evaluated it was decided to continue with the current sample of 76 companies due to the extensive time required to identify additional companies. The associated research limitation was noted and discussed in the research limitations of the previous chapter.

The frequency distribution of the sample for the different commodity types are shown in Table 9.

Table 9 Commodity Type Frequency Distribution

Commodity Type	Frequency	Percent
Coal	6	7.9
Copper	2	2.6
Diamonds	2	2.6
Ferrochrome	2	2.6
Gold	44	57.9
Iodine	1	1.3
Iron Ore	6	7.9
Magnetite	2	2.6
Nickel	2	2.6
Platinum	6	7.9
Silver	2	2.6
Uranium	1	1.3
Total	**76**	**100.0**

Table 9 indicates that 12 different commodity types were represented in the sample and that the majority of sampled companies, 57.9%, were gold mining companies. The remainder of commodities was not represented by a significant number with the second highest representation coming from coal, iron ore and platinum all at 7.9%.

The distribution of the sample in terms of its size, measured by its market capitalisation (MC), is presented in Figure 4.

Figure 4 Market Capitalisation (MC) Histogram

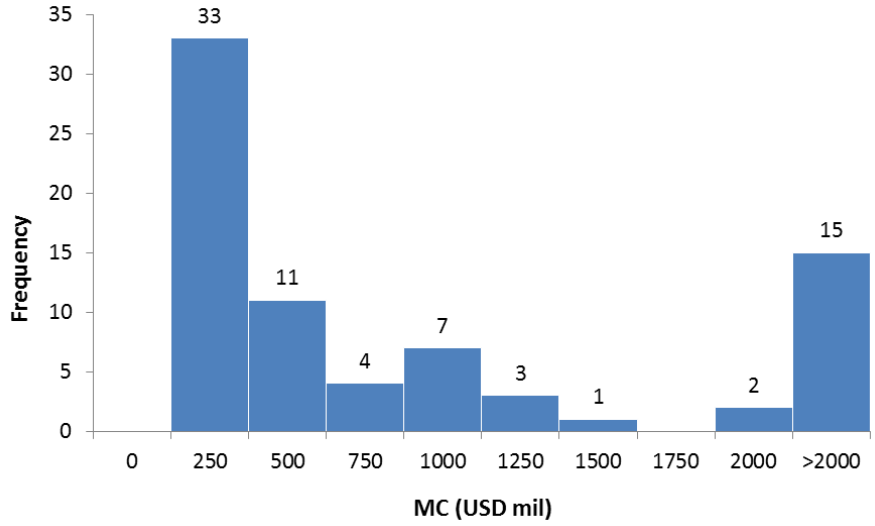


Figure 4 indicates that the majority of the sample consisted of small-cap companies with a MC below USD2 billion. Only 15 companies had a MC of more than USD2 billion.

The MC of the different stock exchanges are compared in Figure 5.

Figure 5 Market Capitalisation (MC) by Stock Exchange

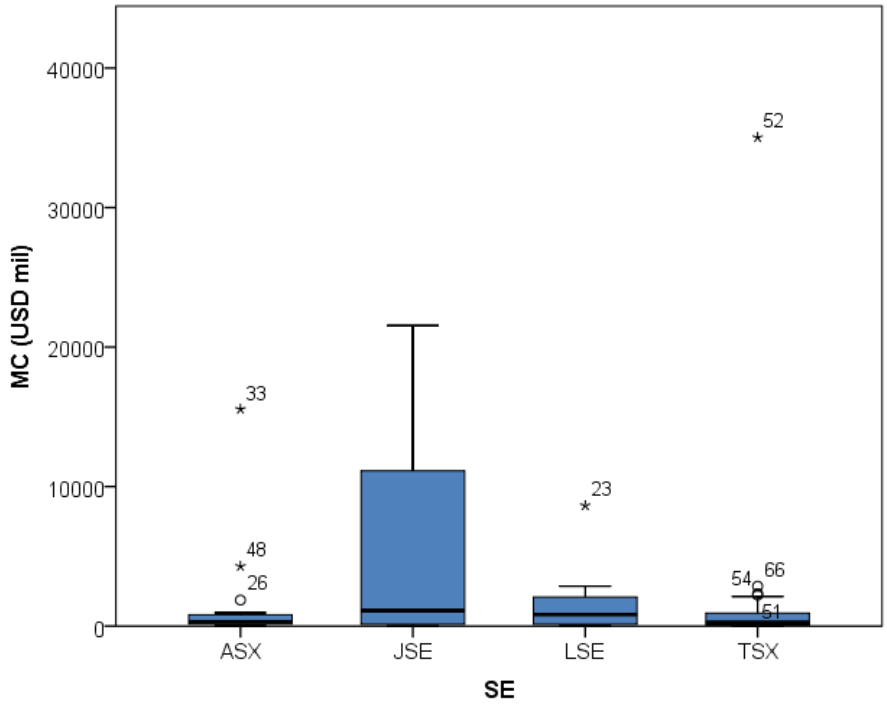


Figure 5 indicates that the companies with a primary listing on the JSE have higher MCs than the other stock exchanges. The company with the highest MC is sample observation 52, Barrick Gold Corporation, which has a primary listing on the TSX.

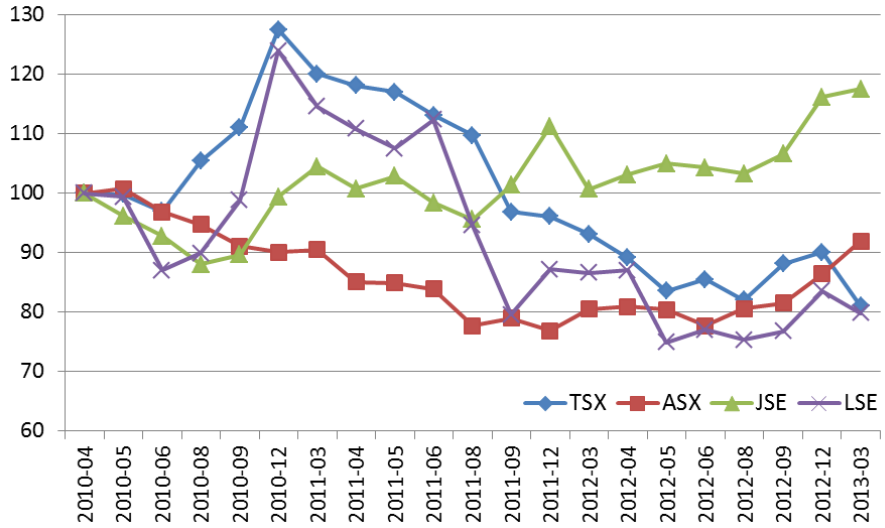
5.3 Key Variables

This section provides the descriptive statistics on the key variables. Appendix C contains a list of the summary descriptive statistics of all the variables used in the data analyses.

5.3.1 Abnormal Shareholder Return (ASR)

Figure 6 provides a comparison of the resource indices of the different primary stock exchanges. All four resource indices were indexed to 100 on 30 April 2010.

Figure 6 Resource Indices Performance Comparison



From Figure 6 it is apparent that the resource sector was under pressure since 2010 with a decline in performance for all stock exchanges except the JSE.

The ASR could be calculated for all 76 sampled companies and had a minimum and maximum value of -256% and 49.4% respectively. The distribution of ASR for the entire sample is shown in Figure 7.

Figure 7 ASR Histogram

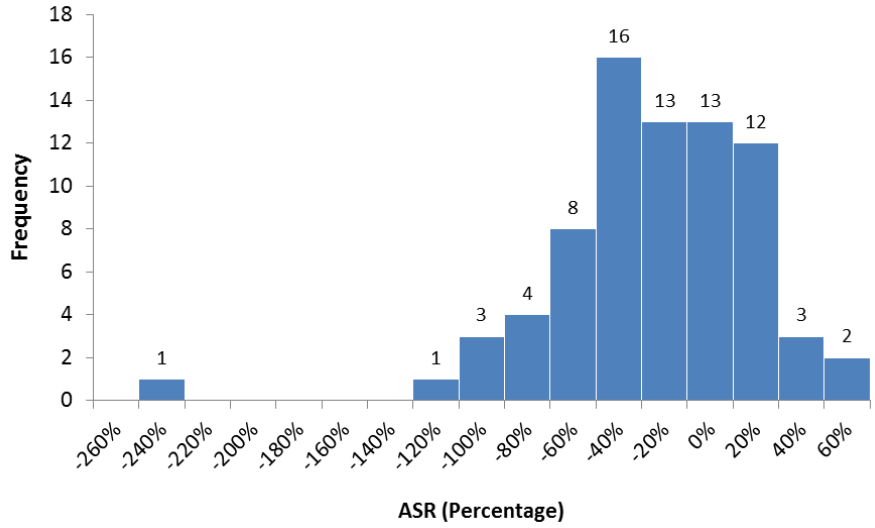
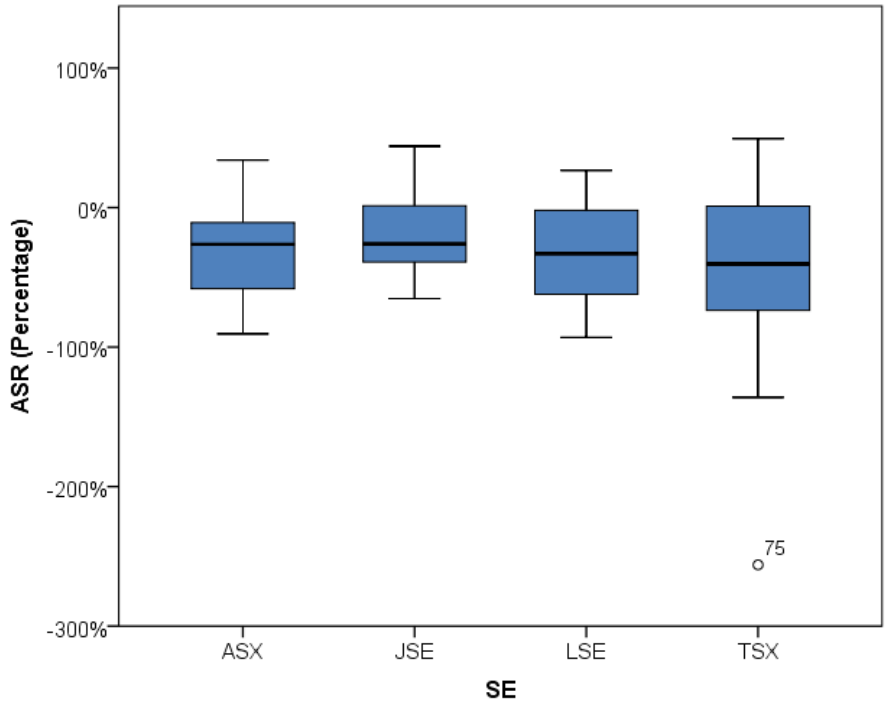


Figure 7 indicates that the ASR distribution is negatively skewed and that it contains one extreme negative observation. Figure 8 provides a comparison of the ASR for each of the stock exchanges.

Figure 8 ASR Comparison by Stock Exchange



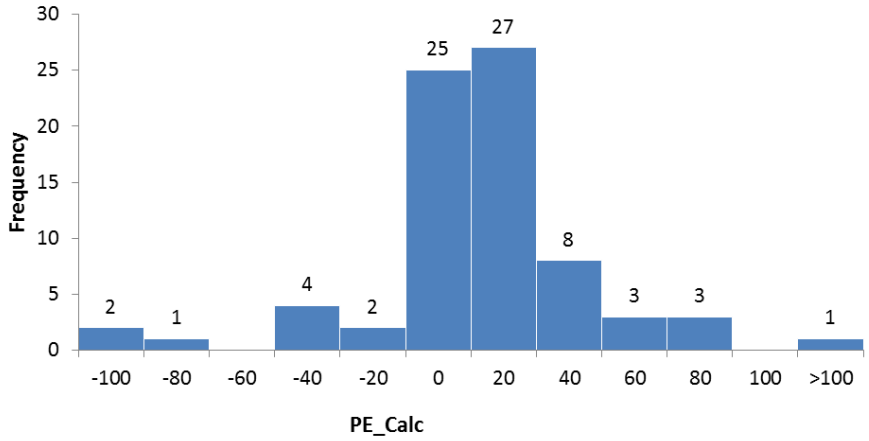
It can be seen from Figure 8 that the majority of sampled companies did not perform well and produced shareholder losses in addition to the losses visible in Figure 6. The extreme negative observation was sample 75, White Tiger Gold Ltd., which experienced an abnormal shareholder loss of 256%. White Tiger Gold Ltd. was

analysed in terms of its financial performance and mineral resource reporting information but no information could be identified to explain the difference when compared to the other companies. White Tiger Gold Ltd. was therefore not removed from the sample.

5.3.2 P/E Ratio

The distribution of the calculated P/E ratio in 2012 (PE_Calc_{2012}) is shown in Figure 9.

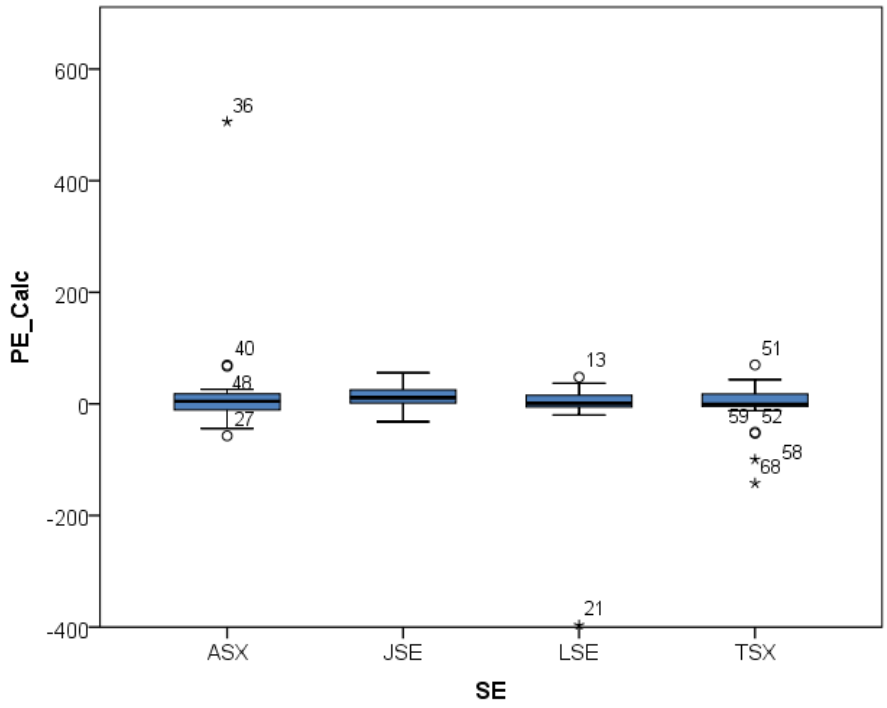
Figure 9 PE_Calc_{2012} Histogram



It can be seen from Figure 9 that 34 sample companies had a negative calculated P/E ratio and corresponds with the sample companies where the P/E ratio were not reported. The balance of 42 sample companies had positive P/E ratios and the calculated P/E ratios were verified through a comparison with the reported P/E ratios.

Figure 10 provides a comparison of the PE_Calc_{2012} values for the different stock exchanges.

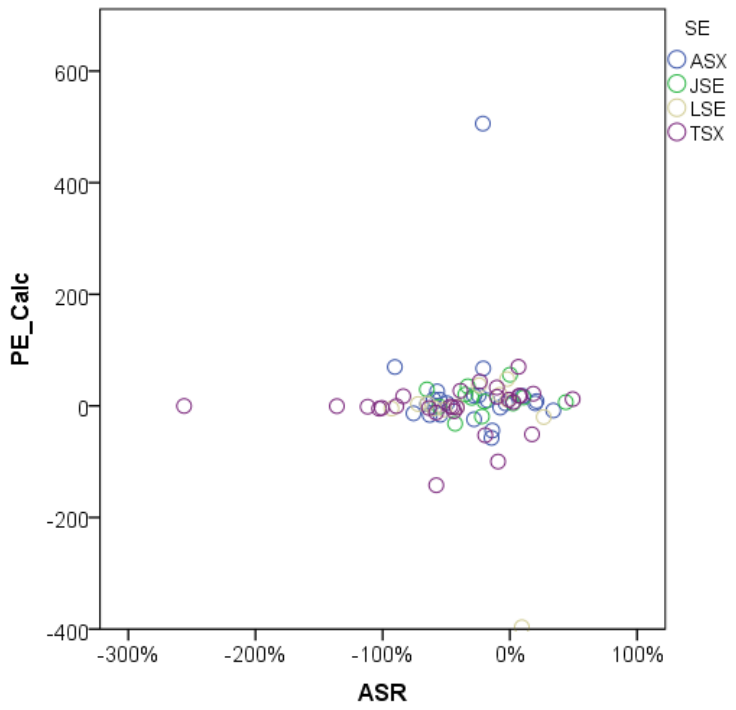
Figure 10 PE_Calc$_{2012}$ Comparison by Stock Exchange



Two extreme observations are visible from Figure 10, samples 36 and 21. The highest P/E ratio of 506 belonged to sample 36, Mincor Resources NL, while the lowest P/E ratio of -397 belonged to sample 21, Petra Diamonds Ltd. The majority of sample companies however had familiar P/E ratios ranging from low positive numbers up to around 40.

The PE_Calc$_{2012}$ variable is compared against the ASR variable in Figure 11.

Figure 11 PE_Calc_{2012} vs. ASR Scatter Plot



The ΔPE variable (change in P/E ratio from 2011 to 2012) could be calculated for 73 of the sampled companies. The ΔPE variable could not be calculated for the following three companies because the required information was not available for 2011 in the OSIRIS database or company reports:

- Luna Gold Corp.
- Orosur Mining Inc.
- Sirocco Mining Inc.

The distribution of ΔPE values is shown in Figure 12.

Figure 12 ΔPE Histogram

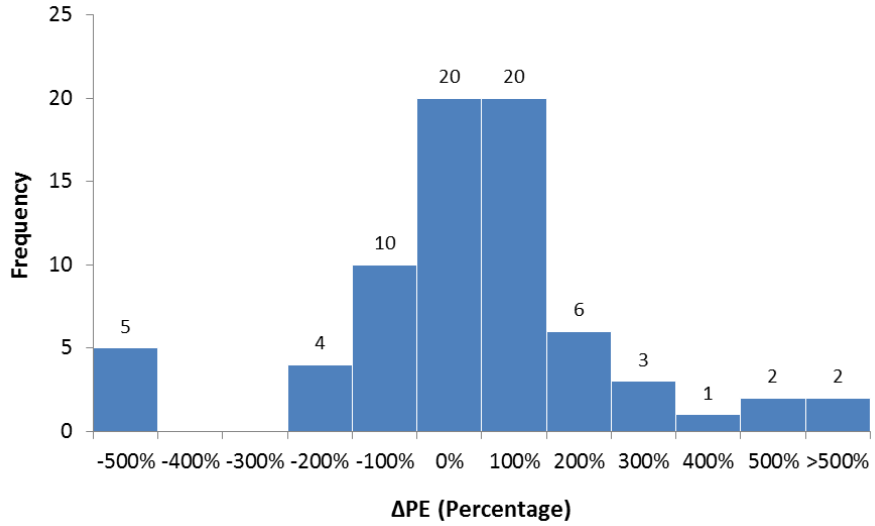
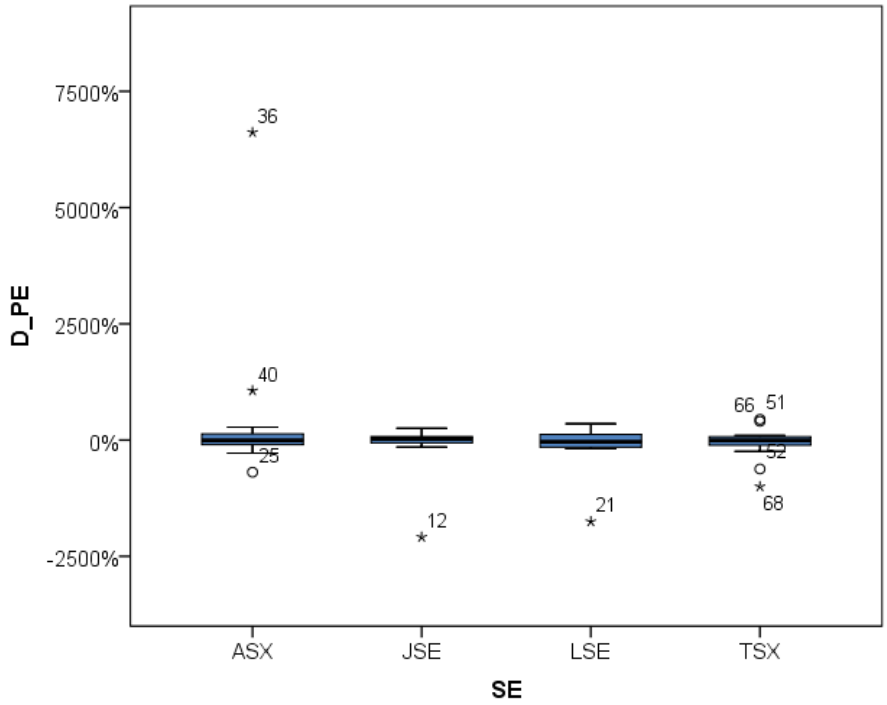


Figure 13 provides a comparison of the ΔPE values for each of the stock exchanges.

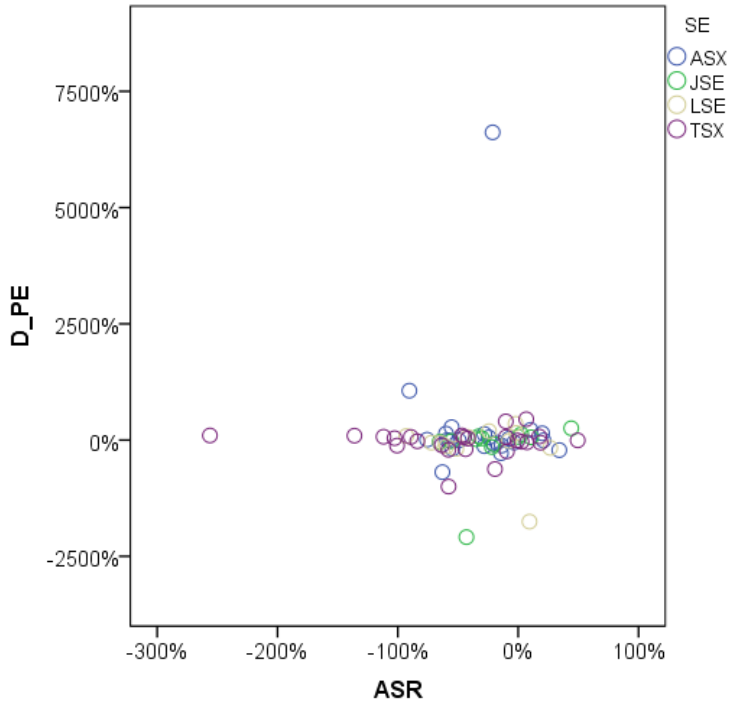
Figure 13 ΔPE Comparison by Stock Exchange



From Figure 13 it can be seen that each of the stock exchanges contain a couple of extreme observations with the ASX being the only stock exchange with extreme positive observations. The highest ΔPE value belonged to sample observation 36, Mincor Resources NL, at 6617% and the lowest belonged to sample observation 12,

ZCI Limited, with -2087%. Figure 14 compares the ΔPE variable against the ASR variable.

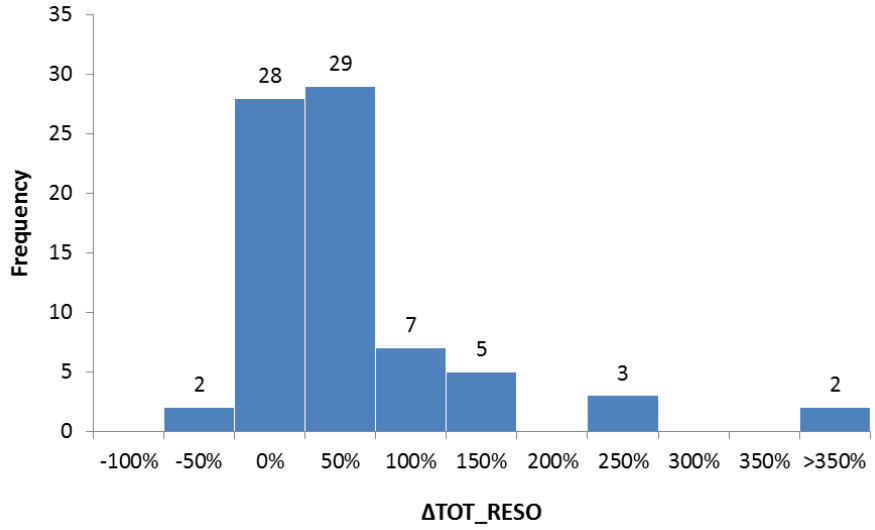
Figure 14 ΔPE vs. ASR Scatter Plot



5.3.3 Change in Total Mineral Resource

All of the sampled companies reported at least their total mineral resource value and this meant that the change in total mineral resources could be calculated for all 76 sampled companies. The ΔTOT_RESO had a minimum of -74%, a maximum of 482% and a mean value of 36%. The distribution of ΔTOT_RESO is shown in Figure 15.

Figure 15 ΔTOT_RESO Histogram



It can be seen from Figure 15 that the ΔTOT_RESO distribution is positively skewed. 30 of the 76 sampled companies experienced a decline in their total mineral resource. The ΔTOT_RESO values for each of the stock exchanges are shown in Figure 16.

Figure 16 ΔTOT_RESO Comparison by Stock Exchange

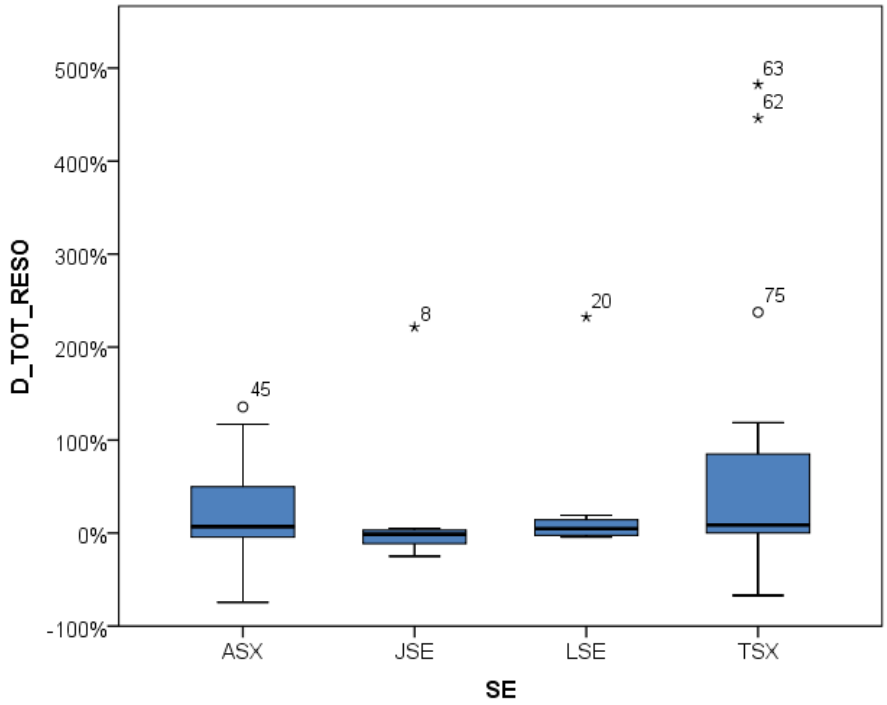


Figure 16 indicates a couple of extreme observations for each of the stock exchanges. The ASX and TSX have a bigger and more positive range than that of the JSE and LSE.

5.3.4 Total Mineral Resource Life of Mine

As with the TOT_RESO variable the TOT_RESO_LOM could be calculated for all the sampled companies. The TOT_RESO_LOM variable is always positive since it is not possible for companies to have a negative mineral resource or negative production. The TOT_RESO_LOM distribution is shown in Figure 17.

Figure 17 TOT_RESO_LOM Histogram

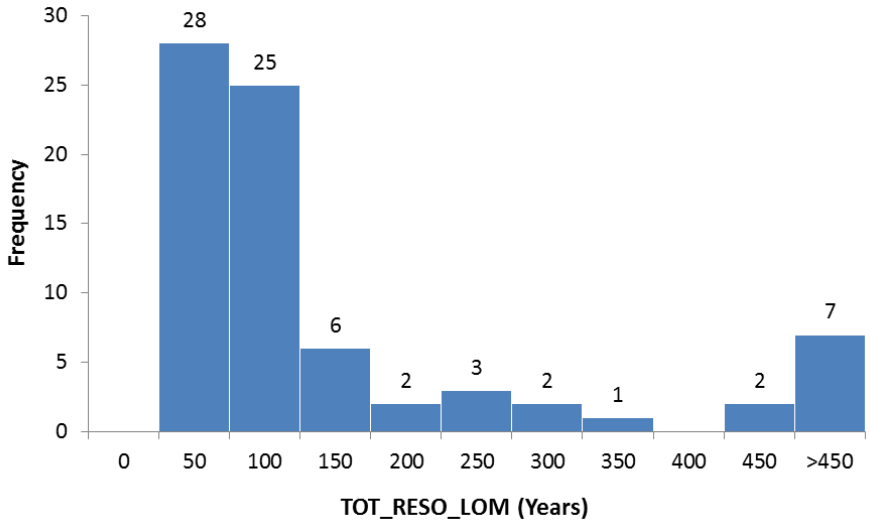


Figure 17 illustrates that the majority of sampled companies had a TOT_RESO_LOM of less than 100 years and that there are a few sampled companies who had a TOT_RESO_LOM of more than 450 years. According to the Mining Journal Online (n.d.) the average life of a mine can vary significantly from eight years for gold mines to up to 100 years for diamond mines. From Figure 17 it can be seen that there are a number of mines with an estimated life of mine of more than 100 years.

Figure 18 provides the TOT_RESO_LOM for each of the stock exchanges.

Figure 18 TOT_RESO_LOM by Stock Exchange

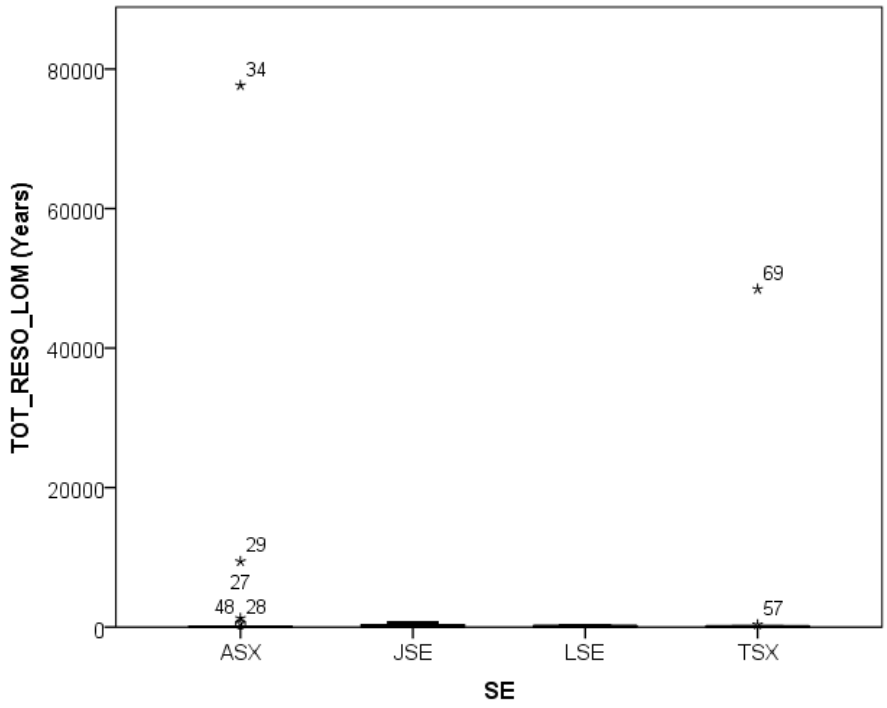


Figure 18 indicates that the ASX has the largest number of outliers. The two highest TOT_RESO_LOM values belonged to sample observation 34, Grange Resources Limited, and sample observation 69, Sirocco Mining Inc.

The distribution in the change of TOT_RESO_LOM (ΔTOT_RESO_LOM) from 2010 to 2011 is shown in Figure 19.

Figure 19 ΔTOT_RESO_LOM Histogram

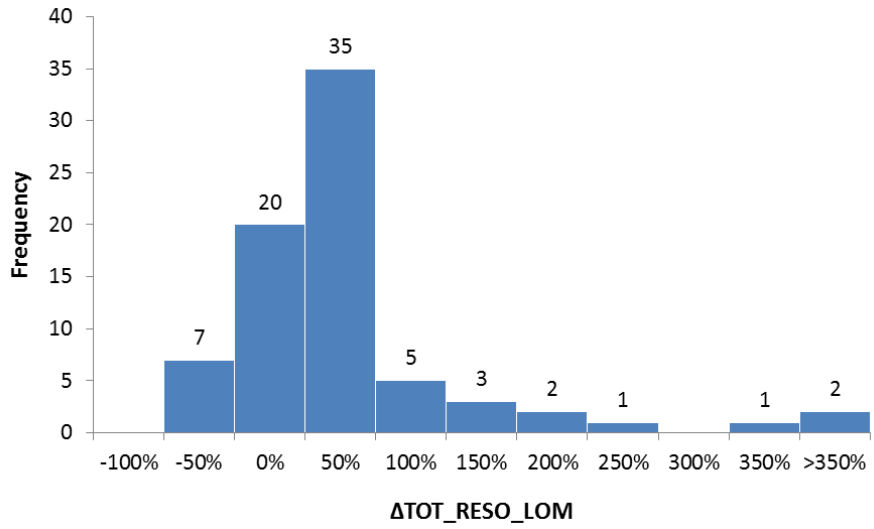
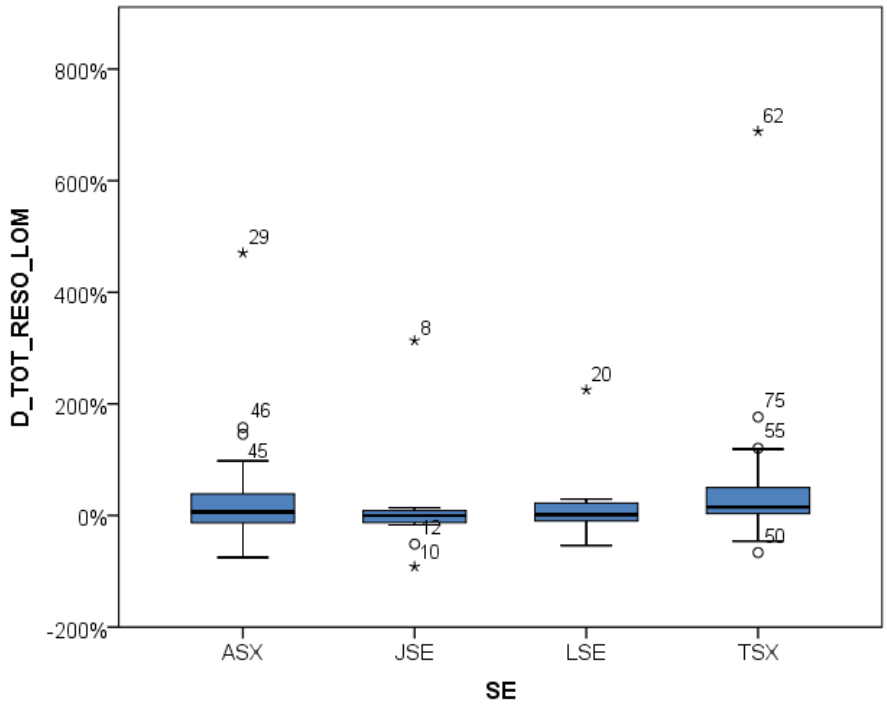


Figure 19 indicates that the ΔTOT_RESO_LOM for the majority of sampled companies fell in the range from -100% to 50% with a mean value of 33%. The ΔTOT_RESO_LOM values are shown per stock exchange in Figure 20.

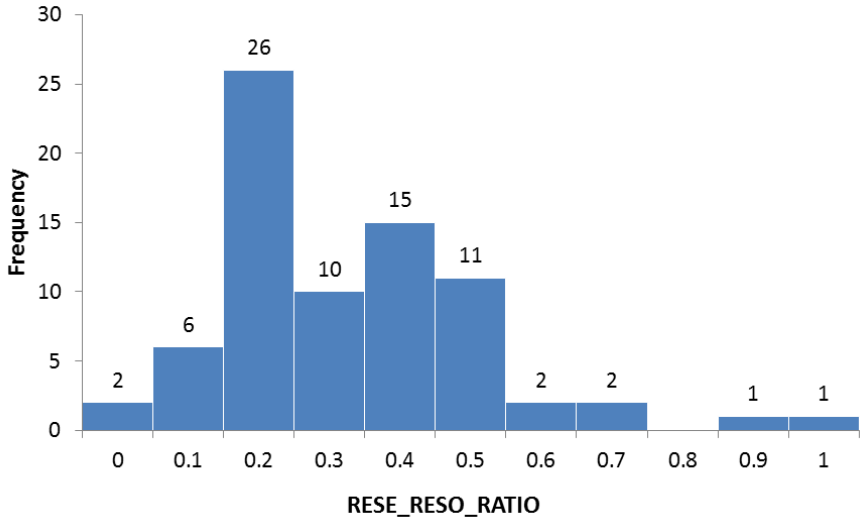
Figure 20 ΔTOT_RESO_LOM by Stock Exchange



5.3.5 Reserve to Resource Ratio

The RESE_RESO_RATIO could be calculated for all 76 sampled companies and had a mean value of 0.28. The distribution of RESE_RESO_RATIO values is shown in Figure 21.

Figure 21 RESE_RESO_RATIO Histogram



It can be seen from Figure 21 that some sampled companies had no reserves while others only had reserves and no additional resources. Two sampled companies had no reserves which suggest that these companies are at the start of the mining life cycle. One company only reported reserves and no resources which suggest that this company is at the end of the mining life cycle with limited growth opportunities. Figure 22 compares the RESE_RESO_RATIO between the different stock exchanges.

Figure 22 RESE_RESO_RATIO by Stock Exchange

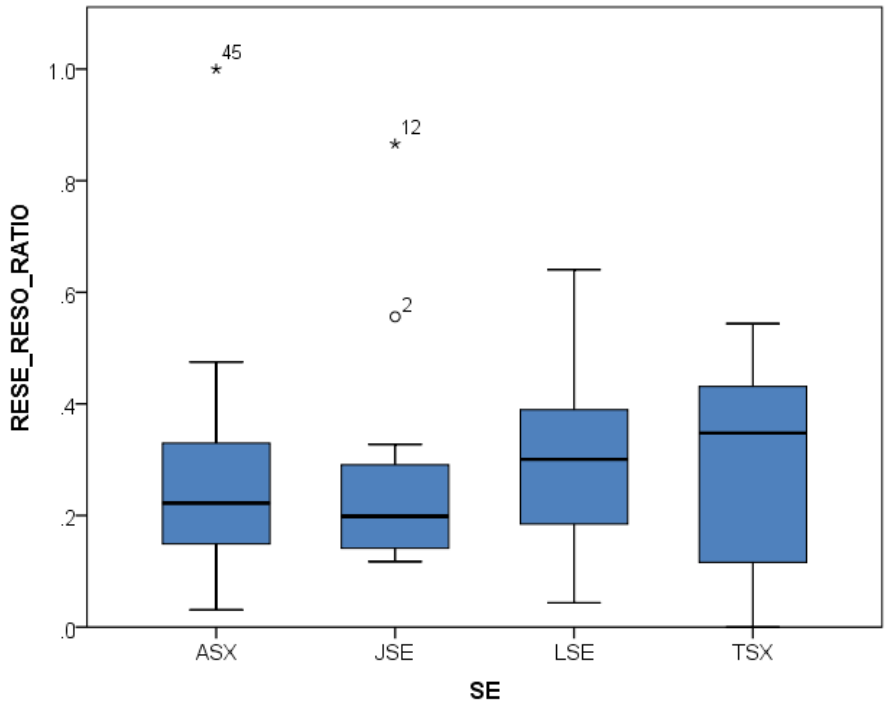


Figure 22 indicates that the TSX had the highest mean RESE_RESO_RATIO which indicates that companies listed on the TSX had more confidence in mineral resources than the other stock exchanges. The JSE had the lowest mean RESE_RESO_RATIO. Sample observation 45, Tasmania Mines Limited, was the company that only reported reserves without any resources.

The change in the RESE_RESO_RATIO from 2010 to 2011 (∆RESE_RESO_RATIO) could only be calculated for 72 sample companies. The ∆RESE_RESO_RATIO could not be calculated for the following four companies because they did not report any reserves in 2010:

- Coal of Africa Limited
- Lake Shore Gold Corp
- Tanami Gold NL
- White Tiger Gold Ltd.

The distribution of the ∆RESE_RESO_RATIO values is shown in Figure 23.

Figure 23 ∆RESE_RESO_RATIO Histogram

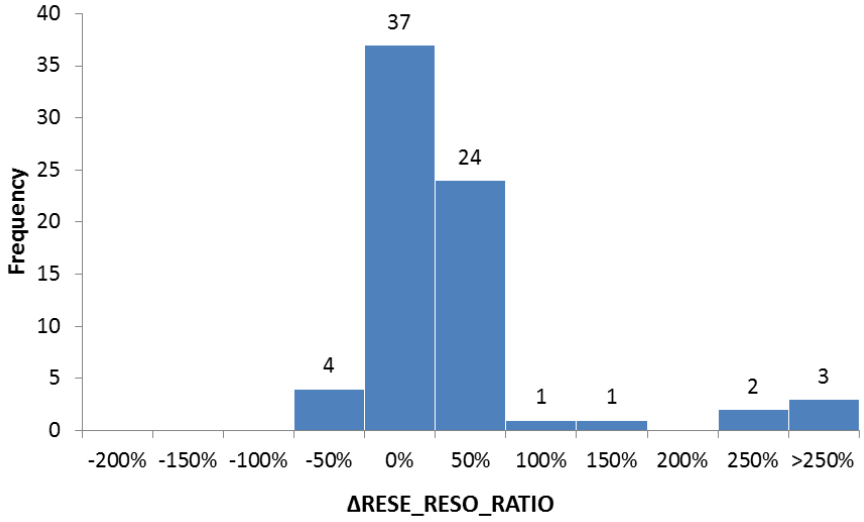


Figure 23 indicates that 41 sample companies experienced a decline in their RESE_RESO_RATIO, i.e. had a negative ∆RESE_RESO_RATIO, with only a few companies achieving a substantial improvement. The breakdown of the ∆RESE_RESO_RATIO per stock exchange is shown in Figure 24.

Figure 24 ΔRESE_RESO_RATIO by Stock Exchange

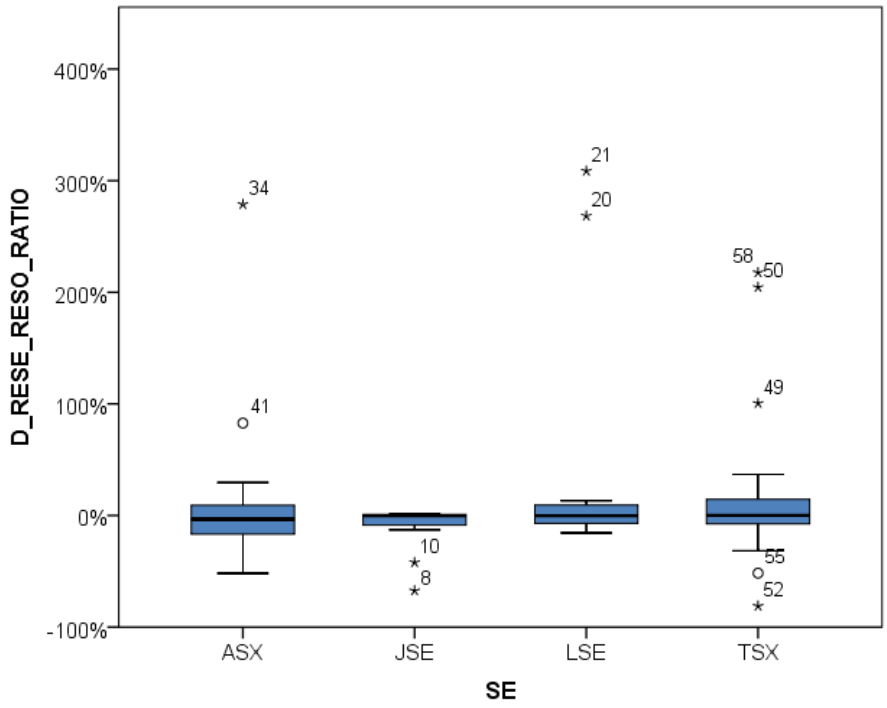


Figure 24 points out that the companies listed on the JSE experienced lower growth in their RESE_RESO_RATIO than the companies listed on the other the stock exchanges.

5.4 Analysis

The analysis tool used for both the regression and hypothesis analyses was IBM SPSS Statistics.

5.4.1 Regression Analyses

The results of the regression analyses are reported in this section. As indicated by Table 5 of the previous chapter, nine regression equations were planned to be conducted for nine different sample groups. In total there were 81 possible regression scenarios for each of the first two research questions. Only the statistical significant results are reported in the following two sections. The normal probability plots (Normal P-P) of regression standardised residual and scatterplots are shown in Appendix D as the supporting graphs to check the assumptions of normality, linearity and homoscedasticity (Pallant, 2011).

The non-significant results are shown in Appendix E and will also be summarised at the end of this section.

Because the actual sample of 76 was significantly fewer than the planned sample of 120 not all of the scenarios achieved the minimum ratio of five observations for each independent variable (Hair *et al.*, 1998). The scenarios that satisfied this requirement was first determined for each research question before the regression analyses were conducted.

5.4.1.1 Research Question 1

Does a relationship exist between a company's mineral resource reporting and its shareholder value?

The ratios of actual sample observations to the number of independent variables for each of the regression scenarios are shown in Table 10. Ratios that achieve the recommended value are highlighted in green, ratios that achieved the minimum value are highlighted in orange and the ratios that did not achieve the minimum value are highlighted in red.

Table 10 RQ1: Observations to Independent Variables Ratio

Regression Equation #	Total Sample	Commodity		Stock Exchange				Market Cap	
		Gold	Non-Gold	ASX	TSX	JSE	LSE	Small	Large
1	19	11	8	6	7	3	3	15.25	3.75
2	76	44	32	24	28	12	12	61	15
3	36	20.5	15.5	11	13	6	6	28.5	7.5
4	13	7.4	5.6	3.8	5	2.2	2	10	3
5	76	44	32	24	28	12	12	61	15
6	36	20.5	15.5	11	13	6	6	28.5	7.5
7	13	7.4	5.6	3.8	5	2.2	2	10	3
8	17	10	7	5.5	6	2.75	2.75	13.5	3.75
9	15	8.75	6.25	4.5	5.75	2.5	2.25	11.5	3.75

Table 10 indicates that only four of the regression scenarios satisfied the recommended ratio of 50:1. These four scenarios however only had one independent variable which reduced the recommended ratio to 15:1 (Hair *et al.*, 1998). Although

below the recommended ratio, all the scenarios that achieved the minimum ratio (highlighted in orange) were also explored thereby accepting the associated limitation on generalisability to the greater population (Hair *et al.*, 1998).

5.4.1.1.1 Regression Equation 1

These regression analyses explored the relationship between ASR and the different financial variables. The regression model is presented in Equation 17.

Equation 17 RQ1: RE1

$$ASR = a + b_1 \Delta REV + b_2 \Delta OP + b_3 \Delta NP + b_4 \Delta OCF + \varepsilon$$

5.4.1.1.1.1 Total Sample

Table 11 summarises the results of the regression analysis applied to the total sample of 76.

Table 11 RQ1 RE1 Results: Total Sample

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	-0.3	0.05	-5.951	0	
D_NP	0.042	0.012	3.549	0.001**	1
Model Summary	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**	
	0.381	0.145	0.134	0.427392545	
ANOVA	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	2.301	1	2.301	12.595	0.001**
Residual	13.517	74	0.183		
Total	15.818	75			

*Significant at a 5% level;**Significant at a 1% level

Excluded Variables	Beta In	t	Sig.
D_REV	0.055	0.51	0.612
D_OP	-0.068	-0.438	0.663
D_OCF	0.176	1.658	0.102

Table 11 indicates that the p value of the resulting model was 0.001. The model was therefore statistically significant (p≤0.05) and included the following statistically significant variable:

- ΔNP**

The adjusted R^2 value indicates that 13.4% of the variance in ASR is explained by the variation in ΔNP and represents a weak relationship. The b coefficient of 0.042 is

positive and indicates a direct relationship between ASR and ΔNP. Higher values of ASR are therefore associated with higher values of ΔNP. The other variables (ΔREV, ΔOP and ΔOCF) were found not to be significant with p values greater than 0.1.

5.4.1.1.1.2 Gold Scenario

Table 12 provides the results of the regression analysis performed on the gold companies.

Table 12 RQ1 RE1 Results: Gold Scenario

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	-0.195	0.073	-2.668	0.011	
D_NP	0.085	0.021	4.007	0**	2.722
D_OP	-0.047	0.018	-2.595	0.013*	2.722
Model Summary	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**	
	0.541	0.293	0.259	0.449250665	
ANOVA	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	3.433	2	1.716	8.504	0.001**
Residual	8.275	41	0.202		
Total	11.707	43			

*Significant at a 5% level;**Significant at a 1% level

Excluded Variables	Beta In	t	Sig.
D_REV	0.089	0.67	0.507
D_OCF	0.024	0.18	0.858

It can be seen from Table 12 that the p value of the resulting model was statistically significant at 0.001 (p≤0.05). The model included the following statistically significant variables:

- ΔNP**
- ΔOP*

The adjusted R^2 value indicates that 25.9% of the variance in ASR is explained by the variation in ΔNP and ΔOP. This represents a weak relationship. The b coefficient of 0.085 is positive and indicates a direct relationship where higher values of ASR are associated with higher values of ΔNP. The b coefficient for ΔOP is however negative and indicates an inverse relationship and indicates that higher values of ASR are associated with lower values of ΔOP. The other variables (ΔREV and ΔOCF) were found not to be significant with p values greater than 0.5.

5.4.1.1.1.3 Non-Gold Scenario

The result of the regression analysis conducted on non-gold companies is shown in Table 13.

Table 13 RQ1 RE1 Results: Non-Gold Scenario

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	-0.334	0.053	-6.28	0	
D_OP	0.033	0.011	2.988	0.006**	1.044
D_OCF	0.033	0.014	2.318	0.028*	1.044
Model Summary	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**	
	0.618	0.382	0.339	0.29182512	
ANOVA	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	1.524	2	0.762	8.95	0.001**
Residual	2.47	29	0.085		
Total	3.994	31			

*Significant at a 5% level;**Significant at a 1% level

Excluded Variables	Beta In	t	Sig.
D_REV	-0.114	-0.74	0.466
D_NP	0.075	0.402	0.691

Table 13 indicates that the p value of the resulting model was 0.001. The model was therefore statistically significant ($p \leq 0.05$) and included the following statistically significant variables:

- ΔOP**
- ΔOCF*

The adjusted R^2 value indicates that 33.9% of the variance in ASR is explained by the variation in the independent variables and represents a moderate relationship. The b coefficient for both of ΔOP and ΔOCF is positive, 0.033, and indicates a direct relationship with ASR. Higher levels of ASR are therefore associated with higher values of both ΔOP and ΔOCF. The other variables ΔREV and ΔNP were found not to be significant with p values of 0.466 and 0.691 respectively.

5.4.1.1.1.4 TSX Scenario

Table 14 summarises the results of the regression analysis applied to the TSX scenario.

Table 14 RQ1 RE1 Results: TSX Scenario

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	-0.349	0.114	-3.078	0.005	
D_NP	0.041	0.017	2.437	0.022*	1

Model Summary	R	R^2	Adjusted R^2	Std. Error of the Estimate
	0.431	0.186	0.155	0.565268719

ANOVA	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.898	1	1.898	5.939	0.022*
Residual	8.308	26	0.32		
Total	10.205	27			

*Significant at a 5% level;**Significant at a 1% level

Excluded Variables	Beta In	t	Sig.
D_REV	0.319	1.886	0.071
D_OP	-0.135	-0.52	0.608
D_OCF	0.208	1.178	0.25

Table 14 indicates that the p value of the resulting model was 0.022. The model was therefore statistically significant ($p \leq 0.05$) and included the following statistically significant variable:

- ΔNP*

The adjusted R^2 value indicates that 15.5% of the variance in ASR is explained by the variation in ΔNP and represents a weak relationship. The b coefficient of 0.041 is positive and indicates a direct relationship between ASR and ΔNP. The other variables (ΔREV, ΔOP and ΔOCF) were found not to be significant with p values greater than 0.25.

5.4.1.1.1.5 Small-Cap Scenario

Table 15 provides the results of the regression analysis performed on the gold companies.

Table 15 RQ1 RE1 Results: Small-Cap Scenario

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	-0.337	0.061	-5.495	0	
D_NP	0.041	0.013	3.135	0.003**	1
Model Summary	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**	
	0.378	0.143	0.128	0.461305043	
ANOVA	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	2.091	1	2.091	9.827	0.003**
Residual	12.555	59	0.213		
Total	14.646	60			

*Significant at a 5% level;**Significant at a 1% level

Excluded Variables	Beta In	t	Sig.
D_REV	0.095	0.782	0.437
D_OP	-0.057	-0.328	0.744
D_OCF	0.201	1.693	0.096

It can be seen from Table 15 that the p value of the resulting model was statistically significant at 0.003 ($p \leq 0.05$). The model included the following statistically significant variable:

- ΔNP**

The adjusted R^2 value indicates that 25.9% of the variance in ASR is explained by the variation in ΔNP. This represents a weak relationship. The positive b coefficient of 0.041 indicates a direct relationship between ASR and ΔNP. The other variables (ΔREV, ΔOP and ΔOCF) were found not to be significant with p values greater than 0.09.

5.4.1.1.2 Regression Equation 4

These regression analyses explored the relationship of ASR with the lowest level of mineral resource components as indicated in Equation 18.

Equation 18 RQ1: RE4

$$ASR = a + b_1\Delta INF + b_2\Delta IND + b_3\Delta MEAS + b_4\Delta PROB + b_5\Delta PROV + \varepsilon$$

The following sections provide the results of the scenarios that were found to be statistically significant. The results of the other scenarios were not statistically significant and are presented in Appendix E.

5.4.1.1.2.1 Non-Gold Scenario

The result of the regression analysis conducted on non-gold companies is shown in Table 16.

Table 16 RQ1 RE4 Results: Non-Gold Scenario

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	-0.358	0.061	-5.887	0	
D_PROB	-0.533	0.166	-3.218	0.003**	1
Model Summary	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**	
	0.534	0.285	0.257	0.31822697	
ANOVA	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	1.049	1	1.049	10.357	0.003**
Residual	2.633	26	0.101		
Total	3.682	27			

*Significant at a 5% level;**Significant at a 1% level

Excluded Variables	Beta In	t	Sig.
D_INF	-0.06	-0.349	0.73
D_IND	-0.236	-1.264	0.218
D_MEAS	0.09	0.532	0.599
D_PROV	-0.046	-0.273	0.787

Table 16 indicates that the p value of the resulting model was 0.003. The model was therefore statistically significant ($p \leq 0.05$) and included the following statistically significant variable:

- ΔPROB**

The adjusted R^2 value indicates that 25.7% of the variance in ASR is explained by the variation in ΔPROB and represents a weak relationship. The b coefficient for ΔPROB is negative and indicates an inverse relationship with ASR. Higher levels of ASR are therefore associated with lower values of both ΔPROB. The other variables were found not to be significant with p values greater than 0.218.

5.4.1.1.2.2 Small-Cap Scenario

Table 17 provides the results of the regression analysis performed on the small-cap companies.

Table 17 RQ1 RE4 Results: Small-Cap Scenario

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	-0.344	0.059	-5.782	0	
D_IND	-0.219	0.101	-2.159	0.036*	1
Model Summary	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**	
	0.297	0.088	0.069	0.411247809	
ANOVA	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	0.788	1	0.788	4.659	0.036*
Residual	8.118	48	0.169		
Total	8.906	49			

*Significant at a 5% level;**Significant at a 1% level

Excluded Variables	Beta In	t	Sig.
D_INF	0.095	0.679	0.5
D_MEAS	0.237	1.755	0.086
D_PROB	0.071	0.498	0.621
D_PROV	0.09	0.649	0.519

It can be seen from Table 17 that the p value of the resulting model was statistically significant at 0.036 (p≤0.05). The model included the following statistically significant variable:

- ΔIND*

The adjusted R^2 value indicates that 6.9% of the variance in ASR is explained by the variation in ΔIND. This represents a very weak relationship. The b coefficient of -0.219 is negative and indicates an inverse relationship where higher values of ASR are associated with lower values of ΔIND. The other variables were found not to be significant with p values greater than 0.086.

5.4.1.1.3 Regression Equation 8

This section contains the regression analyses that were conducted to explore the relationship between ASR and different mineral resource ratios as shown in Equation 19.

Equation 19 RQ1: RE8

$$ASR = a + b_1 RESE\_RESO\_RATIO + b_2 MI\_INF\_RATIO + b_3 MEAS\_IND\_RATIO + b_4 PROV\_PROB\_RATIO + \varepsilon$$

5.4.1.1.3.1 Total Sample

Table 18 summarises the results of the regression analysis applied to the total sample.

Table 18 RQ1 RE8 Results: Total Sample

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	-0.237	0.067	-3.555	0.001	
MI_INF_RATIO	-0.03	0.013	-2.36	0.021*	1

Model Summary	R	R^2	Adjusted R^2	Std. Error of the Estimate
	0.279	0.078	0.064	0.452969666

ANOVA	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.143	1	1.143	5.572	0.021*
Residual	13.542	66	0.205		
Total	14.685	67			

*Significant at a 5% level;**Significant at a 1% level

Excluded Variables	Beta In	t	Sig.
RESO_RESE_RATIO	0.075	0.627	0.533
MEAS_IND_RATIO	0.043	0.337	0.738
PROV_PROB_RATIO	0.055	0.435	0.665

Table 18 indicates that the p value of the resulting model was 0.021. The model was therefore statistically significant ($p \leq 0.05$) and included the following statistically significant variable:

- MI_INF_RATIO*

The adjusted R^2 value indicates that 6.4% of the variance in ASR is explained by the variation in MI_INF_RATIO and represents a very weak relationship. The b coefficient of -0.03 is negative and indicates an inverse relationship between ASR and MI_INF_RATIO. Higher values of ASR are therefore associated with lower values of MI_INF_RATIO. The other ratios were found not to be significant with p values greater than 0.5.

5.4.1.1.3.2 Gold Scenario

Table 19 provides the results of the regression analysis performed on the gold companies.

Table 19 RQ1 RE8 Results: Gold Scenario

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	-0.443	0.105	-4.23	0	
PROV_PROB_RATIO	0.342	0.147	2.319	0.026*	1

Model Summary	R	R^2	Adjusted R^2	Std. Error of the Estimate
	0.352	0.124	0.101	0.496778009

ANOVA	Sum of Squares	df	Mean Square	F	Sig.
Regression	1.327	1	1.327	5.379	0.026*
Residual	9.378	38	0.247		
Total	10.705	39			

*Significant at a 5% level;**Significant at a 1% level

Excluded Variables	Beta In	t	Sig.
RESO_RESE_RATIO	-0.05	-0.318	0.752
MI_INF_RATIO	-0.239	-1.589	0.121
MEAS_IND_RATIO	-0.156	-0.749	0.459

It can be seen from Table 19 that the p value of the resulting model was statistically significant at 0.026 ($p \leq 0.05$). The model included the following statistically significant variable:

- PROV_PROB_RATIO*

The adjusted R^2 value indicates that 10.1% of the variance in ASR is explained by the variation in PROV_PROB_RATIO. This represents a weak relationship. The b coefficient of 0.342 is positive and indicates a direct relationship where higher values of ASR are associated with higher values of PROV_PROB_RATIO. The other ratios were found not to be significant with p values greater than 0.1.

5.4.1.1.3.3 Small-Cap Scenario

The result of the regression analysis conducted on the small-cap companies is shown in Table 20.

Table 20 RQ1 RE8 Results: Small-Cap Scenario

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	-0.275	0.081	-3.403	0.001	
MI_INF_RATIO	-0.029	0.014	-2.092	0.041*	1
Model Summary	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**	
	0.279	0.078	0.06	0.493532983	
ANOVA	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	1.066	1	1.066	4.377	0.041*
Residual	12.666	52	0.244		
Total	13.732	53			

*Significant at a 5% level;**Significant at a 1% level

Excluded Variables	Beta In	t	Sig.
RESO_RESE_RATIO	0.012	0.089	0.93
MEAS_IND_RATIO	0.072	0.496	0.622
PROV_PROB_RATIO	0.065	0.453	0.652

Table 20 indicates that the p value of the resulting model was 0.041. The model was therefore statistically significant (p≤0.05) and included the following statistically significant variable:

- MI_INF_RATIO*

The adjusted R^2 value indicates that 6% of the variance in ASR is explained by the variation in MI_INF_RATIO and represents a very weak relationship. The b coefficient for MI_INF_RATIO is negative and indicates an inverse relationship with ASR. Higher values of ASR are therefore associated with lower values of both ΔPROB. The other variables were found not to be significant with p values greater than 0.6.

5.4.1.1.4 Regression Equation 9

These regression analyses explored the relationship between ASR and the change in the different mineral resource ratios as shown in Equation 20.

Equation 20 RQ1: RE9

$$ASR = a + b_1\Delta RESE\_RESO\_RATIO + b_2\Delta MI\_INF\_RATIO + b_3\Delta MEAS\_IND\_RATIO + b_4\Delta PROV\_PROB\_RATIO + \varepsilon$$

5.4.1.1.4.1 Total Sample

The result of the regression analysis conducted on the total sample is shown in Table 21.

Table 21 RQ1 RE9 Results: Total Sample

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	-0.326	0.051	-6.382	0	
D_MEAS_IND_RATIO	0.046	0.022	2.05	0.045*	1
Model Summary	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**	
	0.26	0.068	0.052	0.379497386	
ANOVA	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	0.605	1	0.605	4.204	0.045*
Residual	8.353	58	0.144		
Total	8.959	59			

*Significant at a 5% level;**Significant at a 1% level

Excluded Variables	Beta In	t	Sig.
D_RESE_RESO_RATIO	0.003	0.021	0.983
D_MI_INF_RATIO	0.031	0.241	0.81
D_PROV_PROB_RATIO	-0.138	-0.785	0.436

Table 21 indicates that the p value of the resulting model was 0.045. The model was therefore statistically significant (p≤0.05) and included the following statistically significant variable:

- ΔMEAS_IND_RATIO*

The adjusted R^2 value indicates that 5.2% of the variance in ASR is explained by the variation in ΔMEAS_IND_RATIO and represents a very weak relationship. The b coefficient of ΔMEAS_IND_RATIO is positive, 0.046, and indicates a direct relationship with ASR. Higher values of ASR are therefore associated with higher values of ΔMEAS_IND_RATIO. The other variables were found not to be significant with p values greater than 0.4.

5.4.1.1.4.2 Non-Gold Companies Scenario

Table 22 provides the results of the regression analysis performed on the non-gold companies.

Table 22 RQ1 RE9 Results: Non-Gold Scenario

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	-0.424	0.072	-5.861	0	
D_MEAS_IND_RATIO	0.113	0.051	2.202	0.038*	1
Model Summary	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**	
	0.417	0.174	0.138	0.35433604	
ANOVA	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	0.609	1	0.609	4.849	0.038*
Residual	2.888	23	0.126		
Total	3.497	24			

*Significant at a 5% level;**Significant at a 1% level

Excluded Variables	Beta In	t	Sig.
D_RESE_RESO_RATIO	-0.042	-0.216	0.831
D_MI_INF_RATIO	-0.239	-1.241	0.228
D_PROV_PROB_RATIO	-0.391	-0.747	0.463

It can be seen from Table 22 that the p value of the resulting model was statistically significant at 0.038 (p≤0.05). The model included the following statistically significant variable:

- ΔMEAS_IND_RATIO*

The adjusted R^2 value indicates that 13.8% of the variance in ASR is explained by the variation in ΔMEAS_IND_RATIO. This represents a weak relationship. The b coefficient of 0.113 is positive and indicates a direct relationship where higher values of ASR are associated with higher values of ΔMEAS_IND_RATIO. The other ratios were found not to be significant with p values greater than 0.2.

5.4.1.1.4.3 Small-Cap Scenario

Table 23 summarises the results of the regression analysis applied to the small-cap scenario.

Table 23 RQ1 RE9 Results: Small-Cap Scenario

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	-0.339	0.06	-5.691	0	
D_MI_INF_RATIO	-0.471	0.195	-2.415	0.02*	1

Model Summary	R	R^2	Adjusted R^2	Std. Error of the Estimate
	0.342	0.117	0.097	0.404488553

ANOVA	Sum of Squares	df	Mean Square	F	Sig.
Regression	0.954	1	0.954	5.832	0.02*
Residual	7.199	44	0.164		
Total	8.153	45			

*Significant at a 5% level;**Significant at a 1% level

Excluded Variables	Beta In	t	Sig.
D_RESE_RESO_RATIO	0.148	0.958	0.344
D_MEAS_IND_RATIO	0.273	1.985	0.054
D_PROV_PROB_RATIO	0.15	1.058	0.296

Table 23 indicates that the p value of the resulting model was 0.02. The model was therefore statistically significant (p≤0.05) and included the following statistically significant variable:

- ΔMI_INF_RATIO*

The adjusted R^2 value indicates that 9.7% of the variance in ASR is explained by the variation in ΔMI_INF_RATIO and represents a very weak relationship. The b coefficient of -0.471 is negative and indicates an inverse relationship between ASR and ΔMI_INF_RATIO. Higher values of ASR are therefore associated with lower values of ΔMI_INF_RATIO. The other ratios were found not to be significant with p values greater than 0.5.

5.4.1.1.5 Non-Significant Regression Equations

The following regression equations did not yield any statistically significant results:

- Regression Equation 2
- Regression Equation 3
- Regression Equation 5
- Regression Equation 6
- Regression Equation 7

The regression results (p values) for the above regression equations are shown in Appendix E.

5.4.1.2 Research Question 2

Does a relationship exist between a company's mineral resource reporting and the investor's confidence in the company?

The ratios of actual sample observations to the number of independent variables for each of the regression scenarios are shown in Table 24.

Table 24 RQ2: Observations to Independent Variables Ratio

Regression Equation #	Total Sample	Commodity		Stock Exchange				Market Cap	
		Gold	Non-Gold	ASX	TSX	JSE	LSE	Small	Large
1	18.25	10.5	7.75	6	6.25	3	3	14.5	3.75
2	73	42	31	24	25	12	12	58	15
3	34.5	19.5	15	11	11.5	6	6	27	7.5
4	12.6	7.2	5.4	3.8	4.6	2.2	2	9.6	3
5	73	42	31	24	25	12	12	58	15
6	34.5	19.5	15	11	11.5	6	6	27	7.5
7	12.6	7.2	5.4	3.8	4.6	2.2	2	9.6	3
8	16.5	9.75	6.75	5.5	5.5	2.75	2.75	13	3.5
9	14.5	8.5	6	4.5	5.25	2.5	2.25	11	3.5

Table 24 indicates that, as in the case of the first research questions, there are several scenarios that do not satisfy the minimum required ratio of five observations for each independent variable. All the remaining scenarios that achieved the minimum ratio (highlighted in orange and green) were analysed and the significant results are presented in the following sections.

5.4.1.2.1 Regression Equation 2

These regression analyses explored the relationship between the change in the P/E ratio (ΔPE) and the change in the total mineral resource value as shown in Equation 21.

Equation 21 RQ2: RE2

$$\Delta PE = a + b_1 \Delta TOT\_RESO + \varepsilon$$

The following sections provide the results of the scenarios that were found to be statistically significant. The results of the other scenarios were not statistically significant and are presented in Appendix E.

5.4.1.2.1.1 Large-Cap Scenario

Table 25 summarises the results of the regression analysis applied to the large-cap companies.

Table 25 RQ2 RE2 Results: Large-Cap Scenario

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	0.009	0.595	0.015	0.988	
D_TOT_RESO	3.675	1.541	2.385	0.033*	1
Model Summary	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**	
	0.552	0.304	0.251	2.294503678	
ANOVA	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	29.939	1	29.939	5.687	0.033*
Residual	68.442	13	5.265		
Total	98.381	14			

*Significant at a 5% level;**Significant at a 1% level

Table 25 indicates that the p value of the resulting model was 0.033. The model was therefore statistically significant (p≤0.05) and included the following statistically significant variable:

- ΔTOT_RESO*

The adjusted R^2 value indicates that 25.1% of the variance in ΔPE is explained by the variation in ΔTOT_RESO and represents a weak relationship. The b coefficient of 3.675 is positive and indicates a direct relationship between ΔPE and ΔTOT_RESO. Higher values of ΔPE are therefore associated with higher values of ΔTOT_RESO.

5.4.1.2.2 Regression Equation 3

These regression analyses explored the relationship of ΔPE with the change in the second level of mineral resource components as indicated in Equation 22.

Equation 22 RQ2: RE3

$$\Delta PE = a + b_1 \Delta RESO + b_2 \Delta RESE + \varepsilon$$

The following sections provide the results of the scenarios that were found to be statistically significant. The results of the other scenarios were not statistically significant and are presented in Appendix E.

5.4.1.2.2.1 LSE Scenario

The stepwise procedure revealed no significant result whereas the backward procedure indicated the following significant result for the LSE scenario as shown in Table 26.

Table 26 RQ2 RE3 Results: LSE Scenario

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	-1.019	0.92	-1.107	0.297	
D_RESO	24.666	4.801	5.138	0.001**	12.683
D_RESE	-4.933	0.958	-5.151	0.001**	12.683
Model Summary	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**	
	0.866	0.75	0.695	2.965637489	
ANOVA	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	237.581	2	118.79	13.507	0.002**
Residual	79.155	9	8.795		
Total	316.736	11			

*Significant at a 5% level;**Significant at a 1% level

The variation inflation factor (VIF) collinearity statistic is however above 10 which is indicative of multicollinearity (Pallant, 2011). The Pearson correlation statistic results are presented in Table 27.

Table 27 Pearson Correlation Results

	D_PE	D_RESO	D_RESE
D_PE	1		
D_RESO	0.115	1	
D_RESE	-0.13	0.96	1

Table 27 indicates that the Pearson correlation coefficient between ΔRESO and ΔRESE is 0.96 and confirms the strong correlation between these two independent variables. These variables were regressed individually which revealed that neither were statistically significant. The resulting p values are shown in Appendix E.

5.4.1.2.2.2 Large-Cap Scenario

The result of the regression analysis conducted on the large-cap companies is shown in Table 28.

Table 28 RQ2 RE3 Results: Large-Cap Scenario

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	-0.214	0.56	-0.382	0.708	
D_RESE	2.858	0.958	2.982	0.011*	1
Model Summary	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**	
	0.637	0.406	0.36	2.119945949	
ANOVA	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	39.957	1	39.957	8.891	0.011*
Residual	58.424	13	4.494		
Total	98.381	14			

*Significant at a 5% level;**Significant at a 1% level

Excluded Variables	Beta In	t	Sig.
D_RESO	-0.275	-0.979	0.347

Table 28 indicates that the p value of the resulting model was 0.011. The model was therefore statistically significant (p≤0.05) and included the following statistically significant variable:

- ΔRESE*

The adjusted R^2 value indicates that 36% of the variance in ΔPE is explained by the variation in ΔRESE and represents a moderate relationship. The b coefficient ΔOP and ΔRESE is positive, 2.858, and indicates a direct relationship with ΔPE. Higher values of ΔPE are therefore associated with higher values of ΔRESE. The ΔRESO variable was found not to be significant with a p value of 0.347.

5.4.1.2.3 Regression Equation 5

These regression analyses explored the relationship between the change in the P/E ratio (ΔPE) and the change in the total mineral resource LOM as shown in Equation 23.

Equation 23 RQ2: RE5

$$\Delta PE = a + b_1 \Delta TOT\_RESO\_LOM + \varepsilon$$

The following section provides the result of the scenario that was found to be statistically significant. The results of the other scenarios were not statistically significant and are presented in Appendix E.

5.4.1.2.3.1 Large-Cap Scenario

Table 29 summarises the results of the regression analysis applied to the large-cap companies.

Table 29 RQ2 RE3 Results: Large-Cap Scenario

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	0.315	0.608	0.518	0.613	
D_TOT_RESO_LOM	4.858	2.169	2.24	0.043*	1
Model Summary	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**	
	0.528	0.278	0.223	2.336819296	
ANOVA	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	27.392	1	27.392	5.016	0.043*
Residual	70.989	13	5.461		
Total	98.381	14			

*Significant at a 5% level;**Significant at a 1% level

Table 29 indicates that the p value of the resulting model was 0.043. The model was therefore statistically significant (p≤0.05) and included the following statistically significant variable:

- ΔTOT_RESO_LOM*

The adjusted R^2 value indicates that 22.3% of the variance in ΔPE is explained by the variation in ΔTOT_RESO_LOM and represents a weak relationship. The b coefficient of 4.858 is positive and indicates a direct relationship between ΔPE and ΔTOT_RESO_LOM.

5.4.1.2.4 Regression Equation 6

These regression analyses explored the relationship between ΔPE and the change in the second level of mineral resource components' LOM as indicated in Equation 24.

Equation 24 RQ2: RE6

$$\Delta PE = a + b_1 \Delta RESO\_LOM + b_2 \Delta RESE\_LOM + \varepsilon$$

The following section provides the result of the scenario that was found to be statistically significant. The results of the other scenarios were not statistically significant and are presented in Appendix E.

5.4.1.2.4.1 Large-Cap Scenario

Table 30 provides the results of the regression analysis performed on the large-cap companies.

Table 30 RQ2 RE6 Results: Large-Cap Scenario

Coefficients	Unstandardised Coefficients		t	Sig.	Collinearity Statistics: VIF
	B	Std. Error			
(Constant)	-0.01	0.497	-0.021	0.984	
D_RESE_LOM	4.866	1.312	3.708	0.003**	1
Model Summary	**R**	**R^2**	**Adjusted R^2**	**Std. Error of the Estimate**	
	0.717	0.514	0.477	2.336819296	
ANOVA	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	50.564	1	50.564	13.747	0.003**
Residual	47.817	13	3.678		
Total	98.381	14			

*Significant at a 5% level;**Significant at a 1% level

Excluded Variables	Beta In	t	Sig.
D_RESO_LOM	-0.138	-0.665	0.518

It can be seen from Table 30 that the p value of the resulting model was statistically significant at 0.003 ($p \leq 0.05$). The model included the following statistically significant variable:

- ΔRESE_LOM**

The adjusted R^2 value indicates that 47.7% of the variance in ΔPE is explained by the variation in ΔRESE_LOM. This represents a moderate relationship. The positive b coefficient of 4.866 indicates a direct relationship between ΔPE and ΔRESE_LOM. The ΔRESE_LOM variable was found not to be significant with a p value of 0.518.

5.4.1.2.5 Non-Significant Regression Equations

The following regression equations did not yield any statistically significant results:

- Regression Equation 1
- Regression Equation 4
- Regression Equation 7
- Regression Equation 8
- Regression Equation 9

The regression results (p values) for the above regression equations are shown in Appendix E.

5.4.2 Hypothesis Analyses

The hypothesis analyses for the next two research questions involve testing whether there is a difference of the ΔRESE_RESO_RATIO for different groups.

5.4.2.1 Research Question 3

Is there a difference between the growth in reported mineral resource confidence of large-cap and small-cap companies?

The planned test statistic, the independent samples t-test, could not be applied because it is not known whether the population is normally distributed and the actual sample size for the large-cap group of 15 did not meet the requirement for the central limit theorem to apply (Weiers, 2008). The nonparametric equivalent, Mann-Whitney U test, was therefore applied. The result of the Mann-Whitney U test is shown in Table 31.

Table 31 RQ3: Mann-Whitney U Test Results

D_RESE_RESO_RATIO	D_RESE_RESO_RATIO
Mann-Whitney U	333
Z	-1.311
Asymp. Sig. (2-tailed)	0.19

MCLabel	Median	N
Small	-0.004454739	57
Large	0.008978254	15
Total	0	72

Table 31 indicates that p value of the Mann-Whitney U test is 0.19. Because the p value is greater than alpha of 0.05 the null hypothesis, there is no difference in the mean improvement of reported mineral resource confidence for large-cap and small-cap companies, cannot be rejected.

5.4.2.2 Research Question 4

Is there a difference between the growth in reported mineral resource confidence of gold and non-gold companies?

The sample size for gold en non-gold companies, 41 and 31 respectively, satisfied the minimum sample size requirement of 30 for the central limit theorem to apply. The independent samples t-test statistic was therefore applied. The results of the test are shown in Table 32.

Table 32 RQ4: Independent Samples t-Test Results

	Levene's Test for Equality of Variances	
	F	Sig.
D_RESE_RESO_RATIO	0.038	0.846

D_RESE_RESO_RATIO	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Equal variances assumed	0.047	70	0.962	0.008164515	0.172808751
Equal variances not assumed	0.046	60.182	0.963	0.008164515	0.175815057

	COMLabel	N	Mean	Std. Deviation	Std. Error Mean
D_RESE_RESO_RATIO	Gold	41	0.144053215	0.686204571	0.107167149
Total	Non-Gold	31	0.1358887	0.776022057	0.139377676

From Table 32 it can be seen that the significance level of Levene's test is 0.846 and confirms that the assumption of equal variance has not been violated and that the independent samples t-test was a suitable statistical test to perform (Pallant, 2011).

The p value assuming equal variances is 0.962 ($p \geq 0.05$). The independent samples t-test did therefore not reveal a significant difference and the null hypothesis, that there is no difference in the mean improvement of reported mineral resource confidence for gold and non-gold companies, cannot be rejected.

5.5 Summary of Findings

This study used two statistical analysis methods to explore the relationships between mineral resource reporting, shareholder value and investor confidence. This section summarises the results of these two methods.

5.5.1 Regression Analyses

Table 33 summarises the results of the regression analyses that were conducted for the first two research questions. The following are presented:

- NC: Regression analysis not conducted because the minimum required ratio was not achieved
- NS : Regression analysis that did not yield any statistically significant results
- * : Regression analysis was statistically significant at a 5% level
- **: Regression analysis was statistically significant at a 1% level

The direction of the association, positive (+) or negative (-), is also provided in brackets for each of the statistically significant results. NC values are highlighted in red, NS value are highlighted in orange while all statistically significant results are highlighted in green.

Table 33 Summary of Regression Results

RQ #	RE #	Total Sample	Commodity		Stock Exchange				Market Cap	
			Gold	Non-Gold	ASX	TSX	JSE	LSE	Small	Large
1	1	** (+)	** (±)	** (+)	NS	* (+)	NC	NC	** (+)	NC
	2	NS	NS	NS	NS	NS	NS	NS	NS	NS
	3	NS	NS	NS	NS	NS	NS	NS	NS	NS
	4	NS	NS	** (-)	NC	NS	NC	NC	* (-)	NC
	5	NS	NS	NS	NS	NS	NS	NS	NS	NS
	6	NS	NS	NS	NS	NS	NS	NS	NS	NS
	7	NS	NS	NS	NC	NS	NC	NC	NS	NC
	8	* (-)	* (+)	NS	NS	NS	NC	NC	* (-)	NC
	9	* (+)	NS	* (+)	NC	NS	NC	NC	* (-)	NC
2	1	NS	NS	NS	NS	NS	NC	NC	NS	NC
	2	NS	NS	NS	NS	NS	NS	NS	NS	* (+)
	3	NS	NS	NS	NS	NS	NS	NS	NS	* (+)
	4	NS	NS	NS	NC	NC	NC	NC	NS	NC
	5	NS	NS	NS	NS	NS	NS	NS	NS	* (+)
	6	NS	NS	NS	NS	NS	NS	NS	NS	** (+)
	7	NS	NS	NS	NC	NC	NC	NC	NS	NC
	8	NS	NS	NS	NS	NS	NC	NC	NS	NC
	9	NS	NS	NS	NC	NS	NC	NC	NS	NC

Table 33 indicate that only 17 of the 124 regression analyses conducted yielded a statistically significant result. The detail of the statistically significant regression models are summarised in Table 34 with the adjusted R^2 values.

Table 34 Statistically Significant Regression Models

RQ #	RE #	Scenario	Regression Model	Adjusted R^2
1	1	Total Sample	$ASR = -0.3 + 0.042\Delta NP$	0.134
		Gold	$ASR = -0.195 + 0.085\Delta NP - 0.047\Delta OP$	0.259
		Non-Gold	$ASR = -0.334 + 0.033\Delta OP + 0.033\Delta OCF$	0.339
		TSX	$ASR = -0.349 + 0.041\Delta NP$	0.155
		Small-Cap	$ASR = -0.337 + 0.041\Delta NP$	0.128
	4	Non-Gold	$ASR = -0.358 - 0.533\Delta PROB$	0.257
		Small-Cap	$ASR = -0.344 - 0.219\Delta IND$	0.069
	8	Total Sample	$ASR = -0.237 - 0.03MI\_INF\_RATIO$	0.064
		Gold	$ASR = -0.443 + 0.342PROV\_PROB\_RATIO$	0.101
		Small-Cap	$ASR = -0.275 - 0.029MI\_INF\_RATIO$	0.060
	9	Total Sample	$ASR = -0.326 + 0.046\Delta MEAS\_IND\_RATIO$	0.052
		Non-Gold	$ASR = -0.424 + 0.113\Delta MEAS\_IND\_RATIO$	0.174
		Small-Cap	$ASR = -0.339 - 0.471\Delta MI\_INF\_RATIO$	0.117
2	2	Large-Cap	$\Delta PE = 0.009 + 3.675\Delta TOT\_RESO$	0.304
	3	Large-Cap	$\Delta PE = -0.214 + 2.858\Delta RESE$	0.406
	5	Large-Cap	$\Delta PE = 0.315 + 4.858\Delta TOT\_RESO\_LOM$	0.278
	6	Large-Cap	$\Delta PE = -0.01 + 4.866\Delta RESE\_LOM$	0.514

5.5.2 Hypothesis Analyses

The results of the hypothesis analyses that were conducted for the last two research questions are shown in Table 35.

Table 35 Summary of Hypothesis Results

RQ #	Hypothesis Tested	Sig. (2-tailed)	Reject H_0
3	$H_0: \mu_L = \mu_S$ $H_1: \mu_L \neq \mu_S$	0.190	No
4	$H_0: \mu_G = \mu_{NG}$ $H_1: \mu_G \neq \mu_{NG}$	0.962	No

6 Discussion of Results

This chapter discusses the results presented in the previous chapter and is organised around the four research questions. Where possible, the results were compared to the literature presented in the first two chapters in order to develop a better understanding and explanation thereof. This chapter is concluded by a discussion on the overall results.

6.1 Research Question 1

This research question explored whether a relationship existed between mineral resource reporting and shareholder value.

6.1.1 Financial Reference Point

The first set of regression analyses used the change in financial variables to serve as a reference point against which the strength of the other results could be compared. This will allow the practical significance to be determined for the remainder of the results.

The regression analyses yielded significant results for five of the six scenarios that were tested. The adjusted R^2 values ranged from 12.8% to 33.9% and had a value of 13.4% for the total sample. The change in net profit (ΔNP) was found to be significant and positively related to the abnormal shareholder return (ASR) in four of the five regression models. The change in operating profit (ΔOP) and operating cash flow (ΔOCF) were the best predictors of ASR for non-gold companies.

These results correspond to those of Gumbi (2012), who found significant evidence that current earnings were associated with future share prices with a R^2 of 61% over a one year period. In a separate regression analysis, Gumbi (2012) indicated that the current cash flow was associated with future share prices with a R^2 of 25% over a one year period.

6.1.2 Mineral Resource Reports

57 regression analyses were conducted in total to explore the potential relationships between ASR and different types of mineral resource information (annual change, life of mine estimate, ratios and annual change in ratios). Of these only eight regression analyses yielded statistically significant results.

The statistically significant results were obtained with the following mineral resource information types:

- Annual change in the level three mineral resource components
- Mineral resource ratios
- Annual change in the mineral resource ratios

6.1.2.1 Annual Change in Level 3 Mineral Resource Components

Spear (1994) found that, in the oil and gas industry, the components of the net annual change in proven reserves conveyed more information than the summary variable. This finding also appears to be relevant to the mining industry although on a higher level. No relationship was identified between ASR and the level one or level two mineral resource components whereas the relationships were identified on level three for the non-gold and small-cap sample scenarios.

The change in the probable reserves (ΔPROB) was statistically significant for non-gold companies with an adjusted R^2 of 25.7%. The adjusted R^2 seems reasonable when compared to financial reference point values. The ΔPROB was however inversely related to ASR which was not expected since ΔPROB reflects the change in the second most confident mineral resource component. This differed from the findings of Donker *et al.* (2006) who found that ΔPROB were positively related to ASR. For small-cap companies, the change in the indicated resources (ΔIND) was statistically significant although it was also inversely associated with ASR. The adjusted R^2 of 6.9% however indicate that this was of little practical significance when compared to the financial reference point values.

The components of the net annual change (new discoveries, production, acquisitions and revisions) evaluated by Spear (1994) provided information regarding the source of the change. Koven (2013) indicated that the use of the acquisition component to grow reserves is no longer rewarded by investors. This might explain why the previous

relationships were negative in nature and why it differs from the results observed in previous studies.

6.1.2.2 Mineral Resource Ratios

According to Taylor *et al*. (2012), the disclosure of mineral reserves (probable and proven) potentially reflects the firm's confidence that future cash flows will be achieved. The mineral reporting standards attached different confidence levels to the different mineral resource components. It was therefore expected that the confidence in a company's mineral resource portfolio would be best understood through ratios.

The ratio of measured and indicated resources to inferred resources (MI_INF_RATIO) was statistically significant for the total sample as well as for small-cap companies. The adjusted R^2 values of 6.4% and 6% respectively, however indicate that these were of little practical significance when compared to the financial reference point values. The MI_INF_RATIO was inversely associated with ASR in both cases.

The ratio of proven to probable reserves (PROV_PROB_RATIO) was statistically significant and directly related to ASR for gold companies. The adjusted R^2 of 10.1% seems reasonable when compared to financial reference point values. The result was expected as the PROV_PROB_RATIO indicates the confidence in economically mineable material after all required assumptions have been applied. Similar results were however expected for the ratio of reserves to resources (RESE_RESO_RATIO) as this provided information regarding the amount of economically mineable material. It was however possible that the annual change in the mineral resource ratios conveyed additional information as this indicated the company's relative performance in terms of the ratios.

6.1.2.3 Annual Change in Mineral Resource Ratios

The annual change in mineral resource ratios yielded three statistically significant results, namely for the total sample, non-gold companies and small-cap companies.

The annual change in the ratio of measured to indicated resources (ΔMEAS_IND_RATIO), was statistically significant and directly related to ASR for the total sample and non-gold companies. The adjusted R^2 of 5.2% for the total sample indicated limited practical significance whereas the adjusted R^2 of 17.4% for the non-

gold companies seemed reasonable when compared to the financial reference point values. This result was surprising as it was expected that the proven and probable reserves would convey more information than the measured and indicated resources as the modifying factors have already been applied. The company's option to report resource either inclusive or exclusive of reserves might explain why the measured and indicated resources are more relevant as the assumption might be that these components already include the reserve information.

The annual change in the ratio of measured and indicated resources to inferred resources (ΔMI_INF_RATIO) was statistically significant and inversely associated with ASR for small-cap companies. The adjusted R^2 of 11.7% seems reasonable when compared to financial reference point values. This indicates that, at least in terms of small-cap companies, the annual change in the mineral resource ratios are more relevant than the mineral resource ratio as the adjusted R^2 value improved from 6% to 11.7%. As with the annual change in mineral resource components, it was expected that the ΔMI_INF_RATIO would be directly associated with ASR although as Spear (1994) indicated this might dependent on the underlying components of the ratio.

6.1.3 Summary of Mineral Resource Reports

This research question set out to determine whether a relationship exists between mineral resource reporting and shareholder value. Loviscek (2013) indicated that there are some residual effects from the GFC that remain after 2010 with EY (n.d.) arguing that the mining industry only emerged from the GFC by the end of 2011. The resource indices examined as part of this study however indicated that the mining industry was still under severe pressure with a decline from the 2010 levels in three of the four indices. This however presented a unique opportunity to study the relationship of mineral resource reports with shareholder value during a period of recovery from a global crisis.

The literature revealed that the relationship between mineral resource reporting and shareholder value was not clearly understood with the existence of varying and sometimes conflicting information. Spear (1994) found no significant evidence of an association between the change in proven reserves and shareholder value. Donker *et al*. (2006) however found significant evidence that the changes in probable and proven reserves were positively associated with shareholder value. Because these studies were confined to the oil and gas industry they did not consider the mineral resource

components (inferred, indicated and measured) present in the mining industry. Contrasting information however also exists in the mining industry where Bird *et al*. (2010) found significant evidence that exploration and mineral resource announcements positively impact share price but found no evidence of mineral reserves being significant. However, according to Taylor *et al*. (2012, p.374) the "Reporting of reserve information is value relevant."

The results indicated that a relationship between mineral resource reporting and shareholder value does exist. The results do not support the findings by Donker *et al.* (2006) who found the change in probable and proven reserves to be significantly and positively related to abnormal returns. Instead this study only found the change in probable reserves to be significant but inversely related to abnormal returns for non-gold companies. This might provide support for the findings by Spear (1994) that the components of the change in the total value convey more information but was outside the scope of this study. The results further suggest that mineral resource reporting (both resource and reserve components) is value relevant and supports the statement by Taylor *et al*. (2012) and partially supports the findings of Bird *et al*. (2010).

Furthermore, the results indicate that the mineral resource ratios and their changes are also value relevant and have not been considered in prior research.

Although some of the adjusted R^2 values for the mineral resource reporting regressions were deemed to be suitable for practical significance they did not explain the same amount of variation as the financial variables. A possible reason for this might be that the "stock market looks far into the future when assessing value" (Booth, 1998, p.5). The mineral resource information might therefore only translate into value over the longer term. Bird, Choi and Yeung (2013) provide a different perspective and indicate that a company's value is contingent on thousands of factors and that the investor's ability to cope with this becomes extremely difficult in the aftermath of crises.

6.2 Research Question 2

This research question explored whether a relationship existed between mineral resource reporting and investor confidence.

6.2.1 Financial Reference Point

Only four out of the 61 regression analyses conducted yielded statistically significant results. It was interesting to note that none of the financial variable regressions were statistically significant, in contrast to the previous question where five out of the six were statistically significant. As a result a reference point for the adjusted R^2 values of the remaining analyses could not be determined. The adjusted R^2 values were however compared to those obtained in the first research question. This suggests that the four statistically significant regression models were also practically significant.

6.2.2 Mineral Resource Reports

All four statistical results were obtained for large-cap companies with the following mineral resource information types:

- Annual change in the level one mineral resource components
- Annual change in the level two mineral resource components
- Annual change in the level one mineral resource life of mine estimate
- Annual change in the level two mineral resource life of mine estimate

The remaining mineral resource information types were not explored for large-cap companies because the minimum requirement of five observations for each independent variable was not satisfied. The results suggest that investor confidence, measured through the change in the P/E ratio, is not dependent on or linked to the commodity type or primary stock exchange reported on. Company size, measured by market capitalisation, however does seem to be significant since none of the small-cap regressions yielded significant results.

The statistically significant variable for each of the four significant results were directly associated with the change in P/E ratio (ΔPE). The variables and their associated adjusted R^2 values are shown in Table 36.

Table 36 Summary of Significant Variables for Research Question 2

Variable	Adjusted R^2
ΔTOT_RESO	30.4%
ΔTOT_RESO_LOM	27.8%
ΔRESE	40.6%
ΔRESE_LOM	51.4%

The statistically significant variables in Table 36 can be grouped into TOT_RESO changes, that involve the total mineral resource, and RESE changes that involve the mineral reserve. All four of these variables talk to the growth potential of the company. The TOT_RESO group indicates longer-term growth potential whereas the RESE group indicates shorter-term growth potential. It appears that investors have more confidence in large-cap companies. A possible explanation for this might be that the reserve uncertainty is bigger for small-cap companies who have just started to produce than for large-cap companies which might benefit from lower levels of uncertainty due to their experience.

Todd (2007) explained that higher P/E ratios indicate higher levels of confidence that future earnings will be achieved. This therefore suggests that the growth in mineral resources indicate higher levels of confidence that future earnings will be achieved. The variation in the RESE group variables also better explained the variation in ΔPE than the TOT_RESO group variables, as indicated by the higher adjusted R^2 values in Table 36. This provides support for the statement by Taylor *et al*. (2012) that the disclosure of mineral reserves potentially reflects the confidence that future cash flows will be achieved. The mineral resource reporting standards associate a higher level of confidence with mineral reserves than mineral resources because the mineral reserves "are the economically mineable portion of a deposit" (Camisani-Calzolari, 2004, p.303).

The highest adjusted R^2 value was obtained with the ΔRESE_LOM which indicate that the growth in the expected mineral reserve life of mine is associated with higher investor confidence. It was however expected that the mineral resource ratios and their annual change would also have been statistically significant because these variables more clearly communicate the confidence of the mineral resource. However, no evidence was found to support this.

Although the above results are not causal and cannot confirm the claims that investor confidence can be improved through the transparent and consistent reporting of

mineral resource estimations (ASX, 2012), the evidence does indicate a relationship between mineral resource reporting and investor confidence.

6.3 Research Question 3

The third research question explored whether there was a difference in the growth of mineral resource confidence between large-cap and small-cap companies. Mirza and Zimmer (2001) found that company size was significant in explaining voluntary disclosures of mineral resource information in annual reports. The author, from experience in the mining industry, expected company size to influence the growth of mineral resource confidence and proposed that large-cap companies, with better funding, can afford and prefer to acquire more certain and larger mineral rights than small-cap companies.

Koven (2013) indicates that large mining companies (like Barrick Gold Corporation, Rio Tinto Ltd. and Cliffs Natural Resources Inc.) used acquisitions to grow their mineral resource portfolio. This is different to the process followed by small-cap companies where it is more likely that they will develop rather than acquire mineral resources from another company. Ferguson, Clinch and Kean (2011) explains that the development life cycle starts with a mineral explorer acquiring a mining tenement, who develops the resource into a bankable feasibility study in order to obtain financing for construction and production. Mirza and Zimmer (2001) indicated that the biggest mineral reserve estimate uncertainty occurs at the exploration and evaluation stage, with lower uncertainty during development and the lowest during construction and production.

The results however did not support this as no significant difference in the growth of mineral resource confidence, measured by the ratio of mineral reserves to mineral resources (ΔRESE_RESO_RATIO), was found between large-cap and small-cap companies.

Koven (2013) suggested that mining companies overpaid for acquisitions at the top of the commodity cycle that only recently, since 2012, resulted in numerous write-downs. The fixation to keep the mineral resource portfolio growing, that caused them to overpay, might also have resulted in large-cap companies considering lower quality resources because the depleting nature of resources also suggest that there is a finite number of resources available for acquisition.

6.4 Research Question 4

Mirza and Zimmer (2001) found evidence that the voluntary disclosure of mineral resource information was influenced by the cost of information production and indicated that gold ore has a lower cost compared to other ore types. They further explained that it is possible to improve the accuracy of mineral resource estimates at a significant cost. This research question therefore explored whether the preceding points translated into a difference in the growth of mineral resource confidence of gold and non-gold companies.

The results however did not reveal a significant difference in the growth of mineral resource confidence as measured by ΔRESE_RESO_RATIO. Core (2001) explained that voluntary disclosures are important for high growth companies that require external funding and where the low quality of mandated disclosures results in information asymmetry. Therefore a possible explanation for this result might be that the mining companies don't require external financing or that the quality of the mandated disclosures is sufficient to avoid information asymmetry. Neither of these however seem plausible considering that mining companies need investments (Deloitte, 2013; PwC, 2012a) and that compliance with mineral resource reporting standards does not necessarily result in quality estimates (Dominy *et al*., 2002).

According to Mirza and Zimmer (2001) mineral resource uncertainty influences the decision to voluntarily disclose information and this could be amplified by the increasing volatility in the mining industry (Deloitte, 2013). Spear (1994) found evidence that revisions to prior estimates were met with negative reaction and had a negative association with returns. Lee Downham (cited in EY, n.d) suggested the mining companies have learned to cope with the increased global uncertainty by becoming more cautious. Support for the increased global uncertainty is provided by Jamie Sokalsky the CEO of Barrick Gold Corporation, one of the sampled companies, who communicated to their investors earlier this year that they "have no plans to build any new mines" (cited in Koven, 2013). Mining companies, gold and non-gold, might therefore be more cautious to communicate the growth or decline in mineral resource confidence due to the increased global uncertainty and potentially the fear that revisions might negatively affect returns.

Bird *et al*. (2010) however indicated that because mineral reserve announcement were an indication that the company had mining production in mind these announcements were made more parsimoniously. As a result, companies like Barrick Gold Corporation who do not plan to open new mines might restrict their mineral reserve announcements to the minimum required by regulation to convey a consistent message to the investing community.

6.5 Summary of Discussions

This chapter discussed the results that were obtained during this study and reveals that a relationship between mineral resource reporting, shareholder value and investor confidence does exist.

The results of the relationship between mineral resource reporting and shareholder value were however different than those in earlier studies and were characterised by several inversely significant relationships. The study further identified new sources of information that were associated with shareholder value, namely the mineral resource ratios and their annual changes.

Although these results were deemed to be practically significant they did not explain the same amount of variation as the financial reference points. Several possible reasons were considered, namely the timeliness of annual reports (Brown & Hillegeist, 2007), factors that cause mineral resource changes (Spear, 1994) and that the shareholder value is contingent on thousands of factors (Bird *et al*., 2013).

Another explanation might be that the effect of the global financial crisis (GFC) is still present in the market. Three distinct time periods were identified from history:

- Period 1: prior to the compulsory disclosure of mineral resources across different countries
- Period 2: subsequent to the compulsory disclosure but prior to the GFC
- Period 3: post GFC

The first two periods have been studied in prior research i.e. Spear (1994) studied data from period one while Donker *et al*. (2006) and Bird *et al*. (2010) studied data during period two. This study considered data from the third, post GFC, period.

The relationship between mineral resource reporting and investor confidence however yielded statistical and practical significant results for large-cap companies. The results provided support for the statements by Taylor et al. (2012), that mineral resource reporting potentially reflects the company's confidence in future cash flows, and by the ASX (2012) that mineral resource reporting can potentially improve investor confidence. This finding is important to the mining industry which desperately needs to improve investor confidence (Deloitte, 2013; PwC, 2012a).

The results further revealed that no differences existed in terms of growing mineral resource confidence between large-cap and small-cap companies. Similarly, no differences existed between gold and non-gold companies. This suggests that the cost of improving the accuracy of mineral resource estimates is not only financial as proposed by Mirza and Zimmer (2001).

6.6 Limitations

Although care has been taken to reduce the limitations of this study, the resulting sample size in each stock exchange could not be controlled. This combined with the missing values resulted in some of the possible relationships not being explored as they did not satisfy the minimum ratio of five observations for each independent variable in the regression equation (Hair *et al*., 1998). The majority of regression analyses that were conducted did not satisfy the recommended ratio of 50 observations for each independent variable and has affected the generalisability of the results according to Hair *et al*. (1998).

7 Conclusion

This study explored the relationship between mineral resource reporting, shareholder value and investor confidence. The majority of the existing literature focused on the oil and gas industry with a limited number of market-based studies available on the mining industry (Bird *et al*., 2010). The existing literature furthermore contained varying and sometimes conflicting information. This indicated that the relationship between mineral resource reporting, shareholder value and investor confidence was not yet clearly understood and supported the exploratory nature of this study. The conflicting information from prior research can be attributed to the different time periods in which the research was conducted. The following time periods were identified:

- Period 1: prior to the compulsory disclosure of mineral resources across different countries
- Period 2: subsequent to the compulsory disclosure but prior to the GFC
- Period 3: post GFC

Of the literature reviewed, this study appears to be the first to be conducted on post GFC data which is characterised by increased global uncertainty (EY, n.d.). Additionally, this study appears to be the first to explore the relationship between mineral resource reporting and investor confidence.

7.1 Main Findings

Multiple regression analyses were conducted to explore the relationship between mineral resource reporting, shareholder value and investor confidence. The abnormal shareholder return was chosen as the proxy variable for shareholder value, while the change in the price earnings (P/E) ratio was chosen as the proxy variable for investor confidence. The mineral resource reporting information were analysed in terms of the following information types:

- Change in mineral resource components
- Change in estimated life of mine (LOM)
- Mineral resource ratios
- Annual change in mineral resource ratios

This study found that a relationship between mineral resource reporting and shareholder value exists. The mineral resource variables that were both of statistical and practical significance are summarised Table 37.

Table 37 Findings: Relationship between Mineral Resource Reporting and Shareholder Value

Scenario	Mineral Resource Variable	Direction of Relationship
Non-Gold	ΔPROB	Negative
Gold	PROV_PROB_RATIO	Positive
Non-Gold	ΔMEAS_IND_RATIO	Positive
Small-Cap	ΔMI_INF_RATIO	Negative

Table 37 indicates that although all four mineral resource variables indicate an improvement in the mineral resource portfolio, two of the relationships are inversely related. The mineral resource ratios and their annual changes are new information types that have not been considered in prior research. The relationships were identified for different scenarios which suggest that the commodity type and company size are important variables to consider when exploring relationships with shareholder value. These findings contradict some of the findings by Spear (1994) and Donker *et al*. (2006); and the finding by Bird *et al*. (2010) that no significant relationship exists between mineral reserves and shareholder value. The unexpected negative relationships presented above however lend some support to the finding by Spear (1994) that it is important to understand the cause of the change in the mineral resource variables.

This study also found that a relationship between mineral resource reporting and investor confidence exists. Although this relationship is proposed in existing literature, it has not yet been examined. The mineral resource variables that were both of statistical and practical significance are summarised Table 38.

Table 38 Findings: Relationship between Mineral Resource Reporting and Investor Confidence

Scenario	Mineral Resource Variable	Direction of Relationship
Large-Cap	ΔTOT_RESO	Positive
Large-Cap	ΔRESE	Positive
Large-Cap	ΔTOT_RESO_LOM	Positive
Large-Cap	ΔRESE_LOM	Positive

Table 38 indicates that all four mineral resource variables were directly associated with investor confidence. The relationships were only identified for large-cap companies which indicate that the company size is an important factor to consider when exploring relationships with investor confidence.

The above findings indicate that mineral resource reporting is value relevant as suggested by Taylor *et al*. (2012).

7.2 Recommendations to Stakeholders

The research findings proved that a relationship does exist between mineral resource reporting and shareholder value as well as between mineral resource reporting and investor confidence. The research findings however contradict many of the findings from previous research and implies that the main purpose of mineral resource reporting, "to communicate company results to the interested stakeholders in such a way that [it] could be understood" (Njowa, 2008, p.1), has not yet been realised. This has important considerations and implications for the following stakeholders:

- Mining companies
- Investors in the mining industry
- Academia

7.2.1 Mining Companies

The mining industry is still experiencing the residual effects of the GFC and desperately need investments to withstand the increased volatility (Deloitte, 2013) as well as to invest in future projects (PwC, 2012a). According to Taylor *et al*. (2012) the communication of mineral resource estimates are essential for investors to make informed decisions which is supported by the findings of this study.

The data gathering process revealed that although the mineral resource reporting codes are more or less standardised the actual reporting of mineral resources is not. The sources of mineral resource reports varied significantly with some companies clearly reporting the results as part of their integrated report and others only submitted their results as part of their securities exchange filings. Dominy *et al*. (2002) highlighted the importance of communicating the accuracy and confidence of mineral resources estimates but the data gathered supported the statement by Njowa (2008) who indicated that this has not yet been realised.

It is therefore recommended that mining companies benchmark their mineral resource reports and consider the information from an investor's perspective. Dominy *et al*. (2002) had a valid argument namely that the compliance with a mineral reporting code does not necessarily produce a quality estimate and that this only indicates that a clear

and transparent process was followed. The findings of this study highlighted that the change in mineral resource variables and mineral resource ratios might convey additional information. It is therefore also recommended that mining companies not only communicate additional analyses in their mineral resource reports but also explain their importance in order to improve their investor's confidence.

7.2.2 Investors in the Mining Industry

The literature reviewed revealed not only the importance of mineral resource reporting (Davis, 2002; Deloitte, 2003; Taylor *et al*., 2012) but also its various sources of uncertainty (Morley *et al*., 1999; Evatt *et al*., 2012). Goldsmith (2002) indicated that many users of mineral resource reports do not fully understand their importance or inherent risks.

The findings of this study contradicted some of the findings from previous research. This suggests that the value of mineral resource reports is different across time periods and is influenced by the following factors:

- Industry under consideration (i.e. oil and gas versus the mining industry)
- Commodity type (i.e. gold versus non-gold companies)
- Company size (i.e. large-cap versus small-cap companies)

It is recommended that investors in the mining industry analyse the different mineral resource information types (i.e. change in mineral resource variables and mineral resource ratios) and the causes for these changes.

7.2.3 Academia

The literature revealed that limited research was available on the relationship between mineral resource reporting, shareholder value and investor confidence in the mining industry. This study found that the preceding relationships do exist but that the mineral resource variables and direction of their association is in conflict with prior research. This study further identified the following new significant mineral resource variables, which were not consider in prior research:

- Change in estimated life of mine (LOM)
- Mineral resource ratios
- Annual change in mineral resource ratios

Three distinct time periods were also identified and this study represented the first study to evaluate the proposed relationships on post GFC data across multiple countries.

It is therefore recommended that the findings from this research be used to conduct additional academic research in order to better understand the implications of the different time periods, industry, commodity types, company size and different interpretations of mineral resource information. The following section provides some recommendations for future research.

7.3 Recommendations for Future Research

This research study revealed several opportunities for future research. It is recommended that qualitative and quantitative research be conducted to expand on the existing academic literature around mineral resource reporting.

7.3.1 Qualitative Research Recommendations

The qualitative recommendation for future research is based on the statement by Dominy *et al*. (2002), that compliance with a mineral reporting code does not necessarily produce a quality estimate. The data gathering process revealed that although the mineral resource reporting codes are standardised the mineral resource reports issued by companies are not.

The mineral resource reports can be evaluated qualitatively in order to explore whether or not there is a relationship between the quality of mineral resource reports, shareholder value and investor confidence. The mineral reporting codes contain a checklist and guideline of reporting and assessment criteria (SAMREC, 2007) which can be used to determine the quality of mineral resource reports.

7.3.2 Quantitative Research Recommendations

The literature to date that has explored the relationships between mineral resource reporting and shareholder value has focused on different single countries and has been conducted on different time periods using different methods. The following distinct time periods were identified:

- Period 1: prior to the compulsory disclosure of mineral resources across different countries
- Period 2: subsequent to the compulsory disclosure but prior to the GFC
- Period 3: post GFC

It is recommended that this study be repeated, following a similar research design and analysis, for each of the three time periods. The results of the three time periods can then be compared to firstly determine the impact of mandating mineral resource disclosures and secondly determine the potential impact of the GFC.

8 References

Aglietta, M. (2000). Shareholder Value and Corporate Governance: Some Tricky Questions. *Economy and Society, 29*(1), 146–159. Retrieved April 3, 2013 from http://www.tandfonline.com/doi/full/10.1080/030851400360596

Agora Financial. (n.d.). *The Six Greatest Penny Stock Scams of All Time*. Retrieved November 9, 2013 from http://research.agorafinancial.com/research/html/psf_6scams_052813/

ASX. (2012, April). *Reserves and Resources Disclosure Rules for Mining and Oil & Gas Companies Report on Consulation Feedback*. Retrieved March 15, 2013 from http://www.asxgroup.com.au/media/reserves_resources_disclosure_rules_report_consultation_feedback.pdf

Bird, R., Choi, D.F.S., & Yeung, D. (2013). Market Uncertainty, Market Sentiment, and the Post-Earnings Announcement Drift. *Review of Quantitative Finance and Accounting*, 1-29. doi: 10.1007/s11156-013-0364-x

Bird, R., Grosse, M., & Yeung, D. (2010). The Market Response to Exploration, Resource and Reserve Announcements by Mining Companies: Australian Data. *The Paul Woolley Centre @ UTS Working Paper Series, 7*, 1–27. Retrieved July 25, 2013 from http://0-business.uts.edu.au.innopac.up.ac.za/qfrc/pwc/research/workingpapers/2010/wp7.pdf

Booth, L. (1998). *What Drives Shareholder Value?* Paper presented at the Federated Press Creating Shareholder Value Conference, 1-33, Toronto, Canada.

Brown, S., & Hillegeist, S.A. (2007). How Disclosure Quality Affects the Level of Information Asymmetry. *Review of Accounting Studies*, *12*(2-3), 443–477. doi:10.1007/s11142-007-9032-5

Brown, W.O., & Burdekin, R.C.K. (2000) Fraud and Financial Markets: The 1997 Collapse of the Junior Mining Stocks. *Journal of Economics and Business, 52*(3), 277-288. doi: 10.1016/S0148-6195(99)00033-8

Bureau van Dijk. (n.d.). *Osiris – User Guide*. Retrieved November 9, 2013 from https://webhelp.bvdep.com/Robo/BIN/Robo.dll?project=65_EN&newsess=1&refer=https%3A//0-osiris.bvdinfo.com.innopac.up.ac.za/version-20131016/Search.QuickSearch.serv%3F_CID%3D1%26context%3D65OT9DX6ZACFHBE

Buskirk, A. (2011). Disclosure Frequency and Information Asymmetry. *Review of Quantitative Finance and Accounting*, *38*(4), 411–440. doi:10.1007/s11156-011-0237-0

Camisani-Calzolari, F.A. (2004). National and International Codes for Reporting Mineral Resources and Reserves: Their Relevance, Future and Comparison. *Journal of the South African Institute of Mining and Metallurgy, 104*(5), 297-305.

Cohen, J.R., Holder-Webb, L.L., Nath, L., & Wood, D. (2012). Corporate Reporting of Nonfinancial Leading Indicators of Economic Performance and Sustainability. *Accounting Horizons, 26*(1), 65–90. doi:10.2308/acch-50073

Core, J.E. (2001). A Review of the Empirical Disclosure Literature: Discussion. *Journal of Accounting and Economics, 31*(1-3), 441–456. doi:10.1016/S0165-4101(01)00036-2

Creamer, M. (2012, July 4). *Global mining drives 45%-plus of world GDP – Cutifani.* Retrieved October 8, 2013 from http://www.miningweekly.com/article/global-mining-drives-45-plus-of-world-gdp-cutifani-2012-07-04

Dalton, D. R., Hitt, M. A., Certo, S. T., & Dalton, M. D. (2007). 1 The Fundamental Agency Problem and Its Mitigation. *The Academy of Management Annals*, *1*(1), 1–64. doi:10.1080/078559806

Daniel, J. (2011). Choosing the Type of Probability Sampling. *Sampling Essentials: Practical Guidelines for Making Sampling Choices*. Sage Publications. Retrieved October 6, 2013 from http://www.sagepub.com/upm-data/40803_5.pdf

Davis, G.A. (2002). *Economic Methods of Valuing Mineral Assets*. Paper Presented at the ASA/CICBV 5th Joint Business Valuation Conference, Orlando, Florida.

Deloitte. (2003). *Financial Reporting in the Global Mining Industry*. Retrieved April 3, 2013 from http://www.deloitte.com/assets/Dcom-Global/Local%20Assets/Documents/Financial%20Reporting.Mining.Oct%2003(1).pdf

Deloitte. (2013). *Tracking the Trends 2013*. Retrieved April 3, 2013 from http://www.deloitte.com/assets/Dcom-Ireland/Local%20Assets/Documents/Energy/2013/ca_en_energy_Tracking_the_trends_2013_112812.pdf

Dey, A. (2008). Corporate Governance and Agency Conflicts. *Journal of Accounting Research, 46*(5), 1143-1181. doi:10.1111/j.1475-679X.2008.00301.x

Dominy, S.C., Noppé, M.A., & Annels, A.E. (2002). Errors and Uncertainty in Mineral Resource and Ore Reserve Estimation: The Importance of Getting it Right. *Exploration and Mining Geology, 11*(1-4), 77-98.

Donker, H., Ng, A., & Rai, K. (2006). Proved or Probable Oil Reserves: Does it Really Matter? An Emperical Study on Canadian Oil and Gas Companies. *Petroleum Accounting and Financial Management Journal, 25*, 94-101.

El Mir, A., & Seboui, S. (2008). Corporate Governance and the Relationship between EVA and Created Shareholder Value. *Corporate Governance*, *8*(1), 46–58. doi:10.1108/14720700810853392

Evatt, G.W., Soltan, M.O., & Johnson, P.V. (2012). Mineral Reserves Under Price Uncertainty. *Resources Policy, 37*(3), 340-345. doi: 10.1016/j.resourpol.2012.03.004

EY. (2013). *Business Risks in Mining and Metals 2013-2014*. Retrieved October, 8, 2013, from http://www.ey.com/GL/en/Industries/Mining---Metals/Business-risks-in-mining-and-metals-2013-2014---The-top-10-risks

EY. (n.d.). *Global Mining and Metals Transactions – 2011 Trends 2012 Outlook - Recognizing value in volatility*. Retrieved October, 6, 2013, from http://www.ey.com/GL/en/Industries/Mining---Metals/Global-mining-and-metals-transactions---2011-trends-2012-outlook---Recognizing-value-in-volatility

Ferguson, A., Clinch, G., & Kean, S. (2011). Predicting the Failure of Developmental Gold Mining Projects. *Australian Accounting Review, 50*(1), 44–53. doi: 10.1111/j.1835-2561.2010.00119.x

Firer, C., Ross, S.A., Westerfield, R.W., & Jordan, B.D. (2012). *Fundamentals of Corporate Finance* (5th ed). New York: McGraw-Hill

Goldsmith, G. (2002). *Resources and Reserves – Their Impact on Financial Reporting, Valuations and the Expectations Gap*. Paper presented at the CMMI Congress, Queensland, Australia.

Gumbi, P. (2012). *Predictive ability of current earnings and cash flows* (Master's Thesis). Retrieved from http://upetd.up.ac.za/thesis/available/etd-02162013-174132/

Hair, J.F., Anderson, R.E., Tatham, R.L., & Black, W.C. (1998). *Multivariate Data Analysis* (5th ed.). New Jersey: Prentice-Hall

Healy, P., & Palepu, K. (2001). Information Asymmetry, Corporate Disclosure, and the Capital Markets: A Review of the Empirical Disclosure Literature. *Journal of Accounting and Economics, 31*(1-3), 405-440. doi: 10.1016/S0165-4101(01)00018-0

Hirschey, M., & Nofsinger, J. (2010). *Investments Analysis and Behavior* (2nd ed.). New York: McGraw-Hill

Hutchinson, M., & Gul, F.A. (2004). Investment Opportunity Set, Corporate Governance Practices and Firm Performance. *Journal of Corporate Finance, 10*(4), 595–614. doi:10.1016/S0929-1199(03)00022-1

International Council on Mining & Metals. (2012a, October). *The Role of Mining in National Economies.* Retrieved April 3, 2013 from http://www.icmm.com/the-role-of-mining-in-national-economies

International Council on Mining & Metals. (2012b, October). *Trends in the Mining and Metals Industry.* Retrieved April 3, 2013 from http://www.icmm.com/trends-in-the-mining-and-metals-industry

Institute of Directors Southern Africa. (2009). *King Code of Governance for South Africa.* Retrieved April 19, 2013 from http://www.library.up.ac.za/law/docs/king111report.pdf

JSE. (2012). *Policy Change Helps JSE to Entice Foreign Listed Mining Companies.* Retrieved April 19, 2013: http://www.jse.co.za/About-Us/Media/Press-Releases/Full-Story/12-02-06/Policy_change_helps_JSE_to_entice_foreign_listed_mining_companies.aspx

Kanagaretnam, K., Lobo, G.J., & Whalen, D.J. (2007). Does Good Corporate Governance Reduce Information Asymmetry around Quarterly Earnings Announcements? *Journal of Accounting and Public Policy, 26*(4), 497–522. doi:10.1016/j.jaccpubpol.2007.05.003

Kantor, B. (2013, May 23). How Important is Mining to the SA Economy. It Depends on How You Measure it [Web blog post]. Retrieved April 19, 2013 from http://www.zaeconomist.com/sa-economy/how-important-is-mining-to-the-sa-economy-it-depends-on-how-you-measure-it/

Koven, B. (2013, March 6). After $50-billion in Writedowns, Miners are Entering a New Era [Web blog post]. Retrieved October, 8, 2013, from http://business.financialpost.com/2013/03/06/after-50-billion-in-writedowns-miners-are-entering-a-new-era/

Kyereboah-Coleman, A. (2007). Corporate Governance and Shareholder Value Maximization: An African Perspective. *African Development Review*, *19*(2), 350–367. doi:10.1111/j.1467-8268.2007.00165.x

Loviscek, A. (2013). The Impact of the Global Financial Crisis on Firm-Level Risk of the S&P 500. *Managerial Finance*, *39*(7), 641–652. doi:10.1108/03074351311323437

Lundholm, R., & Van Winkle, M. (2006). Motives for Disclosure and Non-Disclosure: A Framework and Review of the Evidence. *Accounting and Business Research*, *36*(sup1), 43-48. doi:10.1008/00014788.2006.9730044

Mendenhall, W., & Sincich, T. (2003). *A Second Course in Statistics Regression Analysis* (6th ed.). United States of America: Pearson Education

Mining Journal Online. (n.d.). *Mining Explained*. Retrieved November 9, 2013 from http://www.mining-journal.com/knowledge/Mining-Explained

Mirza, M., & Zimmer, I. (2001). Disclosure of Reserve Quantum in the Extractive Industries. *Accounting and Finance, 41*(1-2), 63–91. doi:10.1111/1467-629X.00054

Morley, C., Snowden, V., & Day, D. (1999). Financial Impact of Resource / Reserve Uncertainty. *Journal of Mining and Metallurgy*, *99*(6), 293-302.

Njowa, G. (2008). *Salient Issues in the Reporting of Mineral Resources and Mineral Reserves in the Vein and Reef Mining*. Paper presented at the Narrow Vein and Reef 2008, Ballarat, Australia. Retrieved April 25, 2013 from http://www.saimm.co.za/Conferences/NarrowVein2008/19-Njowa.pdf

Olsen, G.T. (2010). *Reserves Overstatements: History, Enforcement, Identification and Implications of New SEC Disclosure Requirements* (Master's Thesis). Retrieved from http://0-www.pe.tamu.edu.innopac.up.ac.za/blasingame/data/0_tab_grad/TAB_Grad_Thesis_Archive/MS_045_OLSEN,Grant_Thesis_TAMU_(May_2010).pdf

Pallant, J. (2011). *SPSS Survival Manual* (4th ed.). New South Whales: Allen & Unwin

Penman, S.H. (1996). The Articulation of Price-Earnings Ratios and Market-to-Book Ratios and the Evaluation of Growth. *Journal of Accounting Research*, *34*(2), 235-259.

PwC. (2012a, August). *Mine The Growing Disconnect*. Retrieved April 19, 2013 from http://download.pwc.com/gx/mining/pwc-mine-2012.pdf

PwC. (2012b, November). *SA Mine Highlighting Trends in the South African Mining Industry*. Retrieved April 19, 2013 from http://www.pwc.co.za/en_ZA/za/assets/pdf/sa-mine-nov-2012.pdf

Rumsey, D. (2009). *Statistics II for Dummies.* Indiana: Wiley Publishing

SAMREC. (2007). *South African Code for Reporting of Mineral Resources and Mineral Reserves (The SAMREC Code)*. Prepared by the South African Mineral Resource Committee (SAMREC) Working Group.

Saunders, M., & Lewis, P. (2012). *Doing Research in Business and Management: An Essential Guide to Planning Your Project*. Financial Times Prentice Hall.

Spear, N. (1994). The Stock Market Reaction to the Reserve Quantity Disclosures of US Oil and Gas Producers*. *Contemporary Accounting Research, 11*(1), 381–404. Retrieved from http://onlinelibrary.wiley.com/doi/10.1111/j.1911-3846.1994.tb00448.x/abstract

Switzer, L.N. (2010). The Behaviour of Small Cap vs. Large Cap Stocks in Recessions and Recoveries: Empirical Evidence for the United States and Canada. *North American Journal of Economics and Finance, 21*(2010), 332–346. doi: 10.1016/j.najef.2010.10.002

Taylor, G., Richardson, G., Tower, G., & Hancock, P. (2012). The Determinants of Reserves Disclosure in the Extractive Industries: Evidence from Australian Firms. *Accounting and Finance, 52*, 373-402. doi: 10.1111/j.1467-629X.2011.00433.x

Todd, A. (2007). *Trust Measures and Indicators for Customers and Investors Part II: Measuring Trust Indicators for Investors*. Paper presented at the Building Customer Trust A Roundtable Discussion, Toronto, Canada. Retrieved April 25, 2013 from http://www.managementexchange.com/sites/default/files/media/posts/documents/Trust_Measures_and_Indicators_for_Investors.pdf

Weatherstone, N. (2008). *International Standards for Reporting of Mineral Resources and Reserves–Status, Outlook and Important Issues*. Paper presented at the 21st World Mining Congress, Krakow. Retrieved March 15, 2013 from http://www.crirsco.com/isr_mineral_resources_reserves0908.pdf

Weiers, R.M. (2008). *Introductory Business Statistics* (7th ed). South-Western

9 Appendices

9.1 Appendix A: Extract of Gathered Data

SE	OSIRIS_Name	Year	COM_TYPE	YearEnd	MC	PE	SP	DIV	REV	OP	NP	OCF	RESO_INC_RESE	PROD	RESO	INF	MI	IND	MEAS	RESE	PROB	PROV
JSE	ANGLO AMERICAN PLATINUM LIMITED	2012	Platinum	2012-12-31	14 158 921 249		52.50	-	5 051 787 146	-79 433 461	-747 193 032	222 205 233	1	2219100								
JSE	ANGLO AMERICAN PLATINUM LIMITED	2011	Platinum	2011-12-31	17 208 155 338	39	65.33	0.24	6 300 580 826	900 792 135	440 997 676	1 511 992 031	1	2410100	857800000	323000000	534800000	270300000	264400000	180800000	66800000	114000000
JSE	ANGLO AMERICAN PLATINUM LIMITED	2010	Platinum	2010-12-31	27 567 544 542	18	104.66	1.02	7 732 056 595	1 851 013 758	1 501 658 606	1 542 671 874	1	2484000	821500000	321800000	499800000	260600000	239100000	170500000	61200000	109300000
JSE	KUMBA IRON ORE LIMITED	2012	Iron Ore	2012-12-31	21 551 521 011	15	66.92	1.47	5 345 865 008	2 712 776 630	1 436 511 541	2 202 996 080	1	43100000								
JSE	KUMBA IRON ORE LIMITED	2011	Iron Ore	2011-12-31	19 775 425 312	9	61.40	2.76	5 963 600 146	3 866 926 195	2 092 866 162	3 131 562 442	1	41300000	573551800	182260000	391291800	247354500	143937300	718541300	336259500	382281800
JSE	KUMBA IRON ORE LIMITED	2010	Iron Ore	2010-12-31	20 604 873 915	10	64.01	3.17	5 837 153 121	3 791 938 209	2 159 680 310	2 750 452 317	1	43300000	589835400	124185600	465649800	307545000	158104800	777255300	350752500	426502800
JSE	ANGLOGOLD ASHANTI LIMITED	2012	Gold	2012-12-31	11 828 992 709	14	30.86	0.36	6 353 000 000	1 596 000 000	830 000 000	1 802 000 000	0	3940000								
JSE	ANGLOGOLD ASHANTI LIMITED	2011	Gold	2011-12-31	16 119 726 659	10	42.17	0.49	6 773 000 000	2 228 000 000	1 552 000 000	2 655 000 000	0	4330000	230875750	71305518.71	159570231.3	119285032.5	40285198.73	75599250.04	58888259.91	16711311.64
JSE	ANGLOGOLD ASHANTI LIMITED	2010	Gold	2010-12-31	18 789 667 182	247	49.29	0.20	5 334 000 000	1 247 000 000	76 000 000	-942 000 000	0	4520000	220008799.8	65111035.63	154897764.2	115740735	39157029.26	71204565.39	54861701.23	16342864.16
JSE	DRDGOLD LIMITED	2012	Gold	2012-06-30	251 353 570	7	0.65	-	366 248 588	53 077 388	37 630 442	75 726 579	0	232353								
JSE	DRDGOLD LIMITED	2011	Gold	2011-06-30	184 640 145		0.48	-	376 347 880	-52 918 076	-42 238 879	47 534 675	0	265179	60154323.9	43144621.24	17009702.66	9322396.42	7687306.235	7286804.467	2681821.826	4604982.641
JSE	DRDGOLD LIMITED	2010	Gold	2010-06-30	170 933 020	6	0.45	0.01	260 539 537	3 540 288	27 200 917	7 017 278	0	241194	60024949.32	42598573.07	17426376.25	9460837.506	7965538.739	7304294.47	2050059.785	5254234.685
JSE	HARMONY GOLD MINING COMPANY LIMITED	2012	Gold	2012-06-30	4 024 804 112	8	9.33	0.12	1 876 310 478	242 079 807	515 921 379	513 605 097	0	1274520								
JSE	HARMONY GOLD MINING COMPANY LIMITED	2011	Gold	2011-06-30	5 675 487 478	63	13.20	-	1 870 355 743	21 817 117	90 517 648	349 013 751	0	1303228	163872321.8	59703924.18	103589684.3	72114109.82	31475574.46	41603057.56	27521033.44	14114174.86
JSE	HARMONY GOLD MINING COMPANY LIMITED	2010	Gold	2010-06-30	4 565 318 313		10.65	0.07	1 482 984 340	24 635 383	-25 130 891	207 198 959	0	1248000	189174954.2	78705011.52	110437791.9	76325856.76	34111935.14	48097507.04	37069803.22	11027703.82
JSE	IMPALA PLATINUM HOLDINGS LIMITED	2012	Platinum	2012-06-30	10 415 872 496	20	16.49	-	3 363 851 278	772 067 715	509 582 080	606 865 932	0	3016000								
JSE	IMPALA PLATINUM HOLDINGS LIMITED	2011	Platinum	2011-06-30	16 884 692 420	17	26.73	0.01	4 860 665 660	1 645 069 185	973 834 922	1 215 459 827	0	3772000	471905.3466	204654.7256	210086.1337	110485.3541	99600.77958	70506.57282	55024.55437	9761.907324
JSE	IMPALA PLATINUM HOLDINGS LIMITED	2010	Platinum	2010-06-30	14 883 315 078	24	23.56	0.34	3 335 863 980	1 009 264 477	617 146 616	774 607 354	0	3689000	463115.1093	238472.4876	224642.6217	119986.8189	104655.8028	68577.53196	58861.09607	9716.435889
JSE	MERAFE RESOURCES LIMITED	2012	Ferrochrome	2012-12-31	202 363 535	35	0.08	-	299 016 488	11 790 499	5 748 987	30 236 615	0	242000								
JSE	MERAFE RESOURCES LIMITED	2011	Ferrochrome	2011-12-31	281 688 797	20	0.11	0.00	298 020 973	17 959 420	14 337 644	36 242 616	0	263000	173743781.2	85596000	88147781.2	40964650	47183131.2	23116630.6	5351301	17765329.6
JSE	MERAFE RESOURCES LIMITED	2010	Ferrochrome	2010-12-31	619 910 871	15	0.25	0.00	385 772 160	68 760 409	42 024 125	37 066 043	0	300000	174404202	85526000	88878202	41400320	47477882	22980142	4531690	18448452
JSE	NORTHAM PLATINUM LIMITED	2012	Platinum	2012-06-30	1 084 021 131	30	2.83	0.01	458 572 061	52 230 109	36 651 386	53 355 194	0	288675								
JSE	NORTHAM PLATINUM LIMITED	2011	Platinum	2011-06-30	2 382 685 289	47	6.23	0.02	539 480 634	73 298 631	51 231 082	112 878 881	0	250100	165840000	139260000	26580000	24290000	2290000	28350000	20260000	8080000
JSE	NORTHAM PLATINUM LIMITED	2010	Platinum	2010-06-30	2 147 266 560	26	5.96	0.03	519 682 346	107 806 665	83 903 929	112 881 025	0	321475	51580000	26160000	25420000	23240000	2180000	27040000	19160000	7880000
JSE	ROYAL BAFOKENG PLATINUM LIMITED	2012	Platinum	2012-12-31	1 119 732 497	56	6.76	-	344 918 043	35 998 820	20 032 584	86 176 577	0	269000								
JSE	ROYAL BAFOKENG PLATINUM LIMITED	2011	Platinum	2011-12-31	1 115 299 149	33	6.75	-	372 066 460	63 654 171	33 575 262	125 888 810	0	282000	49240000	12860000	36380000	21490000	14890000	11330000	3520000	7810000
JSE	ROYAL BAFOKENG PLATINUM LIMITED	2010	Platinum	2010-12-31	1 651 591 595	3	10.06	-	317 671 890	66 422 279	477 427 617	118 410 734	0	288000	50250000	14670000	35580000	21660000	13920000	12110000	4910000	7200000
JSE	SOUTH AFRICAN COAL MINING HOLDINGS LIMITED	2012	Coal	2012-12-31	7 983 406		0.02	-	26 369 138	-4 397 285	-5 740 282	765 426		401366								
JSE	SOUTH AFRICAN COAL MINING HOLDINGS LIMITED	2011	Coal	2011-12-31	13 891 065		0.03	-	42 655 319	-6 841 807	-12 100 848	-568 348		811000	38950000	2430000	36520000	2350000	34170000	11190000	150000	11040000
JSE	SOUTH AFRICAN COAL MINING HOLDINGS LIMITED	2010	Coal	2010-12-31	27 971 384		0.06	-	2 980 096	-3 839 458	-1 512 515	-9 011 610		89000	41020680	0	41020681	6575073	34445608	25730521	3972440	21758082
JSE	TRANS HEX GROUP LTD	2012	Diamonds	2013-03-31	39 778 308	4	0.38	-	85 233 910	12 091 901	9 155 459	8 922 906	0	84409								
JSE	TRANS HEX GROUP LTD	2011	Diamonds	2012-03-31	39 942 162	2	0.38	-	98 325 882	12 771 461	20 656 301	20 310 297	0	69508	14509015	10993951	3515064	3515064	0	1700141	1700141	0
JSE	TRANS HEX GROUP LTD	2010	Diamonds	2011-03-31	39 969 562		0.38	-	96 871 966	-3 754 702	-6 313 333	11 460 518	0	92904	18985436	14509213	4476223	4476223	0	2553914	2553914	0
JSE	ZCI LIMITED	2012	Copper	2013-03-31	32 869 414		0.59	-	60 464 000	-990 000	-1 033 000	3 305 000		6910000000								
JSE	ZCI LIMITED	2011	Copper	2012-03-31	52 025 686		0.93	-	42 772 000	-42 403 000	-35 756 000	-1 318 000		4143000000	30127	0	30127	30127	0	194733	100763	93970
JSE	ZCI LIMITED	2010	Copper	2011-03-31	81 969 896		1.47	-	24 731 000	-5 808 000	-4 718 000	-11 592 000		2227000000	34640	0	34640	34640	0	213502	110121	103381
LSE	AFRICAN BARRICK GOLD PLC	2012	Gold	2012-12-31	2 851 188 324	48	6.95		1 087 339 000	122 491 000	59 471 000	257 903 000		626212								
LSE	AFRICAN BARRICK GOLD PLC	2011	Gold	2011-12-31	2 908 944 200	11	7.09		1 217 915 000	410 121 000	274 895 000	498 323 000		688278	9589566	3742327	5847239	5657029	190210	17095334	15457833	1637501
LSE	AFRICAN BARRICK GOLD PLC	2010	Gold	2010-12-31	3 921 161 884	18	9.56		981 405 000	317 605 000	218 103 000	345 141 000		700934	9085991	3718893	5367098	5166988	200110	16821436	15498906	1322530
LSE	CENTAMIN PLC	2012	Gold	2012-12-31	682 166 990	3	0.62	-	426 133 000	192 526 000	199 038 000	220 507 000	0	262828								
LSE	CENTAMIN PLC	2011	Gold	2011-12-31	1 387 017 527	8	1.27	-	340 479 000	179 980 000	181 945 000	180 044 000	0	202699	28538333.31	2300000	13119166.65	8295272.236	4823894.417	10100000	5893709.711	4179593.936
LSE	CENTAMIN PLC	2010	Gold	2010-12-31			2.73		86 921 000	26 680 000	28 594 000	34 274 000	0	83432	25511837.9	3500000	11005918.95	7170524.218	3835394.73	9100000	5467262.527	3588535.052
LSE	FERREXPO PLC	2012	Iron Ore	2012-12-31	2 333 268 430	11	3.96	0.13	1 435 377 000	341 917 000	214 340 000	118 570 000		9409000								
LSE	FERREXPO PLC	2011	Iron Ore	2011-12-31	2 446 272 960	4	4.16	0.06	1 794 955 000	758 202 000	567 822 000	502 709 000		9063000	2158000000	647280000	1510720000			477120000		
LSE	FERREXPO PLC	2010	Iron Ore	2010-12-31	3 831 123 240	9	6.51	0.07	1 296 760 000	550 941 000	422 906 000	379 758 000		9033000	2235990000	668160000	1567830000			465620000		
LSE	HAMBLEDON MINING PLC	2012	Gold	2012-12-31	34 012 011		0.03	-	38 913 000	-20 522 000	-22 143 000	-9 941 000		22470								
LSE	HAMBLEDON MINING PLC	2011	Gold	2011-12-31	38 792 261		0.05	-	33 325 000	-10 210 000	-7 922 000	2 729 000		20851	1893420	1251404	642016	642016	0	86042	86042	0
LSE	HAMBLEDON MINING PLC	2010	Gold	2010-12-31	60 573 856	20	0.12	-	29 053 000	4 022 000	2 965 000	3 690 000		22410	1926697	1251404	675293	675293	0	104554	104554	0
LSE	HIGHLAND GOLD MINING LIMITED	2012	Gold	2012-12-31	495 238 425	4	1.52		353 352 000	125 344 000	122 902 000	131 199 000	1	216885								
LSE	HIGHLAND GOLD MINING LIMITED	2011	Gold	2011-12-31	945 240 009	9	2.91	0.08	300 977 000	144 920 000	103 823 000	116 930 000	1	184102	11179669	2139260	9040409	6492174	2548235	2656250	1397251	1258999
LSE	HIGHLAND GOLD MINING LIMITED	2010	Gold	2010-12-31	958 033 727	8	2.95	-	245 061 000	155 210 000	122 328 000	94 620 000	1	200028	9002921	1652984	7349937	6691146	658791	2621252	2111100	510152
LSE	INTERNATIONAL FERRO METALS LIMITED	2012	Ferrochrome	2012-06-30	125 340 715		0.23		203 579 626	-3 457 074	-6 325 035	21 760 496		153046								
LSE	INTERNATIONAL FERRO METALS LIMITED	2011	Ferrochrome	2011-06-30	144 114 111		0.26	-	242 894 792	-18 891 573	-19 616 656	-8 660 206		194869	36403098.91	8153778.328	28249320.58	9697311.268	18552009.31	20665523.24	7979105.758	12686417.48
LSE	INTERNATIONAL FERRO METALS LIMITED	2010	Ferrochrome	2010-06-30	224 747 357		0.41	-	187 968 069	-11 014 244	-11 072 252	-35 137 697		200440	40613313.3	7372289.529	33241023.77	26700580.58	6540443.19	19108649.78	14131923.71	4976726.068

9.2 Appendix B: Complete List of Sampled Companies

SE	OSIRIS_Name	COM_TYPE
JSE	ANGLO AMERICAN PLATINUM LIMITED	Platinum
JSE	KUMBA IRON ORE LIMITED	Iron Ore
JSE	ANGLOGOLD ASHANTI LIMITED	Gold
JSE	DRDGOLD LIMITED	Gold
JSE	HARMONY GOLD MINING COMPANY LIMITED	Gold
JSE	IMPALA PLATINUM HOLDINGS LIMITED	Platinum
JSE	MERAFE RESOURCES LIMITED	Ferrochrome
JSE	NORTHAM PLATINUM LIMITED	Platinum
JSE	ROYAL BAFOKENG PLATINUM LIMITED	Platinum
JSE	SOUTH AFRICAN COAL MINING HOLDINGS LIMITED	Coal
JSE	TRANS HEX GROUP LTD	Diamonds
JSE	ZCI LIMITED	Copper
LSE	AFRICAN BARRICK GOLD PLC	Gold
LSE	CENTAMIN PLC	Gold
LSE	FERREXPO PLC	Iron Ore
LSE	HAMBLEDON MINING PLC	Gold
LSE	HIGHLAND GOLD MINING LIMITED	Gold
LSE	INTERNATIONAL FERRO METALS LIMITED	Ferrochrome
LSE	LONMIN PUBLIC LIMITED COMPANY	Platinum
LSE	MINERA IRL LTD	Gold
LSE	PETRA DIAMONDS LTD	Diamonds
LSE	PETROPAVLOVSK PLC	Gold
LSE	RANDGOLD RESOURCES LIMITED	Gold
LSE	VATUKOULA GOLD MINES PLC	Gold
ASX	ADITYA BIRLA MINERALS LIMITED	Copper
ASX	ATLAS IRON LIMITED	Iron Ore
ASX	CITIGOLD CORPORATION LIMITED	Gold
ASX	COAL OF AFRICA LIMITED	Coal
ASX	COCKATOO COAL LIMITED	Coal
ASX	DRAGON MINING LIMITED	Gold
ASX	ENERGY RESOURCES OF AUSTRALIA LIMITED	Uranium
ASX	FOCUS MINERALS LIMITED	Gold
ASX	FORTESCUE METAL GROUP LIMITED	Iron Ore
ASX	GRANGE RESOURCES LIMITED	Magnetite
ASX	MEDUSA MINING LIMITED	Gold
ASX	MINCOR RESOURCES NL	Nickel
ASX	MOUNT GIBSON IRON LIMITED	Iron Ore
ASX	NORTHERN IRON LIMITED	Iron Ore
ASX	NORTON GOLD FIELDS LIMITED	Gold
ASX	RAMELIUS RESOURCES LIMITED	Gold
ASX	RESOLUTE MINING LIMITED	Gold
ASX	SARACEN MINERAL HOLDINGS LIMITED	Gold
ASX	ST BARBARA LIMITED	Gold

SE	OSIRIS_Name	COM_TYPE
ASX	TANAMI GOLD NL	Gold
ASX	TASMANIA MINES LIMITED	Magnetite
ASX	UNITY MINING LIMITED	Gold
ASX	WESTERN AREAS LIMITED	Nickel
ASX	WHITEHAVEN COAL LIMITED	Coal
TSX	ALACER GOLD CORP.	Gold
TSX	ALAMOS GOLD INC	Gold
TSX	AURICO GOLD INC.	Gold
TSX	BARRICK GOLD CORPORATION	Gold
TSX	BRIGUS GOLD CORP.	Gold
TSX	CENTERRA GOLD INC.	Gold
TSX	CLAUDE RESOURCES INC	Gold
TSX	CROCODILE GOLD CORP	Gold
TSX	EASTERN PLATINUM LTD.	Platinum
TSX	ENDEAVOUR MINING CORPORATION	Gold
TSX	GOLDEN STAR RESOURCES LTD.	Gold
TSX	GOLDGROUP MINING INC.	Gold
TSX	KIRKLAND LAKE GOLD INC.	Gold
TSX	LAKE SHORE GOLD CORP	Gold
TSX	LUNA GOLD CORP.	Gold
TSX	NEW DAWN MINING CORP.	Gold
TSX	OROSUR MINING INC	Gold
TSX	PAN AMERICAN SILVER CORP	Silver
TSX	QMX GOLD CORPORATION	Gold
TSX	SEMAFO INC	Gold
TSX	SIROCCO MINING INC.	Iodine
TSX	SOUTHGOBI RESOURCES LTD.	Coal
TSX	ST ANDREW GOLDFIELDS LIMITED	Gold
TSX	TIMMINS GOLD CORP.	Gold
TSX	UNITED SILVER CORP	Silver
TSX	VERIS GOLD CORP.	Gold
TSX	WHITE TIGER GOLD LTD.	Gold
TSX	XINERGY LTD	Coal

9.3 Appendix C: Descriptive Statistics on Key Variables

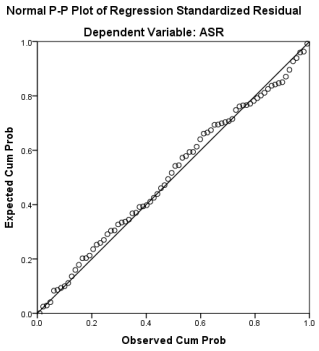
Variable	N	Min	Max	Mean	Std. Dev	Skewness		Kurtosis	
						Statistic	Std. Error	Statistic	Std. Error
ASR	76	-2.56	0.49	-0.34	0.46	-1.57	0.28	6.13	0.54
D_PE	73	-20.87	66.17	0.33	8.78	5.68	0.28	45.41	0.56
D_REV	76	-0.70	2.67	0.14	0.52	2.09	0.28	7.01	0.54
D_OP	76	-32.58	20.72	-0.47	5.67	-2.99	0.28	21.12	0.54
D_NP	76	-28.99	4.97	-1.00	4.22	-4.63	0.28	27.92	0.54
D_OCF	76	-15.77	19.37	0.33	3.71	1.11	0.28	14.13	0.54
D_TOT_RESO	76	-0.74	4.82	0.36	0.92	3.15	0.28	11.77	0.54
D_RESO	76	-0.74	4.82	0.32	0.85	3.41	0.28	14.07	0.54
D_INF	75	-0.79	4.32	0.33	0.93	2.62	0.28	7.19	0.55
D_MI	76	-0.72	15.31	0.67	2.44	4.75	0.28	23.96	0.54
D_IND	75	-0.81	7.12	0.28	1.14	4.36	0.28	21.48	0.55
D_MEAS	71	-0.83	9.93	0.49	1.69	4.28	0.28	19.92	0.56
D_RESE	72	-0.90	11.24	0.38	1.54	5.57	0.28	36.25	0.56
D_PROB	70	-0.96	6.11	0.21	1.01	4.35	0.29	20.93	0.57
D_PROV	70	-0.61	15.35	0.71	2.60	4.47	0.29	21.13	0.57
D_TOT_RESO_LOM	76	-0.92	6.88	0.33	1.13	3.70	0.28	17.22	0.54
D_RESO_LOM	76	-0.90	6.06	0.29	1.06	3.65	0.28	15.88	0.54
D_INF_LOM	75	-0.81	5.84	0.33	1.13	2.98	0.28	10.07	0.55
D_MI_LOM	76	-0.90	18.37	0.68	2.91	4.99	0.28	25.94	0.54
D_IND_LOM	75	-0.96	11.43	0.23	1.47	6.41	0.28	46.93	0.55
D_MEAS_LOM	71	-0.89	8.77	0.44	1.63	3.66	0.28	14.48	0.56
D_RESE_LOM	72	-0.95	10.98	0.34	1.50	5.50	0.28	36.24	0.56
D_PROB_LOM	70	-1.00	5.35	0.14	0.94	4.16	0.29	20.15	0.57
D_PROV_LOM	70	-0.94	11.90	0.50	1.99	4.35	0.29	20.72	0.57
RESE_RESO_RATIO	76	-	1.00	0.28	0.19	1.29	0.28	2.73	0.54
MI_INF_RATIO	74	0.04	30.42	2.85	4.19	4.69	0.28	26.76	0.55
MEAS_IND_RATIO	72	-	14.54	0.65	1.73	7.49	0.28	60.53	0.56
PROV_PROB_RATIO	71	-	73.60	1.61	8.69	8.35	0.28	70.08	0.56
D_RESE_RESO_RATIO	72	-0.81	3.09	0.14	0.72	2.85	0.28	8.20	0.56
D_MI_INF_RATIO	73	-0.80	20.53	0.64	3.05	5.46	0.28	31.26	0.56
D_MEAS_IND_RATIO	67	-0.79	12.83	0.59	2.11	4.08	0.29	18.90	0.58
D_PROV_PROB_RATIO	63	-0.85	15.74	0.90	2.96	3.59	0.30	13.46	0.59
Valid N (listwise)	58								

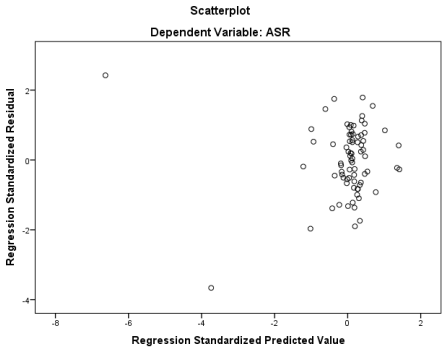
9.4 Appendix D: Significant Regression Analyses Supporting Graphs

9.4.1 Research Question 1

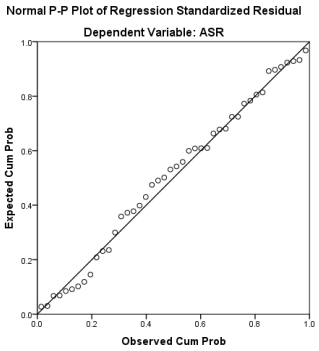
9.4.1.1 Regression Equation 1

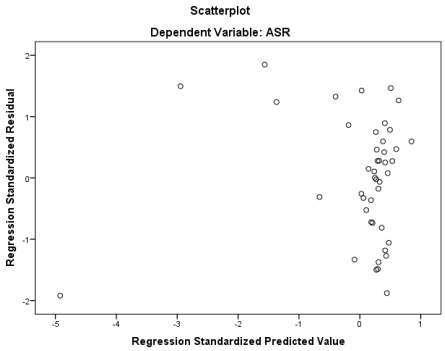
9.4.1.1.1 Total Sample



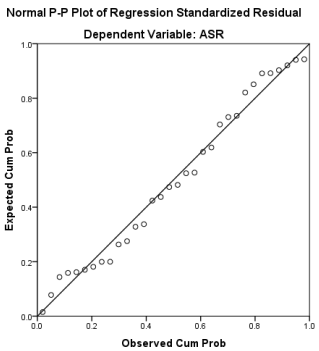


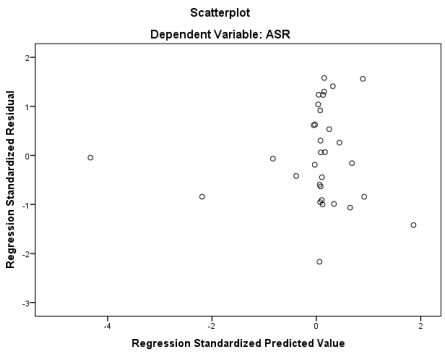
9.4.1.1.2 Gold



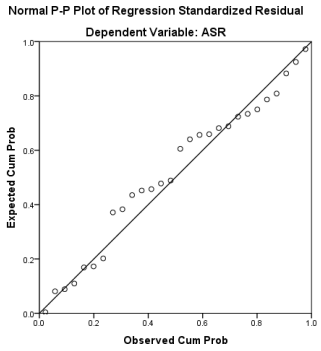


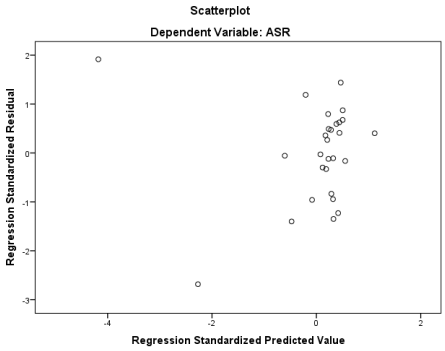
9.4.1.1.3 Non-Gold



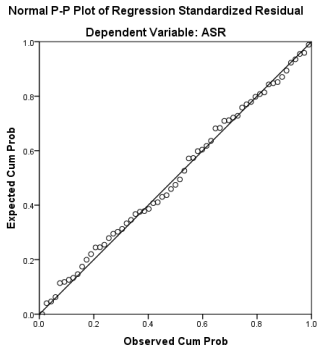


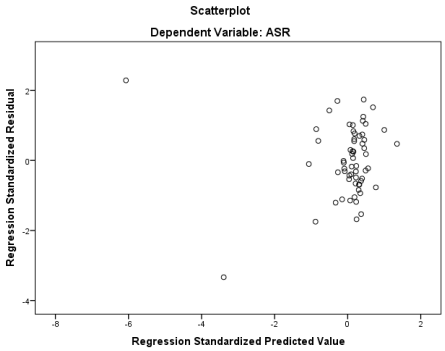
9.4.1.1.4 TSX





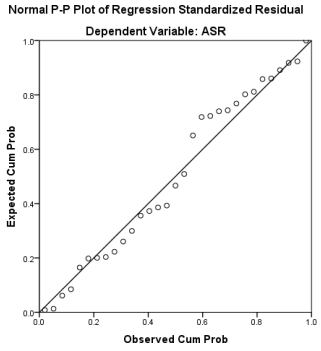
9.4.1.1.5 Small-Cap

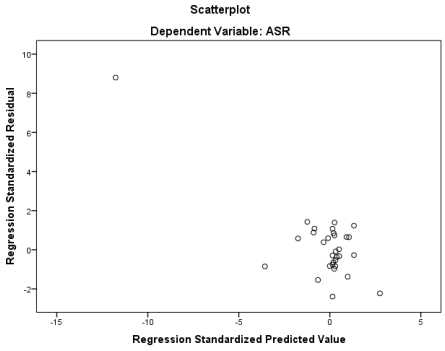




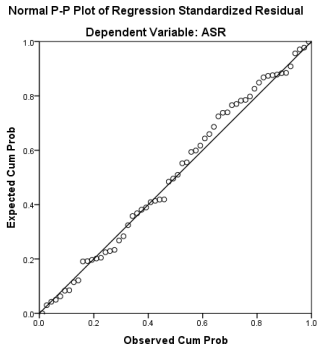
9.4.1.2 Regression Equation 4

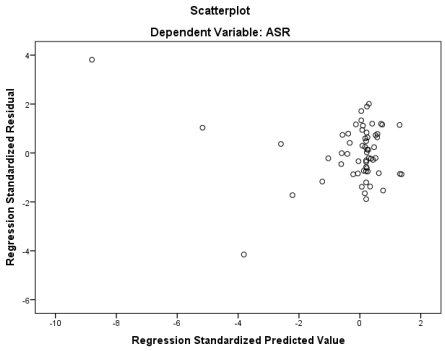
9.4.1.2.1 Non-Gold





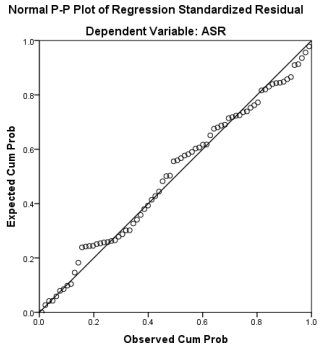
9.4.1.2.2 Small-Cap

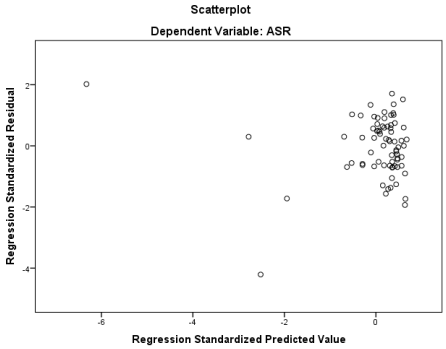




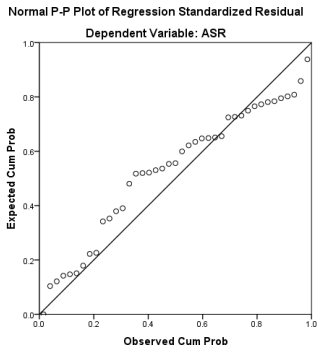
9.4.1.3 Regression Equation 8

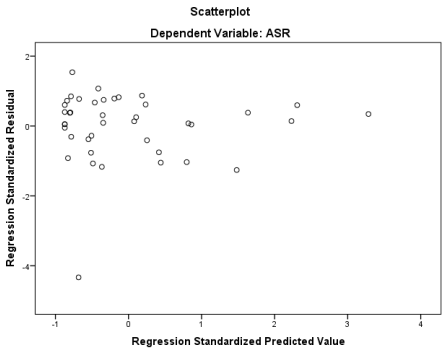
9.4.1.3.1 Total Sample



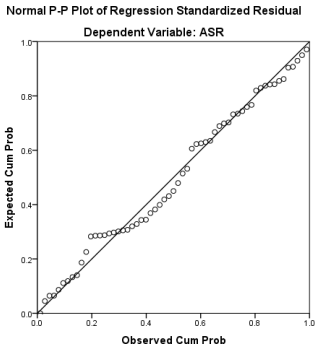


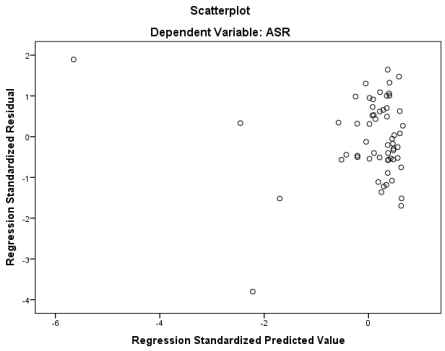
9.4.1.3.2 Gold





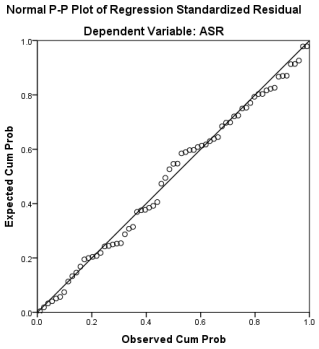
9.4.1.3.3 Small-Cap

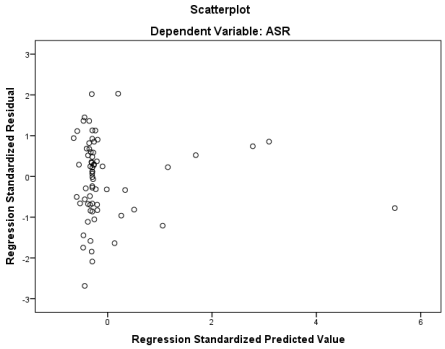




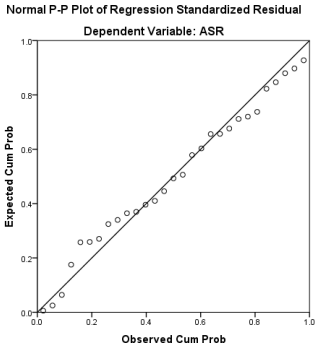
9.4.1.4 Regression Equation 9

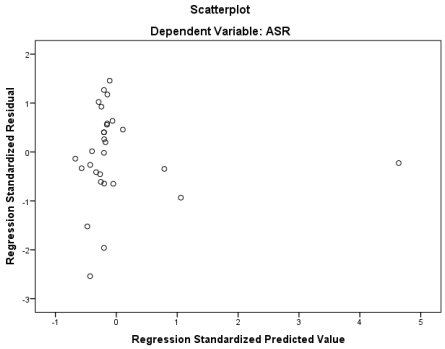
9.4.1.4.1 Total Sample



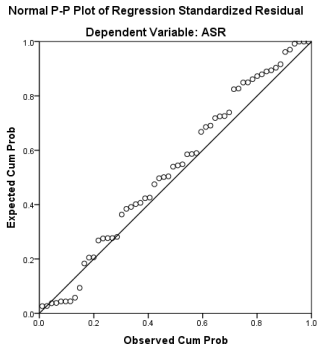


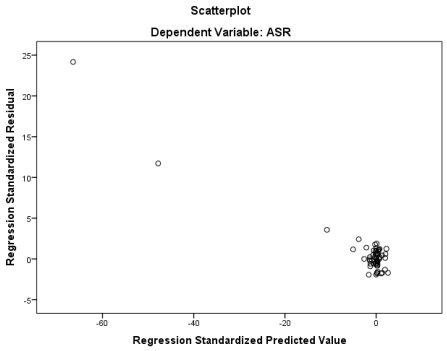
9.4.1.4.2 Non-Gold





9.4.1.4.3 Small-Cap

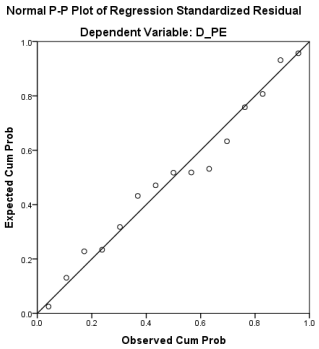


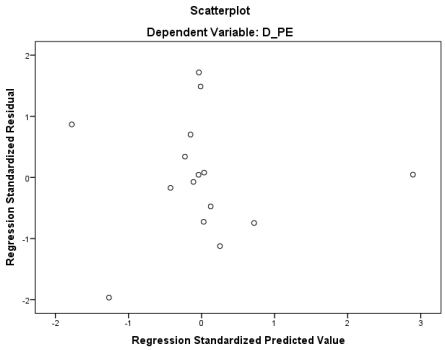


9.4.2 Research Question 2

9.4.2.1 Regression Equation 1

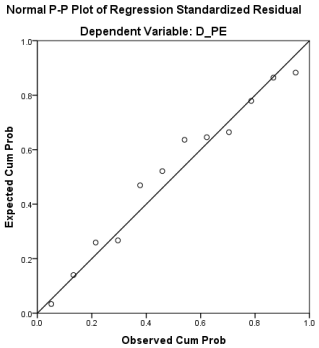
9.4.2.1.1 Large-Cap

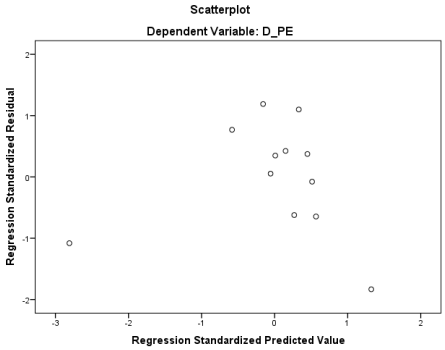




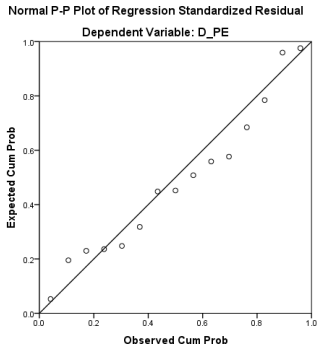
9.4.2.2 Regression Equation 3

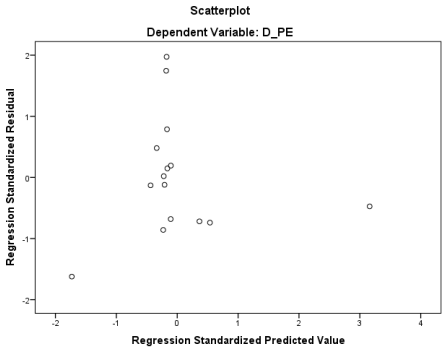
9.4.2.2.1 LSE





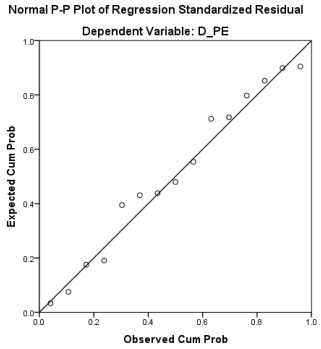
9.4.2.2.2 Large-Cap

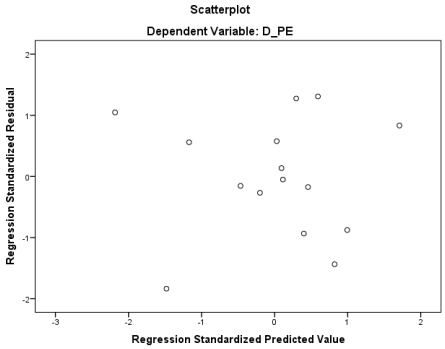




9.4.2.3 Regression Equation 5

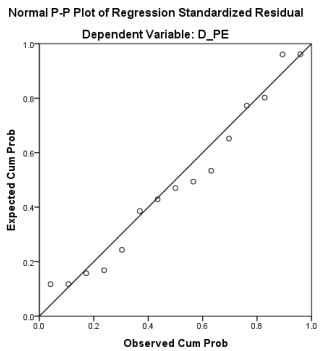
9.4.2.3.1 Large-Cap

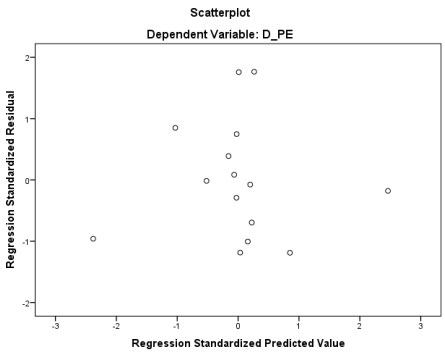




9.4.2.4 Regression Equation 6

9.4.2.4.1 Large-Cap





9.5 Appendix E: Non-Significant Regression Analyses

9.5.1 Research Question 1

9.5.1.1 Regression Equation 1

Scenario	Excluded Variables	Beta In	t	Sig.
ASX	D_NP	0.038	0.179	0.86
	D_OP	0.18	0.858	0.4
	D_REV	-0.205	-0.983	0.336
	D_OCF	0.334	1.661	0.111

9.5.1.2 Regression Equation 2

Scenario	Excluded Variables	Beta In	t	Sig.
Total Sample	D_TOT_RESO	-0.162	-1.414	0.162
Gold	D_TOT_RESO	-0.134	-0.877	0.386
Non-Gold	D_TOT_RESO	-0.346	-2.021	0.052
ASX	D_TOT_RESO	-0.059	-0.275	0.786
TSX	D_TOT_RESO	-0.127	-0.654	0.519
JSE	D_TOT_RESO	-0.432	-1.513	0.161
LSE	D_TOT_RESO	0.022	0.069	0.946
Small	D_TOT_RESO	-0.135	-1.048	0.299
Large	D_TOT_RESO	0.034	0.121	0.905

9.5.1.3 Regression Equation 3

Scenario	Excluded Variables	Beta In	t	Sig.
Total Sample	D_RESO	-0.003	-0.023	0.981
	D_RESE	0.05	0.423	0.674
Gold	D_RESE	0.035	0.22	0.827
	D_RESO	0.109	0.683	0.499
Non-Gold	D_RESE	0.047	0.254	0.801
	D_RESO	-0.338	-1.932	0.063
ASX	D_RESO	0.003	0.013	0.989
	D_RESE	-0.008	-0.038	0.97
TSX	D_RESE	0.034	0.167	0.869
	D_RESO	0.113	0.555	0.584
JSE	D_RESE	0.108	0.342	0.739
	D_RESO	-0.46	-1.638	0.132
LSE	D_RESO	0.011	0.036	0.972
	D_RESE	0.18	0.58	0.575
Small	D_RESO	0.036	0.264	0.792
	D_RESE	0.063	0.469	0.641
Large	D_RESO	-0.173	-0.635	0.536
	D_RESE	0.274	1.027	0.323

9.5.1.4 Regression Equation 4

Scenario	Excluded Variables	Beta In	t	Sig.
Total Sample	D_INF	0.013	0.102	0.919
	D_PROB	0.048	0.38	0.705
	D_IND	-0.062	-0.491	0.625
	D_PROV	0.048	0.379	0.706
	D_MEAS	0.191	1.541	0.128
Gold	D_IND	0.095	0.566	0.575
	D_PROB	0.157	0.938	0.355
	D_PROV	0.024	0.142	0.888
	D_INF	0.155	0.929	0.359
	D_MEAS	0.197	1.192	0.241
TSX	D_IND	0.044	0.212	0.834
	D_PROB	0.102	0.491	0.628
	D_PROV	-0.076	-0.366	0.717
	D_MEAS	0.109	0.526	0.604
	D_INF	0.212	1.039	0.309

9.5.1.5 Regression Equation 5

Scenario	Excluded Variables	Beta In	t	Sig.
Total Sample	D_TOT_RESO_LOM	-0.155	-1.346	0.182
Gold	D_TOT_RESO_LOM	-0.161	-1.06	0.295
Non-Gold	D_TOT_RESO_LOM	-0.161	-0.892	0.379
ASX	D_TOT_RESO_LOM	-0.065	-0.306	0.762
TSX	D_TOT_RESO_LOM	-0.17	-0.879	0.388
JSE	D_TOT_RESO_LOM	-0.315	-1.051	0.318
LSE	D_TOT_RESO_LOM	0.064	0.203	0.843
Small	D_TOT_RESO_LOM	-0.124	-0.956	0.343
Large	D_TOT_RESO_LOM	-0.198	-0.727	0.48

9.5.1.6 Regression Equation 6

Scenario	Excluded Variables	Beta In	t	Sig.
Total Sample	D_RESE_LOM	0.045	0.375	0.709
	D_RESO_LOM	-0.09	-0.759	0.45
Gold	D_RESE_LOM	0.013	0.082	0.935
	D_RESO_LOM	-0.019	-0.116	0.908
Non-Gold	D_RESE_LOM	0.11	0.597	0.555
	D_RESO_LOM	-0.154	-0.842	0.407
ASX	D_RESE_LOM	-0.057	-0.254	0.802
	D_RESO_LOM	-0.077	-0.346	0.733
TSX	D_RESE_LOM	-0.005	-0.024	0.981
	D_RESO_LOM	-0.093	-0.458	0.651
JSE	D_RESE_LOM	0.137	0.436	0.672
	D_RESO_LOM	-0.314	-1.046	0.32
LSE	D_RESO_LOM	0.053	0.169	0.869
	D_RESE_LOM	0.196	0.631	0.542
Small	D_RESO_LOM	-0.054	-0.4	0.691
	D_RESE_LOM	0.067	0.497	0.621
Large	D_RESE_LOM	0.186	0.683	0.507
	D_RESO_LOM	-0.444	-1.785	0.098

9.5.1.7 Regression Equation 7

Scenario	Excluded Variables	Beta In	t	Sig.
Total Sample	D_INF_LOM	-0.049	-0.386	0.701
	D_PROB_LOM	0.036	0.288	0.774
	D_PROV_LOM	0.099	0.792	0.431
	D_IND_LOM	-0.11	-0.878	0.383
	D_MEAS_LOM	0.144	1.157	0.251
Gold	D_IND_LOM	0.004	0.024	0.981
	D_INF_LOM	0.053	0.316	0.754
	D_PROB_LOM	0.09	0.534	0.597
	D_PROV_LOM	0.075	0.447	0.658
	D_MEAS_LOM	0.17	1.023	0.313
Non-Gold	D_INF_LOM	-0.121	-0.619	0.541
	D_PROB_LOM	-0.288	-1.534	0.137
	D_PROV_LOM	0.134	0.689	0.497
	D_MEAS_LOM	0.031	0.16	0.874
	D_IND_LOM	-0.173	-0.894	0.379
TSX	D_IND_LOM	-0.009	-0.044	0.966
	D_PROB_LOM	0.063	0.301	0.766
	D_PROV_LOM	-0.078	-0.375	0.711
	D_MEAS_LOM	0.086	0.416	0.681
	D_INF_LOM	0.165	0.803	0.43
Small	D_PROB_LOM	0.017	0.115	0.909
	D_INF_LOM	-0.006	-0.043	0.966
	D_PROV_LOM	0.144	1.01	0.317
	D_IND_LOM	-0.143	-1	0.322
	D_MEAS_LOM	0.192	1.355	0.182

9.5.1.8 Regression Equation 8

Scenario	Excluded Variables	Beta In	t	Sig.
Non-Gold	RESO_RESE_RATIO	0.138	0.708	0.485
	MI_INF_RATIO	-0.288	-1.533	0.137
	PROV_PROB_RATIO	-0.082	-0.422	0.677
	MEAS_IND_RATIO	-0.142	-0.734	0.47
ASX	RESO_RESE_RATIO	0.36	1.724	0.1
	MI_INF_RATIO	-0.163	-0.739	0.468
	MEAS_IND_RATIO	-0.129	-0.582	0.567
	PROV_PROB_RATIO	0.321	1.517	0.145
TSX	RESO_RESE_RATIO	-0.016	-0.076	0.94
	MEAS_IND_RATIO	-0.035	-0.167	0.869
	PROV_PROB_RATIO	0.163	0.774	0.447
	MI_INF_RATIO	-0.289	-1.416	0.171

9.5.1.9 Regression Equation 9

Scenario	Excluded Variables	Beta In	t	Sig.
Gold	D_RESE_RESO_RATIO	0.093	0.534	0.597
	D_MI_INF_RATIO	0.035	0.2	0.843
	D_PROV_PROB_RATIO	0.04	0.232	0.818
	D_MEAS_IND_RATIO	0.184	1.073	0.291
TSX	D_PROV_PROB_RATIO	-0.119	-0.549	0.588
	D_MI_INF_RATIO	0.078	0.357	0.724
	D_RESE_RESO_RATIO	0.097	0.448	0.659
	D_MEAS_IND_RATIO	0.242	1.142	0.266

9.5.2 Research Question 2

9.5.2.1 Regression Equation 1

Scenario	Excluded Variables	Beta In	t	Sig.
Total Sample	D_OCF	-0.055	-0.467	0.642
	D_OP	0.005	0.043	0.966
	D_NP	0.029	0.244	0.808
	D_REV	-0.126	-1.074	0.286
Gold	D_NP	-0.045	-0.285	0.777
	D_OCF	-0.08	-0.505	0.616
	D_OP	-0.049	-0.311	0.758
	D_REV	-0.155	-0.989	0.329
Non-Gold	D_OCF	-0.047	-0.254	0.801
	D_OP	0.031	0.169	0.867
	D_NP	0.123	0.666	0.511
	D_REV	-0.134	-0.726	0.474
ASX	D_OCF	0.046	0.218	0.83
	D_NP	0.139	0.658	0.518
	D_REV	-0.124	-0.587	0.563
	D_OP	0.157	0.746	0.464
TSX	D_REV	-0.024	-0.117	0.908
	D_OP	-0.129	-0.623	0.539
	D_OCF	-0.08	-0.386	0.703
	D_NP	-0.133	-0.642	0.527
Small	D_OCF	-0.054	-0.405	0.687
	D_OP	0.01	0.073	0.942
	D_NP	0.034	0.256	0.799
	D_REV	-0.125	-0.942	0.35

9.5.2.2 Regression Equation 2

Scenario	Excluded Variables	Beta In	t	Sig.
Total Sample	D_TOT_RESO	-0.002	-0.019	0.985
Gold	D_TOT_RESO	0.149	0.95	0.348
Non-Gold	D_TOT_RESO	-0.062	-0.333	0.742
ASX	D_TOT_RESO	-0.152	-0.722	0.478
TSX	D_TOT_RESO	0.239	1.183	0.249
JSE	D_TOT_RESO	0.07	0.222	0.829
LSE	D_TOT_RESO	0.131	0.418	0.685
Small	D_TOT_RESO	-0.022	-0.166	0.869

9.5.2.3 Regression Equation 3

Scenario	Excluded Variables	Beta In	t	Sig.
Total Sample	D_RESO	-0.031	-0.254	0.801
	D_RESE	-0.079	-0.652	0.517
Gold	D_RESO	0.062	0.377	0.708
	D_RESE	0.111	0.682	0.499
Non-Gold	D_RESO	-0.06	-0.316	0.754
	D_RESE	-0.322	-1.802	0.082
ASX	D_RESO	-0.117	-0.526	0.605
	D_RESE	-0.277	-1.29	0.212
TSX	D_RESO	0.09	0.416	0.682
	D_RESE	0.092	0.421	0.678
JSE	D_RESE	-0.004	-0.013	0.99
	D_RESO	0.093	0.296	0.773
LSE	D_RESO[a]	0.115	0.367	0.721
	D_RESE[a]	-0.13	-0.416	0.686
Small	D_RESO	-0.044	-0.314	0.755
	D_RESE	-0.098	-0.708	0.482

[a] *Variables regressed individually*

9.5.2.4 Regression Equation 4

Scenario	Excluded Variables	Beta In	t	Sig.
Total Sample	D_PROV	-0.018	-0.141	0.888
	D_MEAS	-0.038	-0.295	0.769
	D_INF	-0.023	-0.181	0.857
	D_IND	0.023	0.176	0.861
	D_PROB	-0.067	-0.522	0.604
Gold	D_INF	-0.005	-0.031	0.975
	D_PROB	0.008	0.044	0.965
	D_PROV	0.058	0.339	0.736
	D_MEAS	-0.096	-0.564	0.576
	D_IND	0.21	1.25	0.22
Non-Gold	D_INF	-0.033	-0.165	0.871
	D_IND	-0.05	-0.248	0.806
	D_MEAS	0.041	0.204	0.84
	D_PROV	-0.105	-0.529	0.601
	D_PROB	-0.22	-1.127	0.27
Small	D_PROV	-0.027	-0.186	0.853
	D_INF	-0.028	-0.191	0.849
	D_MEAS	-0.049	-0.332	0.742
	D_IND	-0.053	-0.358	0.722
	D_PROB	-0.101	-0.691	0.493

9.5.2.5 Regression Equation 5

Scenario	Excluded Variables	Beta In	t	Sig.
Total Sample	D_TOT_RESO_LOM	0.024	0.202	0.84
Gold	D_TOT_RESO_LOM	0.062	0.393	0.696
Non-Gold	D_TOT_RESO_LOM	0.024	0.131	0.897
ASX	D_TOT_RESO_LOM	-0.059	-0.275	0.786
TSX	D_TOT_RESO_LOM	0.177	0.863	0.397
JSE	D_TOT_RESO_LOM	0.182	0.587	0.57
LSE	D_TOT_RESO_LOM	0.096	0.305	0.767
Small	D_TOT_RESO_LOM	0.015	0.111	0.912

9.5.2.6 Regression Equation 6

Scenario	Excluded Variables	Beta In	t	Sig.
Total Sample	D_RESO_LOM	0.016	0.132	0.896
	D_RESE_LOM	-0.072	-0.588	0.558
Gold	D_RESO_LOM	-0.058	-0.352	0.727
	D_RESE_LOM	0.073	0.443	0.66
Non-Gold	D_RESO_LOM	0.026	0.14	0.89
	D_RESE_LOM	-0.23	-1.251	0.221
ASX	D_RESO_LOM	-0.039	-0.172	0.865
	D_RESE_LOM	-0.171	-0.776	0.447
TSX	D_RESO_LOM	0.028	0.128	0.9
	D_RESE_LOM	0.079	0.363	0.72
JSE	D_RESO_LOM	0.19	0.611	0.555
	D_RESE_LOM	0.377	1.287	0.227
LSE	D_RESO_LOM	0.08	0.255	0.804
	D_RESE_LOM	-0.153	-0.491	0.634
Small	D_RESO_LOM	0.013	0.097	0.923
	D_RESE_LOM	-0.086	-0.621	0.537

9.5.2.7 Regression Equation 7

Scenario	Excluded Variables	Beta In	t	Sig.
Total Sample	D_PROV_LOM	-0.021	-0.161	0.872
	D_INF_LOM	-0.004	-0.029	0.977
	D_MEAS_LOM	-0.024	-0.19	0.85
	D_IND_LOM	0.03	0.238	0.813
	D_PROB_LOM	-0.055	-0.429	0.669
Gold	D_PROB_LOM	-0.094	-0.55	0.586
	D_INF_LOM	-0.12	-0.703	0.487
	D_IND_LOM	0.104	0.607	0.548
	D_PROV_LOM	-0.016	-0.095	0.925
	D_MEAS_LOM	-0.139	-0.82	0.418
Non-Gold	D_INF_LOM	0.007	0.035	0.972
	D_PROV_LOM	0.04	0.2	0.843
	D_IND_LOM	0.011	0.057	0.955
	D_MEAS_LOM	0.05	0.252	0.803
	D_PROB_LOM	-0.08	-0.403	0.69
Small	D_PROV_LOM	-0.03	-0.201	0.842
	D_INF_LOM	-0.007	-0.044	0.965
	D_IND_LOM	0.01	0.065	0.948
	D_MEAS_LOM	-0.032	-0.215	0.831
	D_PROB_LOM	-0.075	-0.509	0.613

9.5.2.8 Regression Equation 8

Scenario	Excluded Variables	Beta In	t	Sig.
Total Sample	RESO_RESE_RATIO	0.01	0.083	0.934
	MI_INF_RATIO	0.03	0.244	0.808
	PROV_PROB_RATIO	-0.012	-0.094	0.925
	MEAS_IND_RATIO	-0.032	-0.253	0.801
Gold	MI_INF_RATIO	0.052	0.317	0.753
	PROV_PROB_RATIO	-0.017	-0.104	0.917
	RESO_RESE_RATIO	0.05	0.302	0.765
	MEAS_IND_RATIO	-0.064	-0.392	0.697
Non-Gold	RESO_RESE_RATIO	0.036	0.178	0.86
	MI_INF_RATIO	0.018	0.091	0.928
	PROV_PROB_RATIO	-0.029	-0.145	0.886
	MEAS_IND_RATIO	-0.052	-0.261	0.796
ASX	RESO_RESE_RATIO	0.039	0.175	0.863
	PROV_PROB_RATIO	0.022	0.096	0.924
	MEAS_IND_RATIO	-0.133	-0.599	0.556
	MI_INF_RATIO	0.148	0.671	0.51
TSX	RESO_RESE_RATIO	0.048	0.214	0.833
	MEAS_IND_RATIO	-0.043	-0.191	0.851
	PROV_PROB_RATIO	0.075	0.336	0.74
	MI_INF_RATIO	0.165	0.747	0.464
Small	RESO_RESE_RATIO	-0.02	-0.14	0.889
	MI_INF_RATIO	0.029	0.204	0.839
	PROV_PROB_RATIO	-0.015	-0.107	0.915
	MEAS_IND_RATIO	-0.03	-0.216	0.83

9.5.2.9 Regression Equation 9

Scenario	Excluded Variables	Beta In	t	Sig.
Total Sample	D_MI_INF_RATIO	0.012	0.087	0.931
	D_PROV_PROB_RATIO	-0.001	-0.01	0.992
	D_MEAS_IND_RATIO	-0.043	-0.32	0.75
	D_RESE_RESO_RATIO	-0.057	-0.429	0.669
Gold	D_RESE_RESO_RATIO	0.064	0.361	0.721
	D_MEAS_IND_RATIO	-0.084	-0.477	0.637
	D_PROV_PROB_RATIO	0.07	0.397	0.694
	D_MI_INF_RATIO	0.192	1.108	0.276
Non-Gold	D_RESE_RESO_RATIO	-0.104	-0.489	0.629
	D_MI_INF_RATIO	-0.094	-0.444	0.662
	D_MEAS_IND_RATIO	0.002	0.011	0.992
	D_PROV_PROB_RATIO	0.065	0.304	0.764
TSX	D_PROV_PROB_RATIO	-0.067	-0.294	0.772
	D_RESE_RESO_RATIO	0.068	0.296	0.77
	D_MEAS_IND_RATIO	-0.133	-0.585	0.565
	D_MI_INF_RATIO	0.361	1.689	0.108
Small	D_PROV_PROB_RATIO	-0.012	-0.078	0.938
	D_RESE_RESO_RATIO	-0.086	-0.562	0.577
	D_MEAS_IND_RATIO	-0.045	-0.293	0.771
	D_MI_INF_RATIO	-0.108	-0.702	0.487