The relationship between internal value drivers and shareholder value: JSE listed mining companies investigated

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ABSTRACT

The primary goal of a publicly traded company is to maximise the wealth of its shareholders. This implies that the management of the firm, as agents of the owners, has to manage the firm in such a manner as to create value from every decision taken. Value-based management (VBM) is a management strategy aimed at achieving shareholder wealth creation and is based on the effective management of a set of internal value drivers to maximise wealth creation.

The primary objective of the current study is to investigate the quantification of the relationship between internal value drivers and shareholder wealth creation in the Mining sector of JSE listed companies in South Africa. In order to achieve this, the internal value drivers were identified from literature, the necessary financial data was collected and the value drivers as well as actual shareholder wealth were quantified. Revenue growth, operating profitability, capital requirements and weighted average cost of capital (WACC) were identified as the value drivers while total shareholder return (TSR) was identified as the actual shareholder wealth creator. For the purpose of the current study, WACC was excluded from the analysis.

By application of linear regression, it was found that revenue growth and operating profitability have a positive, statistically significant effect of TSR. After analysing the effect size, it is however concluded that the effect is not practically significant. These findings concur with similar research in the field of VBM.

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INTRODUCTION

1.1 BACKGROUND

Warren Buffet, CEO and majority shareholder of Berkshire Hathaway is the world's richest man (Miller, 2008). His fortune, as valued on 7 March 2008, is $62 billion, $4 billion more than that of Bill Gates, who occupied the top spot for the preceding thirteen years.

Accumulating such a fortune requires an exceptional individual and it ought to be worthwhile to investigate the methods employed by Buffet to reach the top of the business world. Buffet has communicated his successful investment philosophy through his CEO's letter to shareholders in Berkshire Hathaway's annual report over a number of years, and it consists of the following eight elements (Bruner, 2003).

1. *Economic reality not accounting reality.* Economic reality is based on cash flows generated by the business and is looking into the future of the business, while accounting reality is backward looking, depicting the business using a set of rigid rules.
2. *The cost of the lost opportunity.* Buffet frames his investment decisions using an (either/or) rather than a (yes/no) approach. Potential investment opportunities are always compared to other returns available.
3. *Value creation: time is money.* Buffet assesses present value of the future cash flows from a potential investment.

4. *Measure performance by gain in intrinsic value, not accounting profits.* Earnings yield of investments are measured when evaluating investments.
5. *Risk and discount rates.* Buffet used the long term rate on US treasury (30 year) bonds to discount cash flows. He defended this unconventional method by stating that he avoids risk and should therefore use a risk-free discount rate.
6. *Diversification.* Buffet disagrees with too much diversified stocks in an investment portfolio. An investor should rather wait for the exceptional opportunity.
7. *Investment decisions should be driven by information and analysis not by emotions or hunches.*
8. *Alignment of agents and owners.* Managers as agents of the shareholders owning the company should manage the company to maximise shareholder value.

All of the foregoing elements are included within value-based management principles (Brigham & Ehrhardt, 2005: 506). The aim of the above discussion is to emphasise the importance of value-based management in value and ultimately wealth creation.

In support of the line of argument, it can further be stated that the central objective or mission of publicly traded companies is to maximise shareholder wealth (Bannister & Jesuthasan, 1997: 12). This mission can be expanded further to producing a return for the shareholder that is higher than the opportunity cost of the cash invested (Frigo, 2002: 6). It implies a growth in share price at an expected rate determined by the specific shareholder. To measure the growth in shareholder value, the value of a company is defined as the present value of all the expected future cash flows less debt, and is determined by seven value drivers: turnover growth, profit margins, cash tax, fixed assets, weighted average cost of capital (WACC) and competitive advantage period (Cant, 2006: 33).

Value-based management (VBM) is the practice companies use to guide actions to maximise the value of the company, which in turn maximises shareholder wealth (Brigham & Ehrhardt, 2005: 507). According to Ashton (2007: 2), VBM involves the identification of value-drivers and aligning management processes to support value creation. In addition to this, the performance measurement systems and incentive schemes have to be designed to encourage value creation (Ashton, 2007: 2; Bannister & Jesuthasan, 1997: 12; Malmi & Ikäheimo, 2003: 235; Ittner & Larcker, 2001: 350). There is thus a cause and effect involved in VBM. On the one hand, the cause is variation in the value-drivers resulting in the effect, which is an increase or decrease in shareholder value. There should thus be a measurable causal relationship between the value-drivers and the shareholder wealth. The following six basic steps of VBM are suggested by Ittner and Larcker (2001: 353):

- Choosing specific internal objectives that lead to shareholder value enhancement.
- Selecting strategies and organisational designs to achieve the objectives.
- Identifying performance variables or value drivers that create value in the business.
- Developing action plans, selecting performance measures and setting targets for value drivers.
- Evaluating the success of the action plans.
- Assessing the ongoing validity of the internal objectives, strategies, plans and control systems in the light of current results.

Various models to enhance corporate value proposed by different authors have been summarised by Ashton (2007: 1):

- The Balanced Scorecard (BSC).
- Baldridge Quality Award Criteria.
- The Deming Management method.

- The Service-profit chain.
- The Skandia intellectual property model.
- The Action-Profit Linkage Model (Epstein & Westbrook, 2001: 39).

These models all target a combination of the VBM steps described by Ittner and Larcker (2001: 353). Brown (2006: 322) however, remarks that caution should be exercised in evaluating these models because a lot of the ways proffered in the literature, to implement VBM, normally involves the management consulting firm of the author of the book or article.

Various value-based management tools can be used to measure the extent to which the company is succeeding in the effort to reach the goal of maximising shareholder wealth (Brown, 2006: 320; Brigham & Ehrhardt, 2005: 507):

- Stern Stewart's EVA^{TM} (Economic Value Added).
- Marakon's equity spread.
- Holt Value's Cash Flow Return on Investment (CFROI).
- Boston Consulting Group's Cash Value Added (CVA).
- MVA (Market value added).
- The corporate valuation model.

These measurements are aimed at quantifying the effects of VBM and cannot in itself create shareholder value.

It has been shown that VBM has definite advantages for wealth creation, in the case of Warren Buffet, the richest man in the world as example. Various models and measurements exist to enhance and measure shareholder wealth creation. Results from empirical research done in the field of VBM are presented in the subsequent section.

It is not always clear if the value drivers used to guide management actions facilitate shareholder wealth creation, or even if the elements contained in the measurements have an influence on value creation (Brown, 2006: 324). Brown (2006: 335) elaborates further by stating that analysts decide on a firm's value by considering short term measures such as cash generation and dividend payments, and not long term value creation defined by VBM metrics. These observations are however based on interviews with only nine executives from two firms in Britain; this limitation is recognised by Brown (2006: 335) and further research is recommended to test the findings.

Sakunasingha (2006: 2) studied motivating factors for companies to adopt VBM practices and also the effects of the adoption. The research targeted the Electronic industry in Thailand and concluded that no single factor can be isolated, that influences companies to adopt VBM, but that the implementation significantly correlated with enhanced corporate performance. Sakunasingha (2006: 184) recommends further research in the area focusing on different industries and different parts of the world.

Haspeslagh et al (2001: 66) reports that almost half of the companies that have adopted some VBM metric have had mediocre success in creating value. In a study done among Finnish companies, Malmi & Ikäheimo (2003: 250) found that while VBM and EVA™ metrics are used with success as basis for compensation among the management of the companies, it does not mean that VBM is actually practiced by the companies or that it has any influence on the financial performance of the companies. The authors also found that companies implement certain aspects of VBM and then assume that VBM are practised.

Ryan & Trahan (2003: 28) found in a study among 86 firms who adopted VBM principals over the period 1984 to 1997 that:

- Residual income increased significantly after adoption.

- Compensation tied to VBM metrics does influence the firm's performance.

It is thus clear that there is disagreement in the literature in terms of the success adopting VBM to increase shareholder wealth.

Limited research has been done on the relationship between the value drivers and value creation. Kim (2004: 944) found that WACC is the most significant strategic variable in determining the value of market value added (MVA).

In conclusion: by utilising VBM principles to investing, Warren Buffet became the richest man in the world (Miller, 2008). VBM can be defined as a set of structured actions of management aimed at maximising shareholder wealth. It is a philosophy that has to be adopted over the long term to yield results. Various models exist for VBM implementation and measurements to evaluate shareholder wealth creation. The value drivers that a company uses to measure its performance should align the company towards the company goal. In the case of VBM the optimisation of the value drivers should then result in the maximisation of shareholder wealth. Various authors have researched the topic with conflicting results from empirical studies; most indicating the need for additional research. Research indicates that companies implement VBM with various degrees of success. Little research exist that link value drivers or performance measurements with shareholder value maximisation.

1.2 THE PROBLEM STATEMENT

The normative theory of value-based management (VBM) is well developed and commentators are in agreement on the benefits that a company can realise through the adoption thereof. Various metrics exist by which shareholder value creation can be evaluated. VBM is the philosophy by which companies seek to realise shareholder value maximisation. Companies identify internal value drivers

and design compensation systems to translate the VBM strategy into management guidelines. The internal effect of the strategy can be measured in terms of economic value added (EVA) while the actual shareholder wealth creation can be measured by total shareholder return (TSR).

The problem is that the relationship between the internal value drivers and shareholder value creation needs to be investigated in order to determine if the application of VBM is feasible.

1.3 OBJECTIVES OF THE STUDY

The primary objective of the study is to investigate the quantification of the relationship between the internal value drivers of companies and shareholder value creation by the companies in the Mining sector in South Africa.

The following secondary objectives will ensure that the primary objective is achieved:

A. To identify the internal drivers of shareholder wealth maximisation. The objective is satisfied by a meticulous evaluation of literature in the field of VBM.
B. To collect comprehensive financial data for firms in the Mining sector in South Africa. This dataset includes internal financial data and the share prices of the firms.
C. To quantify the internal drivers of shareholder wealth creation of firms in the Mining sector in South Africa. This objective is imperative in the investigation of the quantification of the relationship between these value drivers and the shareholder value creation.
D. To determine the actual shareholder wealth creation achieved by the firms in the Mining sector in South Africa.

E. To investigate the causal relationship between internal value drivers and shareholder wealth creation of firms in the Mining sector in South Africa.

1.4 SCOPE AND LIMITATIONS OF THE STUDY

The study is limited to firms in the Mining sector in South Africa listed on the JSE. The time period over which financial data is evaluated is limited to the period from 1998 to 2008. For firms established after 1998 the period will be limited to the first year in which financial statements are published, up to 2008. Only firms with three and more sets of annual financial results, during the defined period, are included in the study. Firms with three and more sets of annual financial results, within the period, that does not exist in 2008 are excluded from the study. The nature of the study requires the firm under investigation to generate revenue. Firms that do not generate revenue will be disregarded from the research sample. In the Mining sector several firms exist and are listed on the JSE for the purpose of exploration of rnining reserves. The firms will exploit the reserves at some stage in the future, if it turns out to be economically feasible, generating revenue and creating shareholder value.

1.5 RESEARCH METHODOLOGY

The data necessary to satisfy the secondary objectives of the study is acquired from secondary sources.

1.5.1 Secondary sources

The sources of financial information used in the study are: (i) Annual reports published by the firms under investigation, (ii) financial information from the website ShareData Online [http://www.sharedata.co.za], (iii) financial information

acquired from McGregor BFA, (iv) [http://www.mcgregorbfa.com] and financial information from the website of the JSE, [http://www.jse.co.za].

1.5.2 Research design

The research for the current study is done using a systematic process of gathering, recording and analysing the data to investigate the relationship between internal value drivers and the shareholder value creation in firms in the Mining sector in South Africa, listed on the JSE. The research is carried out using a combination of the following standard research designs: correlation based research and secondary data analysis (Hofstee, 2006: 120-131).

1.5.3 Data Analysis

The primary objective of the study is to investigate the relationship between the internal value drivers as independent variables and shareholder value creation as the dependent variable. The following statistical methods are used in investigating these relationships: graphical analysis, descriptive statistics, simple linear regression and multiple linear regression methods. MINITAB statistical software is used for the statistical analysis.

1.6 DIVISION OF CHAPTERS

Chapter 1 introduces the research problem and the methods to be used. It includes the introduction, the problem statement and objectives, a summary of the research methodology and scope of the study.

Chapter 2 explores the available literature on shareholder value, value-based management, internal value drivers and research results from previous empirical studies.

Chapter 3 describes the research design and includes the methodology, research design, sampling method, data description and a description of the data analysis methods used. Limitations and ethical considerations are presented.

Chapter 4 presents the results from the empirical study and includes the data analysis and quantification of the relationship between internal value drivers and shareholder value creation. The conclusions from the research, recommendations and future research themes are presented to conclude the study.

1.7 CONCLUSION

The chapter describes the background to the current study. The background motivates and leads to the problem statement. The objectives of the study are listed and the sources of data and the research method to satisfy the objectives are introduced. The chapter concludes with the division of the chapters of the study report. The ensuing chapter supplies the theoretical background pertaining to the study.

CHAPTER 2

THEORY OF SHAREHOLDER VALUE CREATION

2.1 INTRODUCTION

The purpose of this chapter is to present the theoretical base for shareholder value creation, measurement of value creation and the relationship between value drivers and value creation. A survey of research relevant to the field of study serves to contextualise the current study.

Investors invest money in firms with the aim of obtaining a return on investments. This return consists of capital growth in the actual value of the shares as determined by transactions on the stock exchange and the income from dividends paid out by the firm invested in. The stock exchange is a market where the market price of the shares reflects the value as perceived by the buyers and sellers. If investors expect a high return on investments the economic principle of scarcity applies and the price of the shares increases (Mohr & Fourie, 2005: 6). Signals from the firm shape the expectations of investors. Markets interpret the signals from the firm and adjust the price of the share according to the general perception of what the signals indicate, in terms of future returns. The management team of the firm, as agents of the owners, has to manage the firm in such a way that the signals sent to the market maximise the value for the shareholders.

This chapter will proceed with a discussion of shareholder value creation which is the basis of this study. The reader will be introduced to the basic principles of corporate value followed by the determination of shareholder value creation or destruction.

2.2 CREATING SHAREHOLDER VALUE

The shareholders as owners of the firm have a share in the total intrinsic firm value in proportion to the amount of shares owned. When discussing value creation it is therefore necessary to initiate the theoretical discussion with the theory of corporate valuation. Theoretical instruments exist to measure shareholder value creation or destruction. These instruments are accordingly presented and explained.

2.2.1 Corporate valuation

Different methods exist to determine the value of a firm. In Table 2.1 different methods of estimating the value of a firm are presented (Burner, 2003: 527). The advantages and disadvantages of each method are summarised in the table.

Table 2.1: Approaches to the estimation of the value of a firm

Approach	**Advantages**	Disadvantages
Book value	• Simple • Authoritative	• Ignores some assets and liabilities. • Historical costs: backward looking. • Subject to accounting manipulation
Liquidation value	• Conservative	• Ignore "going concern" value. • (Dis)orderly sale?
Replacement value	• Current	• Replace *what*? • Subjective estimates.
Multiples, Earnings capitalization: • Price/Earnings • Value/EBIT • Price/Book	• Simple • Widely used	• "Earnings" subject to accounting manipulation. • Snapshot estimate: may ignore cyclical changes. • Depends on comparable firms: ultimately just a measure of relative, not absolute value.
Discounted cash flow	• Theoretically based • Rigorous • Affords many analytical insights • Cash focus • Multi period focus • Reflects time value of money	• Time consuming. • Risks "analysis paralysis" • Easy to abuse misuse. • Tough to explain to novices.

Various literature sources concur that the most accurate estimation of the value of a firm is the present value of all the future cash flows to be generated, discounted at the required rate of return (Leach & Melicher, 2006: 304; Brigham & Ehrhardt, 2005: 9; Brealy & Myers, 2003: 33; Hawawini & Viallet, 2001: 429;

Koller, 1994: 87). This is referred to as the discounted cash flow (DCF) approach as listed in Table 2.1. The discounted cash flow approach is used to calculate the value of a firm and to determine if value is created or destroyed and is an integral part of value-based management. This implies that cash flows create value. The relevant value of a firm for value-based management is the value of the operating assets as these are the instruments of cash flow generation (Brigham & Ehrhardt, 2005: 509). The total value of the firm is calculated as the value of operations plus the value of the non-operating assets less the value of debt and preferred stock.

Figure 2.1 exhibits all the variables used in the DCF approach of calculating the value of operations of a firm. The diagram was set up combining the theory presented by Brigham and Ehrhardt (2005: 507-521) pertaining to corporate valuation. The value of operations of the firm appears on the left and the variables driving the value branched out to the right. Appendix A contains the equations quantifying the relationships between the variables in Figure 2.1 (Brigham & Ehrhardt, 2005: 507-521).

The diagram and the equations reveal the three primary drivers of value as the free cash flow generated (FCF), the weighted average cost of capital employed (WACC) and the growth in revenue (g). Value is proportional to the FCF and growth in sales and inversely proportional to the WACC. The elements outlined also illustrate that value is created by managing income statement items as well as balance sheet items. Value is only created by investing shareholder funds in a way that the returns on the funds exceed WACC (Koller, 1994: 87; Cant, 2006: 33; Frigo, 2002: 6).

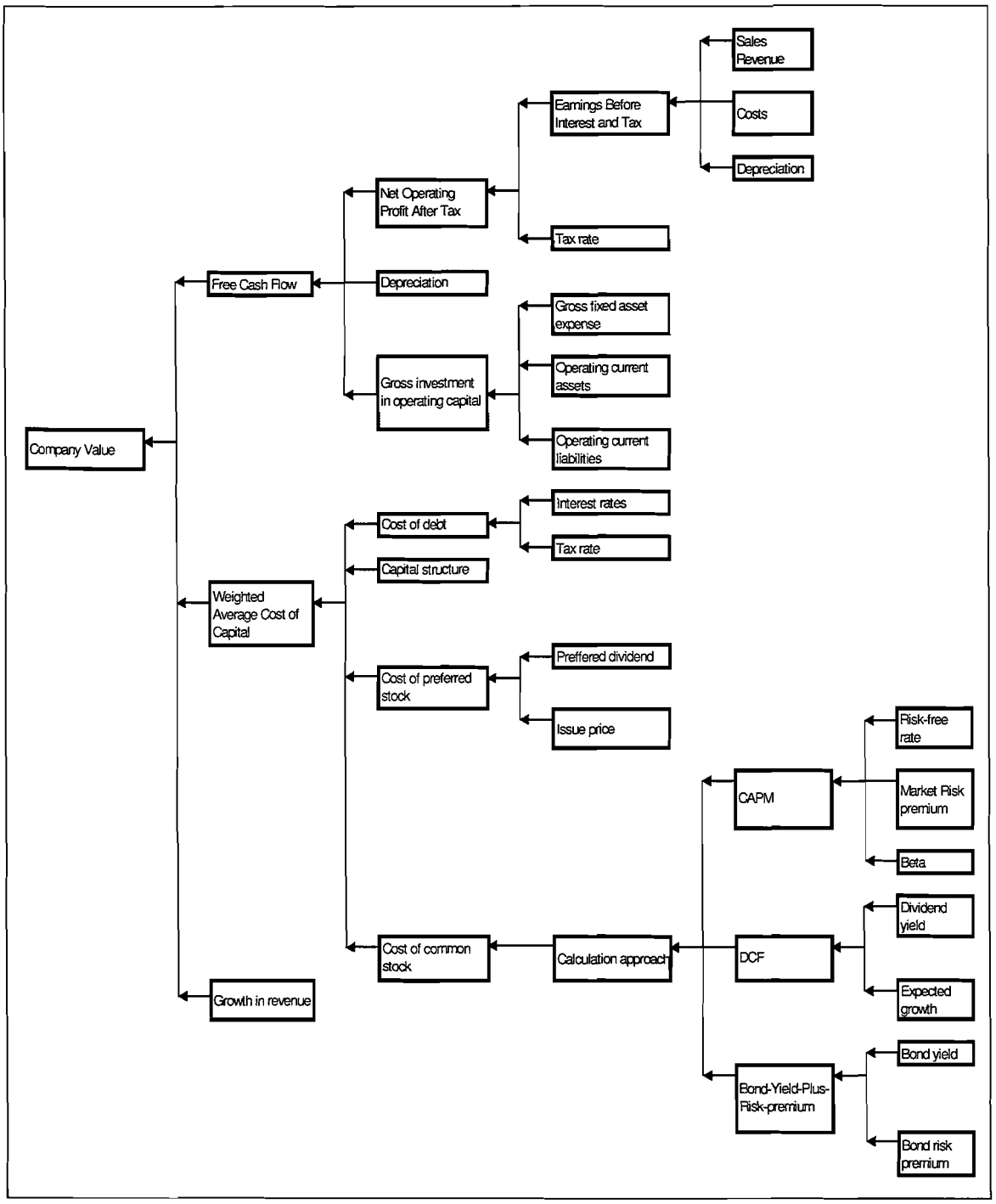

Figure 2.1: Drivers of firm value (DCF approach) (Brigham and Ehrhardt, 2005: 507-521)

Further analysis of the three main value drivers in Figure 2.1 reveals the following:

- Growth in revenue is a function of the strategy implemented by management. The strategy consists of all the competitive moves and business approaches the management of a company uses to grow the business and to achieve the goals of the company (Hough et al, 2008: 4).
- WACC is a function of the capital structure employed by management to finance the company.
- FCF is driven by NOPAT and gross investment in operating capital. FCF is maximised when management is able to maximise the profit made from the investment in operating capital. Managing the operating profitability (NOPAT/Sales) and the capital requirements (Operating capital/Sales) thus drives FCF and in turn shareholder value (Brigham & Ehrhardt, 2005: 519).

The preceding theoretical analysis affirms that value creation is under the control of management and that shareholder value is maximised when both the income statement and balance sheet items are under control.

2.2.2 Measuring shareholder value creation

Total shareholder return (TSR) measures the actual increase in shareholder value within a given period (Ameels et al, 2002):

$$TSR = \frac{(P_{t+1} - P_t) + D_{t+1}}{P_t} \quad (1)$$

Where:

P_t = Share price at the beginning of the period

P_{t+1} = Share price at the end of the period

D_{t+1} = Dividend at the end of the period

Various financial measurements exist that are utilised to determine the increase or decrease in shareholder value using the firm's internal variables. To ensure value creation, the performance of managers has to be measured in such a way that decisions are made to maximise value (Koller, 1994: 89). A first measurement of value creation is Economic profit, defined by (Koller, 1994: 98) as:

$$Economic\ Profit = Invested\ Capital \times (Return\ on\ invested\ capital - WACC) \quad (2)$$

This is equivalent to economic value added (EVA) which can be calculated as below (Brigham & Ehrhardt, 2005: 110):

$$EVA = (Operating\ capital \times (ROIC - WACC) \quad (3)$$

To increase EVA the return on invested capital should be maximised and WACC minimised. EVA is a measurement copyrighted by Stern Stewart and company and used as a measurement of value creation within a given period; normally a year (Brewer et al, 1999: 4). EVA is also defined as:

$$EVA = NOPAT - (Total\ net\ operating\ capital \times WACC) \quad (4)$$

The focus of EVA is both on balance sheet and income statement items. An increase in net operating income after tax (NOPAT) and a decrease in WACC will yield value creation. To increase EVA managers can either increase profits without increasing capital investment, reduce capital investment without reducing the profits at a rate higher than WACC or increase capital if the rate of return in profit is higher than WACC (Lovata & Costigan, 2002: 217).

EVA as a measurement is generally regarded as the most appropriate internal measure to determine if management decisions create value (Brealy & Myers,

2003: 325; Brigham & Ehrhardt, 2005: 111; Hawawini & Viallet, 2001: 30; Laschinger, 2004: 81; Kim, 2004: 940). EVA focuses on the interests of the owners or shareholders (Salmi & Virtanen, 2001: 5). The adoption of EVA as a measurement system also has some disadvantages. It is clear that a decrease in investment in assets increases EVA which might be detrimental for the long term earnings growth of the firm (El Mir & Seboui, 2006: 244). Another limitation of EVA as a measurement is the fact that it focuses on current performance and may impede long term thinking (Brealy & Myers, 2003: 324). Adoption of EVA may also have high implementation costs (Lovata & Costigan, 2002: 216).

Market value added (MVA) is another measurement that can be used to determine the total wealth created by the firm (Kim, 2004: 939). It is defined as the difference between the market value of both the firm's debt and equity and the book value of the firm. Because it measures the performance from the inception of the firm to the current period it is less useful as a performance measurement for management decision making over a short period. Return on investment (ROI) and cash flow return on investment (CFROI) are two more measurements mentioned in the literature (Koller, 1994: 92). These metrics are not generally used when a firm practices VBM (Brewer et al, 1999: 5).

If a firm practices value-based management, shareholder wealth creation would be a metric in determining management compensation (Ashton, 2007: 2). The balanced scorecard combines the following four dimensions in determining management performance: customer, financial, learning, growth and internal business processes (Hoque, 2003: 553). The financial section should thus include the measurement for shareholder wealth creation which would be EVA in the majority of cases.

In this discussion of shareholder wealth creation, the determination of the value of a firm is explained, the primary drivers for creating wealth by a firm are identified and internal measurements for shareholder wealth creation were

presented. It can be deduced that VBM is based on the hypothesis that the internal measurements for value creation are related to the actual increase or decrease in shareholder value. The current study investigates this relationship.

It now remains to contextualise the current study by presenting relevant research where value-based management, the internal drivers of value and the actual shareholder wealth are studied. Research attempting to determine relationships between the elements of VBM is also discussed.

2.3 RELEVANT RESEARCH ON VALUE-BASED MANAGEMENT

The literature related to VBM can be categorised in three groups. The first group aim to promote an approach developed by a consultant or consulting firm which is nothing less than academic advertising of a product. The second group are literature reviews and theoretical studies which aim to consolidate or expand the theory of VBM. The last group consists of empirical research of different facets of VBM. For obvious reasons the first group of papers are disqualified from being reviewed here for lack of objectivity. The second group are used in the preceding sections to explain the theory of VBM. The reader will be presented with research belonging to the last group associated with the relationship between value creation and VBM performance measurements.

Firms apply the principles of VBM differently which leads to various degrees of success in the results obtained. Firms also apply elements of VBM to some parts of the business expecting value creation. VBM is in theory an all-inclusive corporate strategy which should include strategy, management reward systems, internal control systems and which should link employee performance with shareholder value creation (Ryan & Trahan, 1999: 47). Research exists where the application of VBM in firms are examined. The research provides insight into reasons why VBM fail to deliver the expected results.

Brown (2006: 324) attempts to discover why firms have adopted VBM and what the effect of the adoption was. Brown (2006: 324) uses grounded theory as research approach, arguing that it is useful in areas of research where very little is known of the subject matter. In accordance to this approach, no specific research question is set; the empirical data is gathered using a loosely set interview schedule to discover as much as possible about the adoption and effects of VBM. The empirical data originates from interviews with executives from two firms in Britain. The author finds that after the adoption the calculated intrinsic value of the firms did not correlate with the share price. It is further found that external factors motivate the adoption of VBM and that it is adopted as a firm-wide philosophy and not as stand-alone measures. Because of the statistically insignificant amount of firms used in this study it is nothing more than a case study and the findings not significant and general.

Gleadle and Cornelius (2007: 2) present a case study on the return to profitability by a struggling firm after implementing EVA as an internal measurement. The management of the firm implemented five focus areas for total quality management (TQM) to compliment the adoption of EVA. The authors provide an excellent description of how the measures were implemented and conclude that the return to profitability of the firm was not as a result of the implementation of EVA but that other factors played a role. The authors find that previous experience of change, the implementation of TQM and employee empowerment lead to the turnaround in the firm. Nowhere did the authors explore the actual value creation for which EVA is actually designed. The findings imply that adoption of EVA as performance measure to affect change is not the appropriate management instrument, but that other mechanisms should be considered.

Ferguson et al (2005: 101) researched the adoption of EVA to answer the following questions: Does a firm adopt EVA because of poor stock price performance and does the adoption lead to improved stock performance? The study uses 65 firms which adopted EVA as a performance measure between

1983 and 1998. The data for 60 months before the adoption to 60 months after the adoption are statistically analysed and conclusions are made. It is found that there is insufficient evidence that poor stock price performance motivates the introduction of EVA into the firm or that this adoption improves stock performance. It is further found that firms that adopt EVA have above average profitability both before and after adoption. These findings are related to the findings of Gleadle and Cornelius (2007: 2) in that again EVA is not the agent of change but rather a tool to maintain the competitive advantage. It can also be argued that the return to profitability and the above average profits result from more effective internal control which is a byproduct of VBM application.

Morisawa and Kurosaki (2002: 6) present the results of a survey of listed firms aimed at determining the state of the VBM adoption in Japan. Morisawa and Kurosaki (2002: 6-11) propose fifteen key factors leading to successful VBM implementation presented in Table 2.2.

Table 2.2: Key success factors for VBM implementation

Management area	Key success factor
Approach	Company president are committed to VBM implementation.
Corporate governance	Outside directors accepted from firms that have trading relationship with firm. Investors are briefed more frequently. Managerial and executive functions are separated.
Decision Making processes	Managerial meetings function properly as deliberative forums. There are clear guidelines for investment decisions. Net present value (NPV) is employed as primary indicator in guidelines for investment decisions.
PDCA cycle (Plan, do, check, act)	EVA indicators, ROE, ROCE, ROA and other capital efficiency indicators are used in intermediate planning. Formulation of policies and budgets are coordinated. Alignment in terms of organisational objectives and objectives of unit supervisors exist. Progress on organisational objectives is reviewed each term. Results from each term end review are used as planning for next term. Performance-based portion of compensation are sufficiently large. Clear standards exist for performance appraisals and compensation.
Raising awareness	Understanding of corporate value management is not limited to headquarters staff but extends to all employee levels.

The factors were identified by statistically analysing the responses to the survey questions comparing VBM firms with non-VBM firms. The importance of this research exists in the identification of the key success factors for VBM implementation. It can be applied in further research in two ways:

- To identify contributing factors in order to determine where companies failed when VBM was not implemented with success.
- To use as base for questionnaire design for VBM research.

Lovata and Costigan (2002: 226) contrast firms that have instituted EVA measures in their compensation plans with those that have not. The authors define defender and prospector firms according to growth strategy. Defender firms are concerned with low cost and efficiency. Prospector firms have a growth strategy developing new products in a changing environment. This implies higher expenditure on research and development costs. It is hypothesised that defender firms will be more prone to EVA adoption than prospector firms will. A logistic regression method is used to evaluate the differences between firms that have adopted EVA against those that have not. It is found that firms with lower research and development costs, defined as defender firms, have a higher adoption rate of EVA. The data used in this study were gathered from secondary sources and the authors do not explore relationships between shareholder value and EVA. In conclusion, the authors state that the identification of firms that have adopted EVA may be difficult because EVA is a trademarked term; some firms may use a similar measurement under a different name.

In order to describe the implementation of VBM, Weaver and Weston (2003: 2) present a case study on Hershey Foods. The approaches evaluated in the case study are fundamental value analysis (FVA), returns to shareholders (RTS), economic profit (EP) and market value added (MVA). Weaver and Weston (2003: 16) find that the four approaches and the market-to-book ratio of Hershey Foods are highly correlated implying successful implementation of VBM.

In order to determine how VBM is applied in practice, Malmi and Ikäheimo (2003: 57) investigated the dimensions of use of VBM among six Finnish firms. It is firstly found that none of the organisations apply VBM comprehensively as suggested in normative literature; only certain elements are applied. Secondly, in some of the firms the adoption of VBM is only stated with no actual evidence of application, while others apply VBM to decision making and control systems. These findings are important because it explains the varied success reported after adoption of VBM in firms. If firms apply VBM only in specific management functions or only state the application without actual actions, the interpretation of research data is problematic and may lead to wrong results.

Ryan and Trahan (1999: 48) provide research findings concerned with the perception, implementation and utilisation of VBM by leading firms in the USA. The findings are comprehensive and for the purposes of this study, the following are important:

- The majority of the surveyed firms are familiar with VBM.
- A variety of methods are used by the firms, most of which are developed internally.
- VBM are not applied comprehensively. The majority of firms utilise VBM in investment decisions, long term planning and performance measurement.
- VBM methods are applied mainly to the top layers of the organisation.

These findings correspond with that of Malmi and Ikäheimo (2003: 57) although the article was written five years earlier. This observation indicates that the application of VBM changed little over time.

In a survey of 219 firms within Taiwan's manufacturing industry, Tseng and Liou (2006: 1545) endeavour to determine whether EVA can be utilised as a valuation tool for patents, research and development (R&D) expenses. The results

illustrate a positive effect on EVA by increased R&D investments and patents registered by the firms, using a statistical model. When physical and labour capital are included in the model, no significant change in the effect on EVA is observed. The authors conclude that EVA is an appropriate instrument to measure the value of patents and R&D expenses. It is thus a measure of the effect of intellectual capital on the intrinsic value of a firm. This study shows that the process of value creation is not limited to applying physical capital to processes and projects, but that it extends to the firms' utilisation of intangible assets. It also implies that efficient application of intellectual assets is necessary for value creation.

The central aim of adoption of EVA and other VBM metrics is to ultimately lead to an increase in shareholder wealth. Various authors have researched this link and the results found are varied. Researchers have examined this problem from various angles and have arrived at miscellaneous conclusions.

Stark and Thomas (1998: 445) examine the relationship between residual income (RI) and market value for firms in the UK. According to Stark and Thomas (1998: 449) RI is defined as:

$$RI_t = E_t - kBV_{t-1}$$

Where:

RI_t = The residual income in the current period (t)

E_t = The earnings in the period (t)

k = The cost of capital

BV_{t-1} = The expenditure on assets which generate the income stream, in the previous period (t-1)

The authors hypothesises that if, according to literature, RI is a better measure than earnings to plan business activities, in order to create shareholder value,

then RI should have a stronger causal effect on market value than earnings. It is found that RI has a stronger explanatory effect on market value than earnings. The following two regression models are compared:

1. Market value = f(RI, Research and development expenditure, Opening book value, Closing book value)
2. Market value = f(Earnings, Research and development expenditure, Opening book value, Closing book value)

The first model explains the market value better than the second model which proves the hypothesis of the research. It is further found that by adding the cost of capital to the first model the explanatory power increases. The authors used a large sample of companies, 711, and proper statistical methods to test the models. The findings support the theory of VBM.

Garvey and Milbourn (2000: 2) state that currently a debate rages among practitioners, questioning if new performance measures such as EVA relate more accurately to shareholder earnings than traditional accounting measurements such as earnings. A theoretical model is presented in which any two performance measures can be related to shareholder earnings. The authors refer to these as EVA and earnings since these have been the focus of the mentioned debates. In the model, EVA and earnings are signals of the results of a manager's action choice and can be used as performance measurements. In empirical testing of the model Garvey and Milbourn (2000: 23) find that firms do not use the same relative weight in manager performance determination. No correlation is found between EVA and share price variations and it is concluded that firms should be advised to determine if a relationship exists between EVA and share price movements before implementing it as a management compensation mechanism. This study underscores the need to determine relationships between internal performance measurements and shareholder wealth creation. It is important to know that a performance measurement, with the cost and effort associated with

adoption, is actually adding value for the shareholder. Because the chosen measurements have a substantial influence on managerial decision making, it is important to determine which measurements are appropriate.

Tortella and Brusco (2003: 284) analyse the effect of adoption of EVA by comparing profitability, investment and cash flow variables before and after the adoption. The firms used in the research sample are obtained from the marketing brochures of Stern Stewart and Company, the copyright owners of EVA as a measurement. The study finds that the adoption of EVA does not yield abnormal market returns before or after the adoption. The results from the analysis of profitability metrics indicate that firms adopted the EVA measurement after a period of declining performance. After adoption, no significant change in performance is observed. Finally, a positive impact is found on the cash flow variables of the companies. The authors interpret this finding as the result of management compensation being connected to the cash flow variables (Tortella & Brusco, 2003: 286).

The findings by Tortella and Brusco (2003: 286) correlate with several other results described in this chapter. The analysis techniques used in the study are conventional statistics and the sample of 61 companies should produce significant results. The findings are thus credible and although it do not support the theory of VBM the results are important and strengthens the motivation for the present study.

Employing an adaptive learning network (ALN) approach, Kim (2004: 943) attempts to link strategic variables to market value added (MVA). In the study data from 608 firms in the USA are used and the MVA is evaluated in terms of EVA, Capital employed, WACC, average P/E ratio, Beta of the firm, Market-to-book value ratio, Operating margin, Return on Investment and Sales growth. The results from the ALN approach, which is an artificial intelligence (AI) method, indicate that WACC is the dominant variable influencing the determination of

MVA. Kim (2004: 245) observes that higher WACC increase MVA. This finding is counter intuitive for the following reasons:

- Future cash flows are discounted at WACC to determine the present value in the valuation of a firm. Higher WACC thus decreases the present value of a firm, a signal which, when interpreted by the market, could lead to a lower share price.
- To determine the net present value (NPV) of a project the predicted cash flows arising as a result of the project are discounted at WACC. Higher WACC will reduce the NPV from a project which will lead to less capital being invested which will obstruct future growth in sales. Again, this signals to the market lower future earnings growth and will lead to a decrease in the share price.

The nature of the results from this study may originate in the analysis method used. To properly model a dependent variable, MVA in this case, the independent variables used should be mutually independent (Levine et al, 2005: 632). The independent variables used in this study are highly inter-dependent and although the method used is not statistical in nature, the results from this model could be biased because of this fact.

Homburg et al (2005) researched the level of implementation of VBM concepts, in a survey done among 80 airline firms. The study concludes that the importance of these concepts is lower for airline firms than for other industries. The authors do not present any data to support this conclusion where the levels of implementation are compared to that in other industries. It is further found that the performance information is not transparently communicated to all the employees in the firms. Related to this finding is the conclusion that VBM are not fully accepted by all the levels in the organisation (Homburg et al, 2005: 3).

These findings may imply that certain industries are better suited for VBM than others. The importance of transparent communication from top management to all the levels of employees emerges from this study. The problems of VBM adoption may not be associated with the airline industry as such but with general communication deficiencies in the industry. This reiterates the findings by Morisawa and Kurosaki (2002: 6) which identified the key success factors for VBM implementation.

Salmi and Virtanen (2001: 20) researched the behaviour of EVA under different financial conditions that may result from management actions, compared to more traditional performance measurements: return on investment (ROI), return on equity (ROE) and internal rate of return (IRR). The research is not done by means of an empirical study, but by using a simulated financial time-series. A model developed by the authors, is used to generate the financial time-series. The study finds that EVA and its variability are strongly affected by the growth rate of the firm. The authors do however find that EVA does not add more clarity to shareholder value creation than the more traditional measurements listed before. Salmi and Virtanen (2001: 23) also argue that EVA does not predict forthcoming bankruptcy any better than the traditional measurements. These simulation findings confirm the need for empirical research into the drivers of shareholder value, as it puts the value of EVA in doubt over traditional accounting measurements.

To determine which income statement items are related to market-to-book ratios in Finland, Kallunki et al (1998: 360) studied a sample of 250 observations of sales, operating income, income after financial income and expenses, net income, adjusted income and net profit over an eight year period for firms listed on the Helsinki stock exchange (HSE). Kallunki et al (1998: 371) derive from a statistical analysis of the variables that income statement items which includes permanent sources of income are higher related to market-to-book value ratios than items containing temporary income or expenses. The relevance of this study

is that investors evaluate cash flows on the basis of future reoccurrence. Thus, if managing value drivers guides management to make decisions resulting in long term cash flows there should be an effect on shareholder value creation.

Ryan and Trahan (2003: 1) examined the performance of 86 firms that have adopted VBM systems from 1984 to 1997. The main goal of the research was to determine if the firms improved economic performance after adoption of VBM. The authors confirm that the typical firm in the sample significantly improved residual income after adoption and verify that the improvement did not realise to the detriment of long-term investments. The firms adopting VBM have thus created sustainable shareholder value. These findings provide evidence in favour of the normative theory of VBM. The secondary goal of the study was to determine the motivation behind tying management compensation to VBM rnetrics. Ryan and Trahan (2003: 28) observe further that the highest performing firms are more likely to have a VBM metric tied to compensation systems. Firms with higher capital relative to sales are more likely to use VBM metrics in compensation systems. Firms in industries where others have adopted VBM are also more likely to adopt it as part of compensation systems. In agreement with Lovata and Costigan (2002: 226), firms with larger growth opportunities are less likely to have VBM metrics in compensation systems. The third research question was whether a firm with VBM tied to compensation systems add more shareholder value than those that do not have VBM tied to compensation systems. No evidence is found of a relationship with residual income. Ryan and Trahan (2003: 27) argue that this observation highlights inefficiencies in management compensation systems. It is also suggested that compensation systems are subject to manipulation by opportunistic managers.

The findings from the research done by Ryan and Trahan (2003: 28) add a new perspective to the VBM approach. According to the normative theory of VBM an effective system includes compensation related to VBM metrics. These findings

contradict the theory and qualify this contradiction by stating that opportunistic managers can manipulate the system.

The research done by El Mir and Seboui (2006: 243) tests whether the shareholder value created according to internal accounting measurements, approximated by EVA, can be related to actual shareholder wealth creation approximated by created shareholder value (CSV). It is necessary to define CSV because of the relevance of this research to the current study (El Mir & Seboui, 2006: 246):

$$CSV = \text{Shareholder value added} - (\text{Equity market value} \times K_e)$$

Where:

Shareholder value added = Increase in equity market value – Payments from shareholders + Dividends + Repurchases – Conversions

Increase in equity market value = Equity market $value_t$ – Equity market $value_{t-1}$

K_e = Return on treasury bonds + required return on equity

In simple terms, CSV is the difference between the changes in market and book value of the equity of the firm adjusted with a rate of return K_e between period t-1 and t. Where Ryan and Trahan (2003: 28) only consider the internal variables of the firm, El Mir and Seboui (2006: 246) tested the effect of EVA on actual shareholder value creation.

El Mir and Seboui (2006: 248) firstly find that there is a non-significant relationship between EVA and CSV. The regression results yields a R^2 (Pearson correlation coefficient) value of only 0.07 which indicates that only 7% of the

variation in CSV is explained by EVA. The authors proceed to evaluate effects on the differences between EVA and CSV. A positive relationship is found between the difference (CSV-EVA) and earnings management which is approximated using discretionary accruals. Lastly, it is found that some governance mechanisms can increase the difference between CSV and EVA while others can decrease it. The authors arrive at this result by doing a regression analysis between CSV minus EVA as the dependant variable and a host of measures of corporate governance including number of directors on the board, ratio of outside to internal directors, the number of years the CEO is in position, a measure of the auditor firm and other quantified mechanisms. The research findings are positive but the authors point out that more research is necessary to provide evidence that by adopting VBM shareholder value can be created.

2.4 CONCLUSION

In this chapter, the determination of firm value is discussed. Various methods of valuation are introduced and the DCF method is discussed in detail. The drivers for shareholder value are identified as growth in revenue, WACC, operating profitability and capital requirements. Shareholder value creation is explained and EVA is identified as the most appropriate metric to determine shareholder value creation.

The review of relevant literature reveals conflicting results from various studies. Worthington and West (2001: 18) came to the same conclusion in a literature review on EVA. While some authors conclude that adoption of VBM and VBM metrics such as EVA does not affect shareholder value, others dispute this by finding positive relationships with value creation. Irala and Reddy (2006: 1) state that accounts of the success of EVA adoption are plentiful but that insufficient empirical research exists to establish these claims. The research aims also differ

between authors. The mode and scope of VBM adoption show that firms apply VBM inconsistently which may explain the varying results found in research.

The primary objective of the current study is to investigate the relationship between the internal value drivers and shareholder value creation by firms in the Mining sector in South Africa. The study adds to the body of knowledge of VBM by evaluating the feasibility of adoption thereof in South Africa in the Mining sector. Conflicting results in both the application of VBM and the results from adoption thereof support the need for further research in the field of value-based management. The literature contextualises the current study and further motivates the need thereof. In the next chapter the research method are discussed.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

The current research is an empirical study investigating the relationship between the internal value drivers and shareholder value creation by firms in the Mining sector, listed on the JSE, in South Africa. This research is a non-experimental design that is observational and quantitative.

The literature study conducted and discussed in the previous chapter identified the internal drivers for shareholder wealth as:

- Growth in revenue
- WACC
- Operating profitability
- Capital requirements

The determination of the WACC of a firm requires a great deal of information some of which are not readily available. For this reason, the current research is limited to studying the relationship between growth in revenue, operating profitability and capital requirement and shareholder value creation. This limitation does not imply that WACC are deemed as of less importance than the remaining variables. It should rather be regarded as an important future research theme.

This chapter includes the following:

- the research design,

- the research methodology which includes the research instruments used, a discussion of the data, the population, the sample and data analysis techniques, limitations to the successful completion of the research, ethical considerations and
- the conclusion to the chapter.

3.2 RESEARCH DESIGN

The research for the current study is done using a systematic process of gathering, recording and analysing the data to investigate the relationship between internal value drivers and the shareholder value creation in firms in the Mining sector in South Africa, listed on the JSE. The research is carried out using a combination of the following standard research designs: correlation based research and secondary data analysis (Hofstee, 2006: 120-131). Each of the research designs is discussed in brief in the following sections to indicate its suitability for the current study.

3.2.1 Correlation based research

Correlation based research is done to compare two or more variables in order to determine if a relationship exists (Hofstee, 2006: 123). Statistics are used to determine if a relationship exists and if the relationship is causal and significant. One of the secondary objectives that have to be fulfilled in order to achieve the primary objective of the study is to investigate the relationship between the internal value drivers of a firm and shareholder value creation. If a firm practices VBM, a correlation is expected between the performance measurements and the shareholder value. The opposite is also implied: if a relationship exists between internal value drivers of a firm and shareholder value creation then the concept of VBM is expected to be successful. When a correlation exists between variables,

it does however not necessarily imply causation (Hofstee, 2006: 123). For this reason, the statistics has to be applied carefully and everything considered before a causal relationship can be established.

Although correlation based research is applicable in this study there are factors that limit its success and have to be considered. External independent variables not considered and measured by the empirical study may have a significant effect on the dependant variables. The technique is data driven and the quality of the results a function of the reliability and accuracy of the input data. Over-simplification of complex relationships could result (Hofstee, 2006: 123).

3.2.2 Secondary data analysis

Secondary data analysis is done by analysing data collected by sources other than the researcher. Primary data analysis is done when the researcher collects the data for a specific purpose and analyses the data. The same set of data can be secondary data when the researcher analyses the data for another purpose (Boslaugh, 2007: 1). The data can range from research data previously collected in the field of study, data collected by government agencies, financial data, weather data and more (Hofstee, 2006: 128). Secondary data can be classified into three different categories: raw data from surveys or counts, summaries of data from agencies like Statistics South Africa or the World Bank and written treatises in the form of books, articles and theses (Struwig & Stead, 2001: 80). The current study relies on secondary data from annual reports of firms, the JSE and financial websites.

The use of secondary data in research has advantages and disadvantages. The first advantage of using secondary data is economy; the researcher does not have to devote resources to the collection of the data. Because the data is already collected and usually cleaned and formatted in a user-friendly form, the researcher has more time to devote to analysis (Boslaugh, 2007: 3). Secondly,

the breadth of data available is an advantage. Large databases exist that can be used for research purposes (Boslaugh, 2007: 4). The third advantage to using secondary data is that frequently the data collection process is informed by expertise and professionalism not available to small research facilities (Boslaugh, 2007: 4).

When secondary data is used, it is important that the data is relevant to the research being done (Struwig & Stead, 2001: 80). The reliability and the limitations of the data should be verified and understood, as it could have a significant effect on the validity of the research for which it is being used (Hofstee, 2006: 128). Additionally, care should be taken that the secondary data is representative of the population for which it was gathered (Hofstee, 2006: 129). A major disadvantage of secondary data is that the researcher was not involved in the planning, execution and cleaning of the data. These processes may influence the results obtained from the data analysis. The secondary data may also exclude important information related to the data, for example geographical, demographical or social parameters that have an influence on the data (Boslaugh, 2007: 5).

The current study relies heavily on secondary data analysis. For this reason, the sources are chosen carefully to ensure the validity of the data.

3.3 RESEARCH METHODOLOGY

In order to realise the primary objective of the study, the secondary objectives have to be accomplished. In the previous section two different research designs are described which are utilised to achieve the secondary objectives of the study. The purpose of this section is to show the reader how the research designs are applied in the current study, the population and the sample from the population are described, the data analysis methods illustrated and the limitations noted.

3.3.1 Research Instruments

In the current study, three research instruments are utilised to gather the necessary financial data. The first is annual reports containing the financial results of the firms under investigation. The annual reports are sources of statutory reporting describing the financial, environmental and sustainable development performance of the firm. The firms are required by law to supply accurate information in an annual report and for that reason, related to this study, are regarded as a prime source of financial information.

The second source of financial information used in this study is the subscription website: ShareData Online. (http://www.sharedata.co.za). The focus of this website is to provide financial information on JSE listed companies. This includes market performance, financial performance, facts and figures. The website is used to supplement information not available in the annual reports such as share price performance on the JSE.

The third source of information is data supplied by McGregor BFA: (http://www.mcgregorbfa.com). McGregor BFA is a source of stock market, fundamental research data and news to the financial sector and the corporate market at large. Data provisioning is made available via web based research and real time delivery products as well as customised data sets for input into client-side systems, websites, print media and displays such as plasma screens. The data is made available as an Excel spreadsheet and is used as back-up where the annual reports are not available.

3.3.2 Data

Table 3.1 presents all the firms in the Mining sector listed on the JSE. The firms chosen as part of the research sample are marked as such, as well as the reasons for firms being disqualified from the study.

Table 3.1: Mining companies listed on the JSE

Company Name	JSE Name	Included in analysis	Reason for exclusion*
South African Coal Mining Holdings LTD	SACMH	No	Only one year in operation.
Wescoal Holdings LTD	WESCOAL	Yes	
Tawana Resources NL	TAWANA	Yes	
Thabex LTD	THABEX	Yes	
TRANS HEX Group LTD	TRNSHEX	Yes	
African Rainbow Minerals LTD	ARM	Yes	
Anglo American PLC	ANGLO	Yes	
Assore LTD	ASSORE	Yes	
BHP Billiton PLC	BHPBILL	Yes	
Chrometco LTD	CHROMETCO	No	Currently company is involved in exploration - no revenues expected in the short to medium term.
Coal of Africa LTD	COAL	Yes	
Exxaro Resources LTD	EXXARO	No	Exxaro resources and Kumba Iron Ore split into two companies in November 2006. Only one full year results independently available.
Kumba Iron Ore LTD	KUMBA	No	Exxaro resources and Kumba Iron Ore split into two companies in November 2006. Only one full year results independently available.
Matodzi Resources LTD	MATODZI	Yes	
Merafe Resources LTD	MERAFE	Yes	
Metorex LTD	METOREX	Yes	
Miranda Mineral Holdings LTD	MIRANDA	No	No information obtainable for this company. Website not active.
Mvelaphanda Resources LTD	MVELA RES	Yes	
Petmin LTD	PETMIN	Yes	
SA Mineral Resources Corporation LTD	SAMROC	Yes	
Sallies LTD	SALLIES	Yes	
Sentula Mining LTD	SENTULA	Yes	
Uranium One INC	URONE	Yes	
Aflease Gold LTD	AFGOLD	No	Currently company involved in exploration, no revenues currently. One project in pre-feasibility phase, one being commissioned.

Company Name	JSE Name	Included in analysis	Reason for exclusion*
African Eagle Resources PLC	AFEAGLE	No	No revenues, no production yet, projects in various stages of development.
ANGLOGOLD Ashanti LTD	ANGGOLD	Yes	
DRDGOLD LTD	DRDGOLD	Yes	
Gold Fields LTD	GFIELDS	Yes	
Great Basin Gold LTD	GB GOLD	No	No revenues – economic viability have not been determined yet. Exploration activities.
Halogen Holdings Societe Anonyme	HALOGEN	No	Holdings company, no revenues in financial statements.
Harmony Gold LTD	HARMONY	Yes	
Pamodzi Gold Limited	PZGOLD	Yes	
PAN African Resources PLC	PAN AFRICAN	No	No revenues, no production yet, projects in various stages of development.
Simmer and Jack Mines LTD	SIMMERS	Yes	
Village Main Reef Gold LTD	VILLAGE	No	No information obtainable for this company. Website not active.
Witwatersrand Consolidated Gold Resources	WITS GOLD	No	Exploration activities, the company does not expect to generate any income in the near future.
Anglo Platinum LTD	ANGLOPLAT	Yes	
Anooraq Resources Corporation	ANOORAQ	No	No revenues, exploration activities have not yet determined if reserves are economically viable.
Aquarius Platinum LTD	AQUARIUS	Yes	
Eastern Platinum LTD	EASTPLATS	Yes	
Impala Platinum Holdings LTD	IMPLATS	Yes	
Jubilee Platinum PLC	JUBILEE	No	Mineral exploration in progress, no revenues or projects producing.
Lonmin PLC	LONMIN	Yes	
Northam Platinum LTD	NORTHAM	Yes	
Wesiswe Platinum LTD	WESIZWE	No	Mineral exploration in progress, no revenues or projects producing.

*The annual reports of the listed firms are the source of information on which the decision of inclusion or non-inclusion is made.

Table 3.2 summarises the data chosen for the research sample and the population.

Table 3.2: The research sample and the population

Total firms	Firms included in study	Firms excluded from study	Firms included in study (%)	Firms excluded from study (%)
45.00	30.00	15.00	66.67	33.33

Table 3.3 shows the amount of firms in each of the sub-sectors of the Mining sector included in the study.

Table 3.3: Mining sub-section summary

Sub-sector	Firms included in study	Percentage (%)
Coal	2.00	6.67
Diamonds & Gemstones	3.00	10.00
General Mining	13.00	43.33
Gold Mining	6.00	20.00
Platinum & Precious Metals	6.00	20.00
Total	**30.00**	**100.00**

The equations to calculate the value drivers according to Brigham and Ehrhardt (2005: 103 – 109) are:

$$\text{Revenue growth}_{i+1} = (\text{Revenue}_{i+1} - \text{Revenue}_i)*100/\text{Revenue}_i$$

Where:

$\text{Revenue growth}_{i+1}$ = revenue growth in the year (i+1)

Revenue_{i+1} = revenue at the end of year (i+1)

Revenue_i = revenue at the end of year (i)

Operating profitability = NOPAT/Revenue

Where:

NOPAT = net operating profit after tax = EBIT(1-Taxrate)

EBIT = earnings before interest and tax

Capital requirements = Operating capital/Revenue

Where:

Operating capital = Operating long term assets + Net operating working capital

Operating long term assets = long term assets used in operations

Net operating working capital = Operating current assets – operating current liabilities.

The variables necessary to calculate the value drivers are thus:

- Revenue per year
- EBIT per year
- Tax paid per year
- Operating long term assets (when operating capital is not available)
- Operating current assets (when operating capital is not available)
- Operating current liabilities (when operating capital is not available)
- Operating capital (when available)

The total shareholder return (TSR) is calculated as follows (Ameels et al, 2002):

$$TSR = \frac{(P_{t+1} - P_t) + D_{t+1}}{P_t}$$

Where:

P_t = Share price at the beginning of the period

P_{t+1} = Share price at the end of the period

D_{t+1} = Dividend at the end of the period

The additional variables necessary to calculate the shareholder value creation are thus:

- Share price at the beginning of the period
- Share price at the end of the period
- Dividend at the end of the period

The variables identified above, per firm for the period of the study, are presented in Appendix B. The data gathered is used to calculate the shareholder wealth creation and the internal value drivers of the firms included in the study.

3.4 DATA ANALYSIS METHOD

The data analysis techniques applied in this study include descriptive statistics of the data, graphical analysis of the data, simple linear regression and multiple linear regression. The analysis is done using Minitab 15, a statistical software package developed by Minitab Incorporated. Minitab 15 is used because of the seamless integration of this package with Microsoft Excel. Data can be copied from Excel and pasted into Minitab by a simple "copy and paste" command. The analysed data can be returned to Excel or Microsoft Word by the same procedure. Minitab has superior graphical capabilities enabling complete data exploration. While the results of the research rely heavily on statistical analysis, it is not the objective to explain the theory behind the techniques used. For this reason, only essential information will be discussed relating to the theory of the statistics used.

3.4.1 Descriptive statistics

Descriptive statistics are done to illustrate the major features of the data under investigation: central tendency, variation and shape of the distribution (Levine et al, 2005: 131). The descriptive statistics included in the current analysis of the data are the mean, median, standard deviation, a graphical representation illustrating the distribution, a box and whisker plot, confidence intervals for the mean, median and standard deviation of the population and a normality test.

3.4.2 Graphical analysis

Graphical representation of data gives the researcher the opportunity to examine data by means of different types of graphs. The current study utilises various techniques to highlight properties of the variables: growth in revenue, operating profitability, capital requirements and the total shareholder return. The variables

are compared over time and between companies. It is also used to examine possible relationships between the dependent and independent variables. Graphical analysis is done by means of box-and-whisker plots grouped per time period and per company, histograms, scatter plots and main effect plots.

3.4.3 Regression analysis

Linear regression is used to predict the behaviour of a response or dependent variable by one ore more explanatory or independent variables (Levine et al, 2005: 512). The response variable is the TSR and the explanatory variables are growth in revenue, capital requirements and operating profitability. Simple and multiple linear regression are employed in evaluating the variables for the current study. Simple linear regression results in a model of the type (Levine et al, 2005: 515):

$$y = b_o + b_1 x$$

Where:

$y =$ Predicted value of the response variable

$b_o =$ Y-intercept

$b_1 =$ Slope for predicted line

$x =$ Explanatory variable

Multiple linear regression results in a model of the type (Levine et al, 2005: 577):

$$y = b_o + b_1 x_1 + b_2 x_2 + ... + b_i x_i$$

Where:

$y =$ Predicted value of the response variable

$b_o =$ Y-intercept

b_i = Slope of Y with x_i variable while all the other x's are held constant.

The results from regression analysis are valid when the assumptions on which regression is based are satisfied (Levine et al, 2005: 527):

- Correlation
- The error is normally distributed
- Homoscedasticity
- Independence of errors

These assumptions are verified by a residual analysis which is part of the functions done by Minitab 15. The residual is the difference between the predicted value of the response variable and the actual value for each data point.

3.5 LIMITATIONS

The first limitation associated with the research involves the fact that no primary data from the firms in the research sample are utilised. The internal performance measures of the individual firms are unknown for the purposes of determining the internal value drivers. For the purpose of this study, the assumption is made that all the firms in the research sample pursue the four drivers of shareholder value creation as identified from the literature.

The second limitation associated with the research involves the exclusion of WACC as an explanatory variable. The theory identifies WACC as an important determinant of shareholder value creation. The calculation of WACC of a company is described in Appendix A. The equations describe the method of calculation using seventeen different variables. The variables include the following estimations: risk free rate of return estimated from long term treasury bonds, equity risk premium, bond yield and bond risk premium. It also requires the beta of the firm which indicates the volatility of its share price against that of

the market. WACC is also determined by the capital structure of the company; the amount of debt and equity employed by management. Because of the complexity of the calculation and the estimations involved, WACC is excluded from the current study and it is recommended that the influence of WACC be evaluated on its own in a future research study.

3.6 ETHICAL PROCEDURES

The study is conducted according to ethical procedures. All the data (i.e. financial statements, annual reports and share prices) used are in the public domain. The author has done everything possible to ensure the correctness of the data used in the research. This entails cross-referencing financial data between three sources: annual statements published by the company, financial data form the website Sharedata Online and data supplied by McGregor BFA.

3.7 CONCLUSION

The chapter describes the research methodology. The research design, research instruments, data and data analysis are presented to the reader. The applicability of the chosen methods towards the realisation of the research objectives is motivated. Factors limiting the research are identified and clarified. In the final chapter, the research results are discussed.

CHAPTER 4

RESEARCH RESULTS AND CONCLUSIONS

4.1 INTRODUCTION

In the preceding chapter the method by which the research are conducted, is described. The purpose of the final chapter is to illustrate the results from applying the method to the data gathered using the research instruments. The secondary objectives of the study are:

A. To identify the internal drivers of shareholder wealth maximisation.
B. To collect comprehensive financial data for firms in the Mining sector in South Africa.
C. To quantify the internal drivers of shareholder wealth creation of firms in the Mining sector in South Africa.
D. To determine the actual shareholder wealth creation achieved by the firms in the Mining sector in South Africa.
E. To investigate the causal relationship between internal value drivers and shareholder wealth creation of firms in the Mining sector in South Africa.

Secondary objective A is satisfied in Chapter 2, where the internal drivers of shareholder wealth creation are identified. Secondary objective B is satisfied in Chapter 3 where the data necessary to determine the value drivers and shareholder wealth creation are presented. In the following section the remaining three secondary objectives are satisfied by means of analysis of the data and exploration of the relationship between the value drivers and shareholder wealth creation. This is the final chapter of the mini dissertation and it presents to the reader with the research findings, conclusions concerning the research findings, achievement of research objectives and recommendations for future research.

4.2 RESEARCH FINDINGS

The data presented in Appendix B are employed to calculate the revenue growth, operating profitability, capital requirements and total shareholder return according to the previously defined methods. Before further analysis, outliers are identified and removed from the data set. The calculated values are subsequently used to investigate the relationship between the internal value drivers and the shareholder wealth creation.

4.2.1 Revenue growth of firms in the Mining sector in South Africa

Table 4.1 presents the revenue growth calculated for the firms in the research sample for the period 1999 to 2008. Where no data are shown in the table, the company did not exist yet, or has not yet published financial statements for 2008.

Table 4.1: Revenue growth for firms in the Mining sector

	Revenue growth (%)									
Firm	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
WESCOAL HOLDINGS LIMITED								-8.2	50.8	39.5
TAWANA RESOURCES NL						-32.2	-100.0	400.0	-29.1	
THABEX LIMITED				112.6	13.1	-64.5	102.4	-89.2	73.9	437.6
TRANS HEX GROUP LIMITED	-5.3	16.1	38.1	64.3	17.0	11.1	-6.0	7.2	-4.8	-10.3
AFRICAN RAINBOW MINERALS LIMITED	-84.5	17.9	-4.4	44.2	21.0	-20.6	41.2	-15.7	33.1	110.0
ANGLO AMERICAN PLC	-87.5	28.0	-0.3	2.4	23.1	33.8	18.1	12.4	-23.0	
ASSORE LIMITED	8.0	29.9	18.9	32.1	15.8	27.1	38.9	9.3	26.9	113.3
BHP BILLITON PLC	-15.1	8.0	256.4	-10.6	-1.9	46.6	29.3	15.4	20.9	25.8
COAL OF AFRICA LIMITED						1196.3	79.2	2.6	90.9	-12.9
MATODZI RESOURCES LIMITED			-32.4	-11.0	670.5	46.5	60.6	67.4	-66.2	
MERAFE RESOURCES LIMITED	5310.0	1099.7	118.3	-37.0	311.7	201.7	10.8	67.7	60.7	
METOREX LIMITED	5.9	689.0	20.5	13.9	8.0	19.1	-2.4	41.2	17.2	43.1
MVELAPHANDA RESOURCES LIMITED			1461.1	801.1	9.6	9.3	-7.6	-3.7	11.6	2.2
PETMIN LIMITED	18.1	504.7	-19.4	33.0				200.8	116.4	74.4
SA MINERAL RESOURCES CORP LIMITED								-35.6	68.3	
SALLIES LIMITED			11.4	15.2	-27.0			-14.1	25.8	
SENTULA MINING LIMITED	-31.6	-15.0	7.3	25.1	74.4	48.2	3.3	8.6	122.0	94.3
URANIUM ONE INC									165.7	
ANGLOGOLD ASHANTI LIMITED	4.0	-1.1	-11.2	-13.7	15.2	13.8	13.9	12.7	10.7	

Firm	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
DRDGOLD LIMITED	38.8	90.8	4.8	23.2	-16.9	9.9	-30.7	-4.1	-4.1	20.1
GOLD FIELDS LIMITED	148.8	23.3	8.9	62.9	10.9	-15.3	-0.1	24.2	33.1	18.4
HARMONY GOLD MINING COMPANY LIMITED	92.4	32.8	50.1	73.7	15.2	-2.3	-11.0	-12.8	34.1	
Pamodzi Gold Limited									858.9	
SIMMER AND JACK MINES LIMITED	-38.2	210.9	187.4	55.1	12.5	-26.1	-19.5	548.7	200.9	41.8
ANGLO PLATINUM LIMITED	-7.3	84.0	15.5	8.5	-18.6	18.9	18.8	68.8	19.3	
AQUARIUS PLATINUM LIMITED			105.3	-3.2	2.0	98.1	11.0	96.0	65.3	34.6
EASTERN PLATINUM LIMITED										
IMPALA PLATINUM HOLDINGS LIMITED	23.7	45.1	97.2	-0.6	-0.8	0.0	6.2	39.5	79.9	19.5
LONMIN PLC	-10.8	6.1	-8.9	-19.5	11.8	32.2	9.5	64.5	4.6	
NORTHAM PLATINUM LIMITED	33.4	46.2	49.0	-0.5	-5.7	16.9	-9.6	53.5	56.7	3.9

Inspection of the data in the preceding table reveals a large variation in revenue growth between the firms over the defined period. Some of these data points are outliers and will be eliminated from the dataset. An outlier is defined by a point more than 1.5 times the inter-quartile range away from the median of the data set (Minitab Inc, 2007).

Figure 4.1 illustrates the variations in revenue growth per firm graphically, and compares the performance of the firms in the research sample for the period 1999 to 2008, after outliers have been eliminated. The graph indicates that there are differences between the revenue growths achieved by the different firms in the research sample. It also shows large variation in the performance of the individual firms.

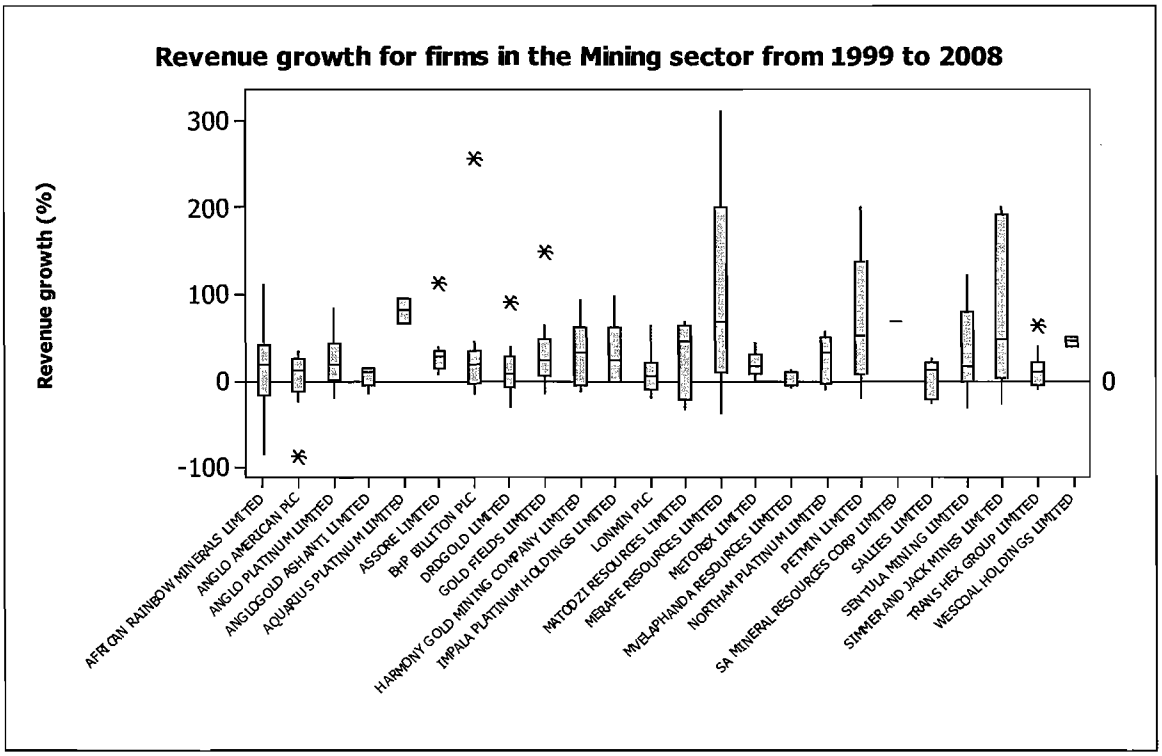

Figure 4.1: Revenue growth of firms in the Mining Sector in South Africa from 1999 to 2008.

In order to examine the relationship between revenue growth and TSR, the data for all the firms are combined in one dataset. This is accomplished by stacking the data using Microsoft Excel.

Figure 4.2 illustrates the combined performance of the firms on an annual basis. The graph illustrates differences between the years in the period 1999 to 2008. A box-plot is used to show the variation of the data per year. The individual box-plot shows the median at the centre of the bar, the first and the third quartile as the top and bottom of the bar. Outliers are shown as asterisks. The variation in revenue growth per year is significant. The mean revenue growth per year varies from 8.19% in 1999 to 55.22% in 2007.

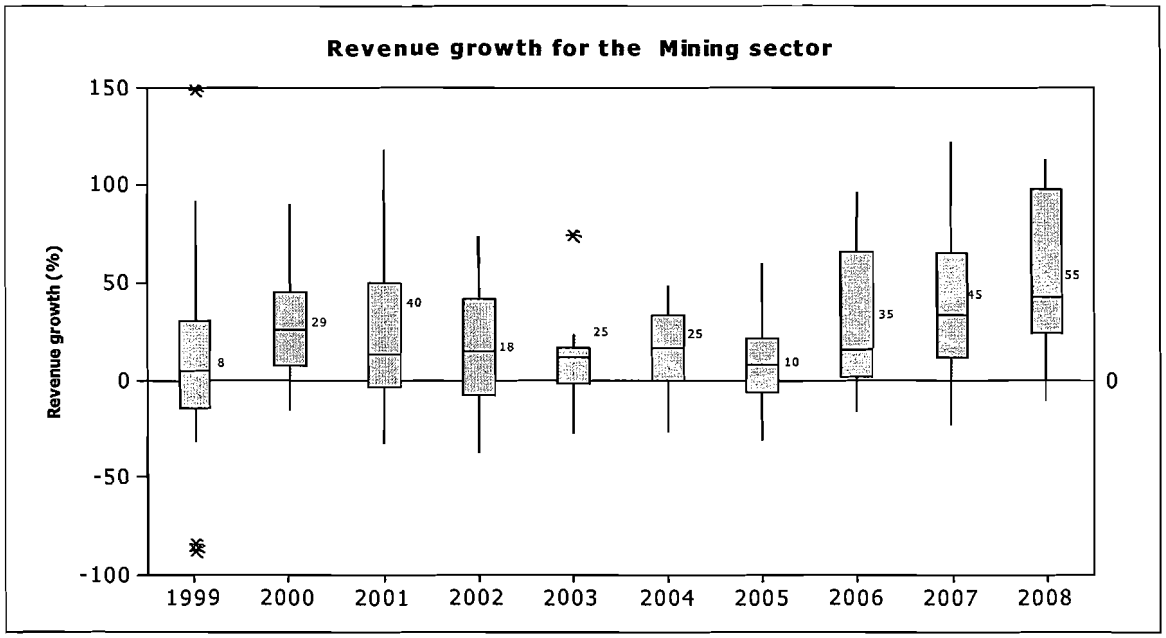

Figure 4.2: Annual Revenue growth of the Mining Sector in South Africa from 1999 to 2008.

Figure 4.3 presents the descriptive statistics for the combined dataset.

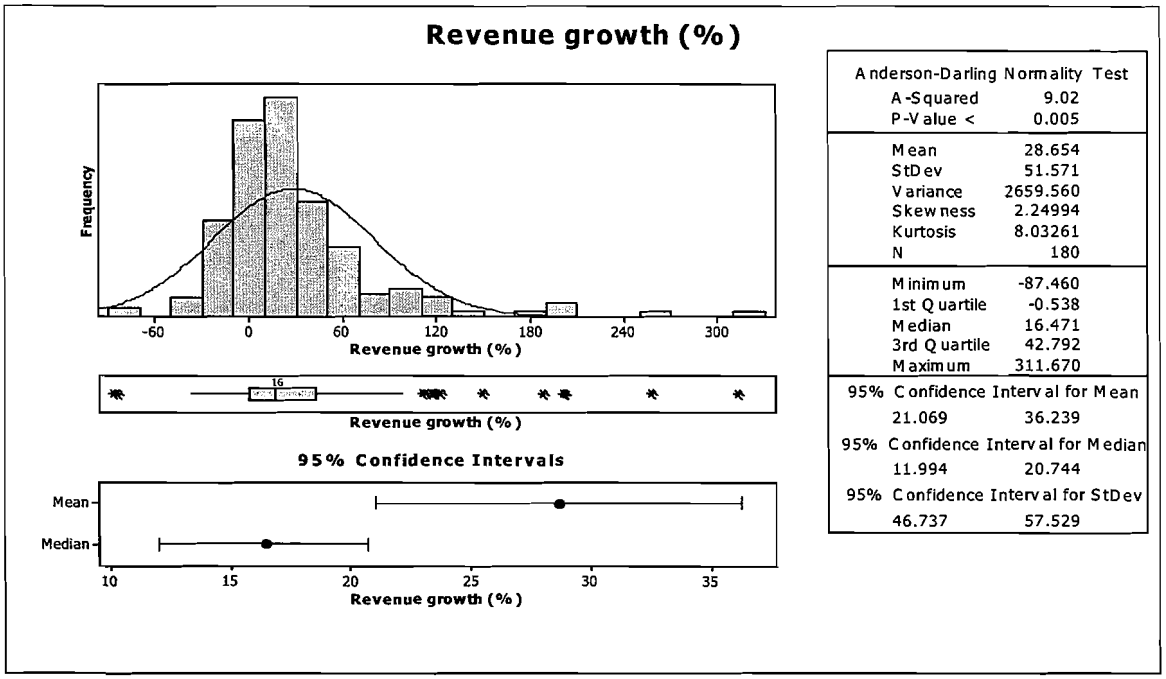

Figure 4.3: Descriptive statistics of the revenue growth of the Mining sector in South Africa.

The dataset consists of 180 data points distributed asymmetrically around a concentration depicted by the histogram. The data are not normally distributed; the probability of the distribution being normal is less then 0.005, indicated by the P-value calculated using the Anderson-Darling normality test. The mean of the sample is 28.654% and the median 16.471%. The data display a large variation quantified by the standard deviation of 51.571%. The descriptive statistics further include confidence intervals for the mean, median and standard deviation of the population the sample represents.

4.2.2 Operating profitability of firms in the Mining sector in South Africa

Table 4.2 presents the operating profitability calculated for the firms in the research sample for the period 1999 to 2008. Where no data is shown in the table, the company did not exist yet, or has not yet published financial statements in 2008.

Inspection of the data in the table reveals a large variation in operating profitability between the firms over the defined period. Some of these data points are outliers and will be eliminated from the dataset. An outlier is defined by a point more than 1.5 times the inter-quartile range away from the median of the data set (Minitab Inc, 2007).

Table 4.2: Operating profitability for firms in the Mining sector

Operating profitability (%)											
Firm	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
WESCOAL HOLDINGS LIMITED									2.0	1.2	3.6
TAWANA RESOURCES NL								- 51,600.0	- 4,181.8	- 18,938.5	
THABEX LIMITED				- 704.9	515.4	- 1,643.6	- 519.4	2,805.6	- 6,650.0	- 4,131.3	- 2,831.4
TRANS HEX GROUP LIMITED	36.6	26.7	43.7	49.2	49.2	35.9	16.0	8.4	19.4	21.3	17.0
AFRICAN RAINBOW MINERALS LIMITED	4.6	161.1	149.2	46.9	- 20.6	7.1	42.5	29.4	25.5	37.6	40.4
ANGLO AMERICAN PLC	15.4	22.8	8.4	28.3	32.4	31.4	28.3	16.9	22.8	40.0	
ASSORE LIMITED	4.2	25.6	19.6	23.8	45.8	11.5	16.7	27.8	22.5	19.4	35.1
BHP BILLITON PLC	15.0	11.9	21.1	12.3	15.9	16.7	15.9	22.4	34.4	35.0	32.0
COAL OF AFRICA LIMITED										- 5.7	- 31.4
MATODZI RESOURCES LIMITED			- 350.8	- 178.2	- 17.8	15.3	18.4	35.5	78.5	514.2	
MERAFE RESOURCES LIMITED	1,454.0	- 58.8	6.0	- 20.5	- 22.3	- 37.9	6.0	17.4	17.0	27.8	
METOREX LIMITED	- 4.4	3.1	19.7	17.9	0.7	4.5	1.0	11.0	25.1	46.3	29.0
MVELAPHANDA RESOURCES LIMITED			78.9	65.5	3.3	1.6	- 3.9	15.7	112.5	39.5	- 52.8
PETMIN LIMITED	48.2	140.5	5.3	7.4	14.8			29.0	15.6	21.6	58.8
SA MINERAL RESOURCES CORP LIMITED			- 182.2	- 36.7		- 21.3		6.4	- 19.7	- 1.2	
SALLIES LIMITED			10.0	12.9	8.6	- 16.0		- 13.1	- 44.9	- 24.2	
SENTULA MINING LIMITED	13.8	- 3.0	9.5	5.5	6.6	14.4	11.2	20.9	24.3	21.1	10.5
URANIUM ONE INC								- 1,423.6	- 60.8	- 19.8	
ANGLOGOLD ASHANTI LIMITED	17.5	18.1	9.1	14.8	20.2	16.8	7.6	- 1.4	2.7	- 16.3	
DRDGOLD LIMITED		- 4.3	- 40.4	- 10.8	- 20.5	- 5.3	- 8.4	- 25.8	5.1	- 74.4	59.8
GOLD FIELDS LIMITED	51.0	- 12.8	9.1	- 11.6	24.1	20.5	6.7	1.3	12.1	14.8	
HARMONY GOLD MINING COMPANY LIMITED	- 1.7	8.2	13.4	5.2	24.7	10.1	- 2.1	- 37.2	- 3.1	7.3	
Pamodzi Gold Limited									- 30.7	- 55.7	
SIMMER AND JACK MINES LIMITED	- 114.2	- 336.4	- 41.9	- 10.9	7.1	10.2	- 62.4	- 126.8	1.3	- 33.6	- 27.6
ANGLO PLATINUM LIMITED	31.6	34.7	48.4	48.9	39.0	24.3	26.3	33.1	40.4	38.2	
AQUARIUS PLATINUM LIMITED								17.1	46.3	48.6	
EASTERN PLATINUM LIMITED										4.3	
IMPALA PLATINUM HOLDINGS LIMITED	20.0	30.5	37.9	39.6	37.9	26.5	17.8	48.2	30.4	26.2	
LONMIN PLC	12.2	25.4	47.5	51.3	45.2	30.8	36.1	28.5	27.3	30.1	
NORTHAM PLATINUM LIMITED	5.6	24.5	38.7	53.4	42.7	30.1	20.7	22.4	35.7	39.4	

Figure 4.4 illustrates the variations in operating profitability per firm graphically and compares the performance of the firms in the research sample for the period 1999 to 2008 after outliers have been eliminated. The graph indicates that there are differences between the operating profitability achieved by the different firms in the research sample. It also shows large variation in the performance of the individual firms. Some of the firms in the group consistently perform well with a small distribution high above the zero-line. Firms in this group are Anglo American PLC, Anglo Platinum Ltd, Impala Platinum Ltd, Lonmin PLC, Assore Ltd, BHP Billiton Ltd and Northam Platinum Ltd. The graph also identifies firms that have made an operating loss for the period, with the median below the zero-line. Simmer and Jack Mines Ltd., Sallies Ltd. and DRDGold Ltd. are in this group.

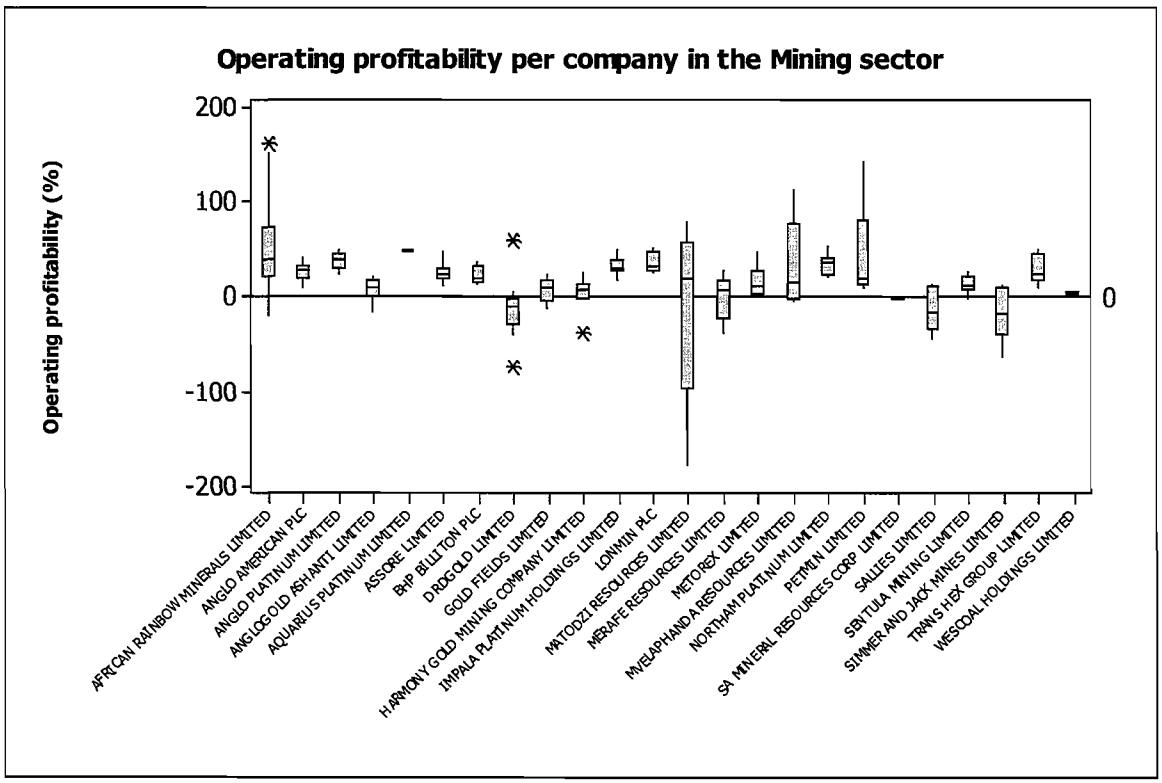

Figure 4.4: Operating profitability of firms in the Mining Sector in South Africa from 1999 to 2008.

In order to examine the relationship between operating profitability and TSR, the data for all the firms are combined in one dataset. Figure 4.5 illustrates the combined performance of the firms on an annual basis. The graph shows differences between the years in the period 1999 to 2008. The variation in individual years is significant. The mean operating profitability per year varies between 9.26% in 2001 and 32.06% in 1999.

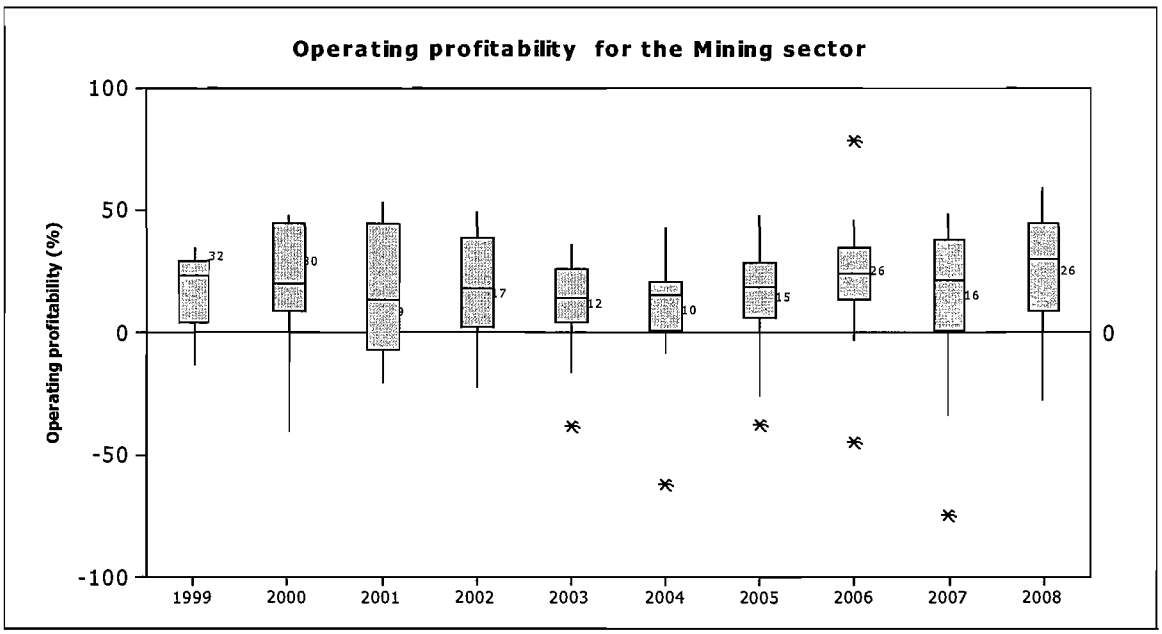

Figure 4.5: Annual Operating profitability of the Mining Sector in South Africa from 1999 to 2008.

Figure 4.6 presents the descriptive statistics for the combined dataset. The dataset consists of 180 data points distributed asymmetrically around a concentration depicted by the histogram. The data appears more symmetrical than the revenue growth data with the median and mean close together and the Skewness -0.332. The data are not normally distributed; the probability of the distribution being normal is less then 0.005, indicated by the P-value calculated using the Anderson-Darling normality test. The mean of the sample is 18.463% and the median 19.368%. The data displays a large variation quantified by the standard deviation of 32.772%. The descriptive statistics further include

confidence intervals for the mean, median and standard deviation of the population the sample represents.

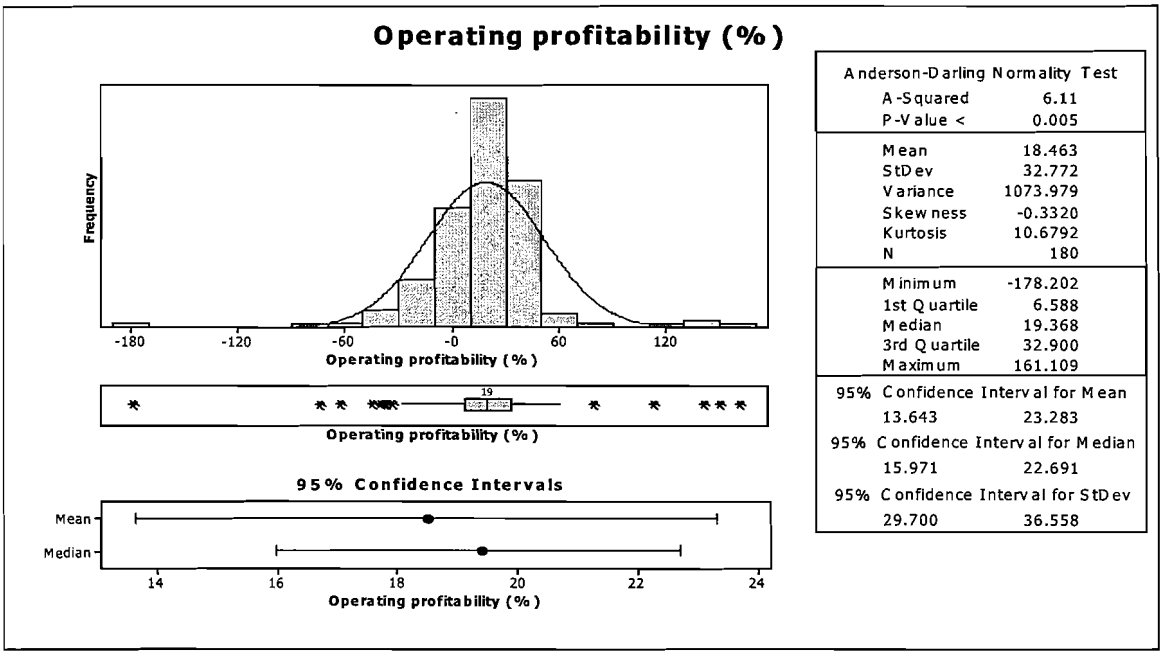

Figure 4.6: Descriptive statistics of the operating profitability of the Mining sector in South Africa.

4.2.3 Capital requirements of firms in the Mining sector in South Africa

Table 4.3 presents the capital requirements calculated for the firms in the research sample for the period 1999 to 2008. Where no data is shown in the table, the company did not exist yet, or has not yet published financial statements in 2008. Inspection of the data in the preceding table reveals a large variation in capital requirement between the firms over the defined period. Some of these data points are outliers and will be eliminated from the dataset. An outlier is defined by a point more than 1.5 times the inter-quartile range away from the median of the data set (Minitab Inc, 2007).

Table 4.3: Capital requirements for firms in the Mining sector

Capital requirements (R/R)											
Firm	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
WESCOAL HOLDINGS LIMITED								0.0	26.3	25.1	31.1
TAWANA RESOURCES NL						0.0	0.0	54190.9	8063.6	2979.5	
THABEX LIMITED				297.6	588.4	385.5	947.9	4842.6	26741.3	6426.3	812.4
TRANS HEX GROUP LIMITED	47.0	49.2	59.0	32.6	52.7	55.3	52.9	41.9	46.2	34.7	34.0
AFRICAN RAINBOW MINERALS LIMITED	49.5	113.1	236.9	168.2	137.6	82.5	106.6	89.1	91.9	114.1	97.5
ANGLO AMERICAN PLC	48.8	77.3	85.9	75.5	106.1	118.7	114.9	97.5	84.2	91.8	
ASSORE LIMITED	21.8	64.1	66.5	61.3	62.3	58.5	56.9	54.7	52.5	101.7	80.5
BHP BILLITON PLC	94.4	130.3	130.6	113.7	134.3	124.3	95.4	93.9	68.2	106.7	102.9
COAL OF AFRICA LIMITED										124.8	
MATODZI RESOURCES LIMITED			162.6	216.1	211.5	1.3	0.7	44.3	93.8	16.0	
MERAFE RESOURCES LIMITED	58.0	207.0	75.6	44.2	218.8	65.1	89.8	113.2	59.8	56.6	
METOREX LIMITED	21.1	22.2	28.4	33.6	32.3	22.0	22.3	41.0	29.1	51.0	146.1
MVELAPHANDA RESOURCES LIMITED			153.3	39.3	18.4	2.7	6.5	5.4	5.9	43.6	30.1
PETMIN LIMITED	32.4	66.4	16.6	21.5	14.7			176.4	188.7	120.1	116.6
SA MINERAL RESOURCES CORP LIMITED			1180.3	169.4		118.3		108.2	144.4	88.0	
SALLIES LIMITED			38.4	30.7	43.8	43.4		26.6	14.7	45.7	
SENTULA MINING LIMITED	116.7	154.6	159.1	145.1	139.1	119.7	99.4	124.4	143.8	149.1	121.6
URANIUM ONE INC								4982.2	961.9	704.5	
ANGLOGOLD ASHANTI LIMITED	108.7	156.4	132.4	105.7	181.5	181.9	295.3	246.4	217.4	179.0	
DRDGOLD LIMITED		80.7	40.4	33.4	36.5	58.0	55.6	70.4	116.1	39.5	100.5
GOLD FIELDS LIMITED	230.5	210.7	178.8	150.1	143.1	123.9	179.7	186.2	196.3	253.8	0.0
HARMONY GOLD MINING COMPANY LIMITED	141.1	98.4	139.3	156.0	156.2	151.3	314.1	395.8	464.4	321.2	
Pamodzi Gold Limited									738.0	47.1	
SIMMER AND JACK MINES LIMITED	1191.0	2142.1	695.7	193.8	131.7	119.9	161.4	-152.3	244.7	308.7	415.5
ANGLO PLATINUM LIMITED	18.7	23.8	19.0	48.2	23.7	33.0	39.6	37.7	38.3	32.6	
AQUARIUS PLATINUM LIMITED								135.5	102.4	81.4	
EASTERN PLATINUM LIMITED										33.0	
IMPALA PLATINUM HOLDINGS LIMITED	64.5	38.3	28.9	19.8	21.3	22.2	29.9	40.1	38.5	35.8	51.9
LONMIN PLC	27.6	38.7	61.6	76.9	26.0	41.8	21.7	24.0	35.3	41.9	
NORTHAM PLATINUM LIMITED	28.9	31.2	25.2	21.6	19.7	30.8	17.6	21.2	51.9	47.3	

Figure 4.7 illustrates the variations in capital requirements per firm graphically and compares the performance of the firms in the research sample for the period 1999 to 2008 after outliers have been eliminated. The graph indicates that there are differences between the capital requirements of the different firms in the research sample. It also shows very large variation in the performance of the individual firms. Some of the firms in the group consistently utilise lower amounts

of operating capital to generate the same revenue. Firms in this group are Anglo Platinum Ltd, Impala Platinum Ltd, Lonmin PLC, Northam Platinum Ltd, Metorex Ltd, Mvelaphanda Ltd and Sallies Ltd. The graph also identifies firms that need large amounts of operating capital to generate revenue. Simmer and Jack Mines Ltd, Anglogold Ashanti Ltd, Harmony gold and Goldfields Ltd are in this group. From this high level observation, it appears as if the platinum mines perform better than the gold mines in utilising capital.

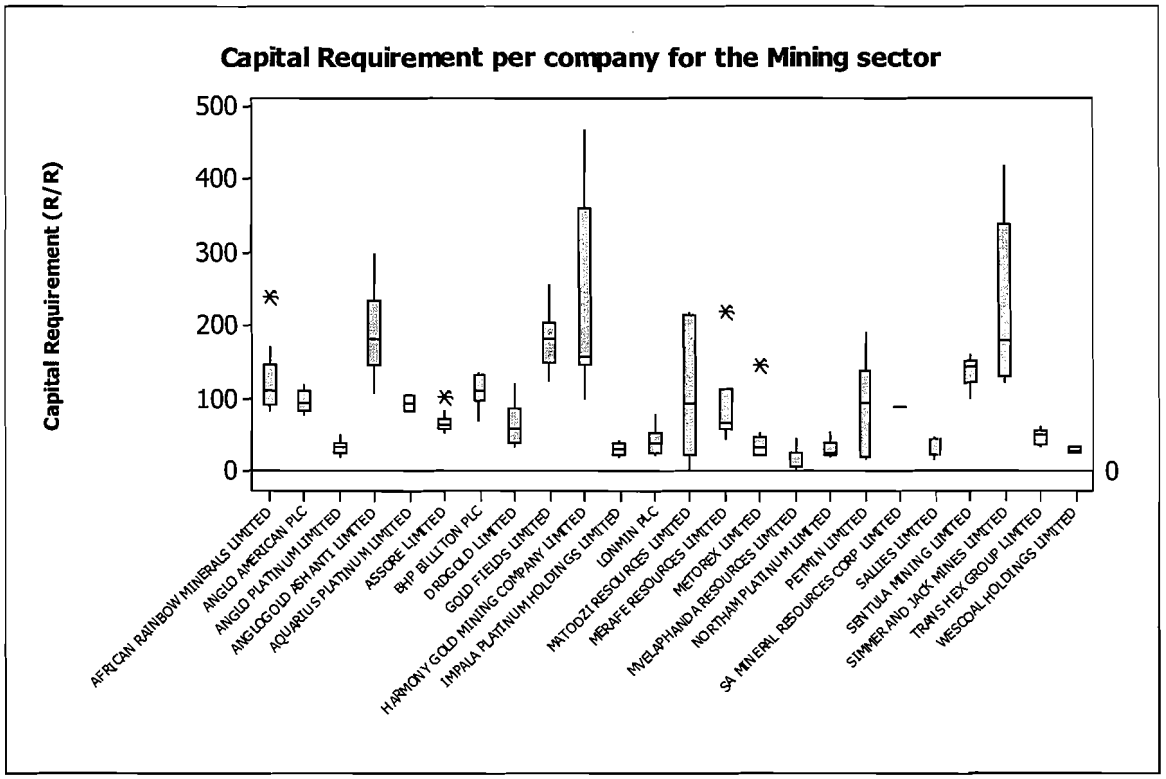

Figure 4.7: Capital requirements of firms in the Mining Sector in South Africa from 1999 to 2008.

Figure 4.8 illustrates the combined performance of the firms on an annual basis. The graph shows differences between the years in the period 1999 to 2008. The variation in individual years is small and less than per firm over the total period. The mean capital requirement per year varies from 76.57 R/R (rand working capital/rand revenue) in 2003, to 124.63 (R/R) in 2008.

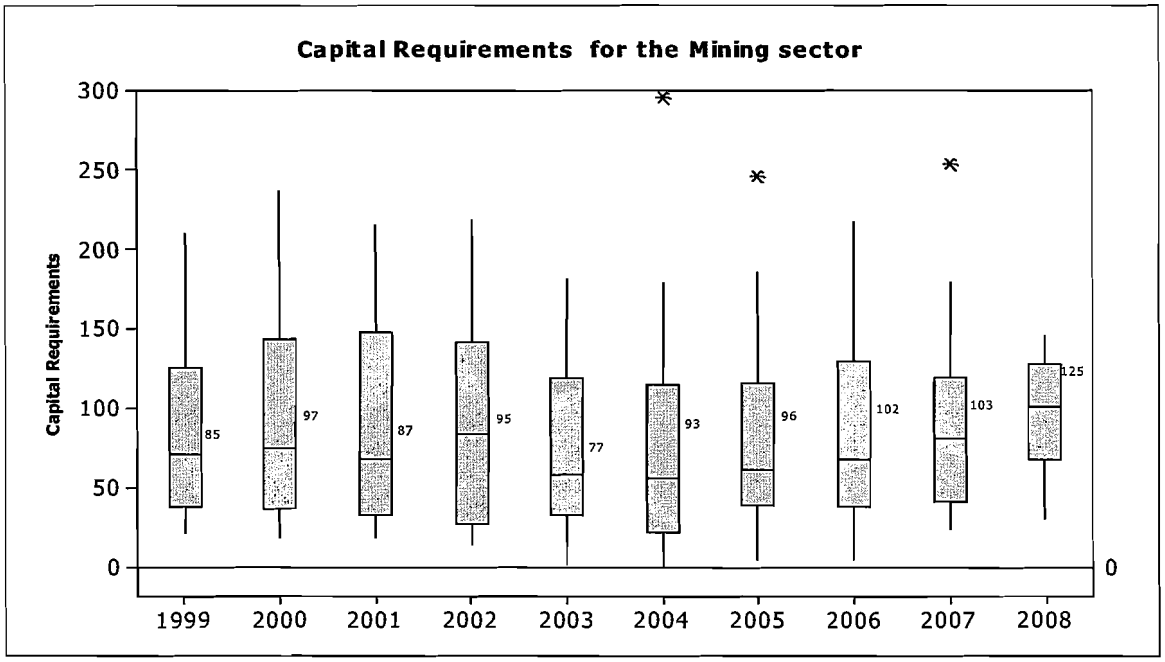

Figure 4.8: Annual Capital requirements of the Mining Sector in South Africa from 1999 to 2008.

Figure 4.9 presents the descriptive statistics for the combined dataset.

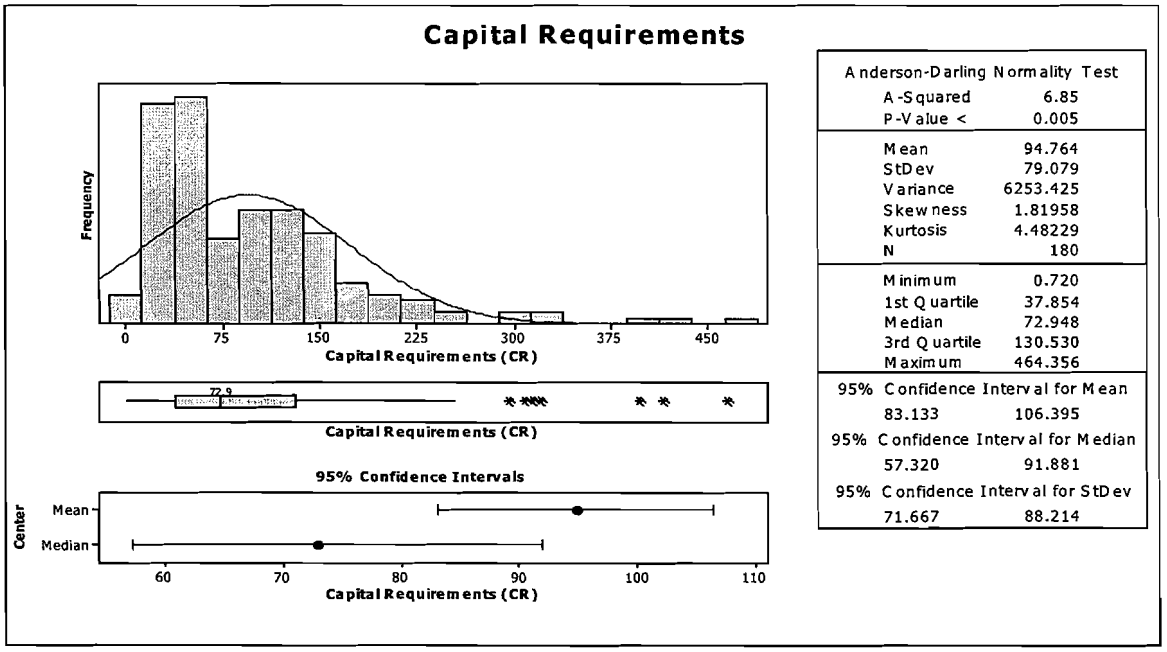

Figure 4.9: Descriptive statistics of the capital requirements of the Mining sector in South Africa.

The dataset consists of 180 data points distributed asymmetrically around a concentration depicted by the histogram. The data are not normally distributed; the probability of the distribution being normal is less then 0.005, indicated by the P-value calculated using the Anderson-Darling normality test. The mean of the sample is 94.764 and the median 72.948. The data displays a large variation quantified by the standard deviation of 79.079. The descriptive statistics further includes confidence intervals for the mean, median and standard deviation of the population the sample represents.

4.2.4 Total shareholder return of firms in the Mining sector in South Africa

Table 4.4 presents the total shareholder return (TSR) calculated for the firms in the research sample for the period 1999 to 2008. Where no data is shown in the table, the company did not exist yet, or has not yet published financial statements in 2008.

Table 4.4: Total shareholder return for firms in the Mining sector

Total shareholder return (%)										
Firm	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
WESCOAL HOLDINGS LIMITED									23.3	41.9
TAWANA RESOURCES NL								- 73.3	- 42.6	
THABEX LIMITED	- 76.0	16.7	150.0	- 7.1	- 30.8	- 8.9	- 12.2	150.0	134.4	- 5.2
TRANS HEX GROUP LIMITED	- 0.3	- 53.2	59.6	23.0	36.8	42.9	- 35.3	- 28.9	20.6	- 35.7
AFRICAN RAINBOW MINERALS LIMITED	- 18.0	81.3	- 26.6	3.9	3.4	- 13.8	- 4.7	38.2	178.4	- 74.3
ANGLO AMERICAN PLC	125.6	11.1	- 54.4	- 28.3	11.8	1.0	59.6	68.4	29.8	- 1.5
ASSORE LIMITED	- 88.7	27.9	58.3	65.3	27.4	- 21.5	66.9	12.8	123.7	219.9
BHP BILLITON PLC	75.9	37.6	55.7	39.0	- 19.3	29.6	60.3	51.2	52.7	59.6
COAL OF AFRICA LIMITED										346.6
MATODZI RESOURCES LIMITED	-	- 8.3	- 54.5	- 13.3	361.5	- 33.3	107.5	39.8	- 14.7	8.7
MERAFE RESOURCES LIMITED	55.0	51.6	27.7	108.3	- 40.0	1.3	- 18.4	19.4	198.6	
METOREX LIMITED	- 5.1	- 12.8	102.0	- 5.6	- 33.3	9.3	68.7	143.0	170.1	- 12.8
MVELAPHANDA RESOURCES LIMITED	- 66.9	93.1	454.9	62.6	5.4	- 23.4	- 19.2	105.4	100.2	
PETMIN LIMITED	92.4	- 27.5	- 5.4	258.6	- 95.4	91.3	75.0	64.9	69.3	114.0
SA MINERAL RESOURCES CORP LIMITED	- 37.5	40.0	- 42.9	- 100.0		- 75.0	100.0	-	300.0	10.0
SALLIES LIMITED	48.3	- 44.9	22.4	- 13.3	- 48.1	25.9	- 2.9	109.1	46.4	

Firm	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
SENTULA MINING LIMITED	- 53.8	- 11.1	120.6	29.4	33.3	119.8	175.4	194.4	95.4	5.9
URANIUM ONE INC								161.4	- 30.7	
ANGLOGOLD ASHANTI LIMITED	55.6	- 21.4	107.2	44.1	10.5	- 32.6	41.6	14.2	- 4.2	
DRDGOLD LIMITED	- 20.0	- 32.7	32.1	364.8	- 59.5	- 11.5	- 62.3	64.0	- 40.9	- 8.4
GOLD FIELDS LIMITED	- 30.0	29.5	40.2	238.5	- 25.4	- 26.1	14.7	87.5	- 12.6	- 5.2
HARMONY GOLD MINING COMPANY LIMITED	20.4	36.3	28.3	213.4	- 32.8	- 28.8	- 15.0	94.6	- 5.6	- 6.9
Pamodzi Gold Limited									- 31.7	
SIMMER AND JACK MINES LIMITED	- 46.2	- 14.3	50.0	38.9	- 40.0	100.0	66.7	192.0	323.3	- 7.6
ANGLO PLATINUM LIMITED	120.0	94.7	32.4	- 18.3	- 12.3	- 24.0	126.9	98.1	25.9	
AQUARIUS PLATINUM LIMITED								145.6	145.7	- 41.7
EASTERN PLATINUM LIMITED										26.9
IMPALA PLATINUM HOLDINGS LIMITED	247.0	67.1	91.0	46.0	- 10.6	- 0.2	29.7	105.0	- 78.4	40.0
LONMIN PLC	111.2	67.3	21.1	46.1	- 17.5	16.0	17.8	162.9	27.6	
NORTHAM PLATINUM LIMITED	75.1	67.4	163.2	29.0	- 19.2	- 25.3	36.4	201.6	96.3	21.5

Inspection of the data in the preceding table reveals variation in TSR between the firms over the defined period. Some data points are outliers and will be eliminated from the dataset. An outlier is defined by a point more than 1.5 times the inter-quartile range away from the median of the data set (Minitab Inc, 2007).

Figure 4.10 illustrates the variations in TSR per firm graphically and compares the performance of the firms in the research sample for the period 1999 to 2008 after outliers have been eliminated. The graph indicates that there are differences between the capital requirements of the different firms in the research sample. It also shows very large variation in the performance of the individual firms. The only firm in the group depicting consistent TSR is BHP Billiton PLC with a rnean TSR far above zero and a tight distribution over the time period. The graph shows that the remainder of the firms all exhibits a large variation in TSR with two firms DRDGold Ltd and Matodzi Ltd performing poor with the median below zero.

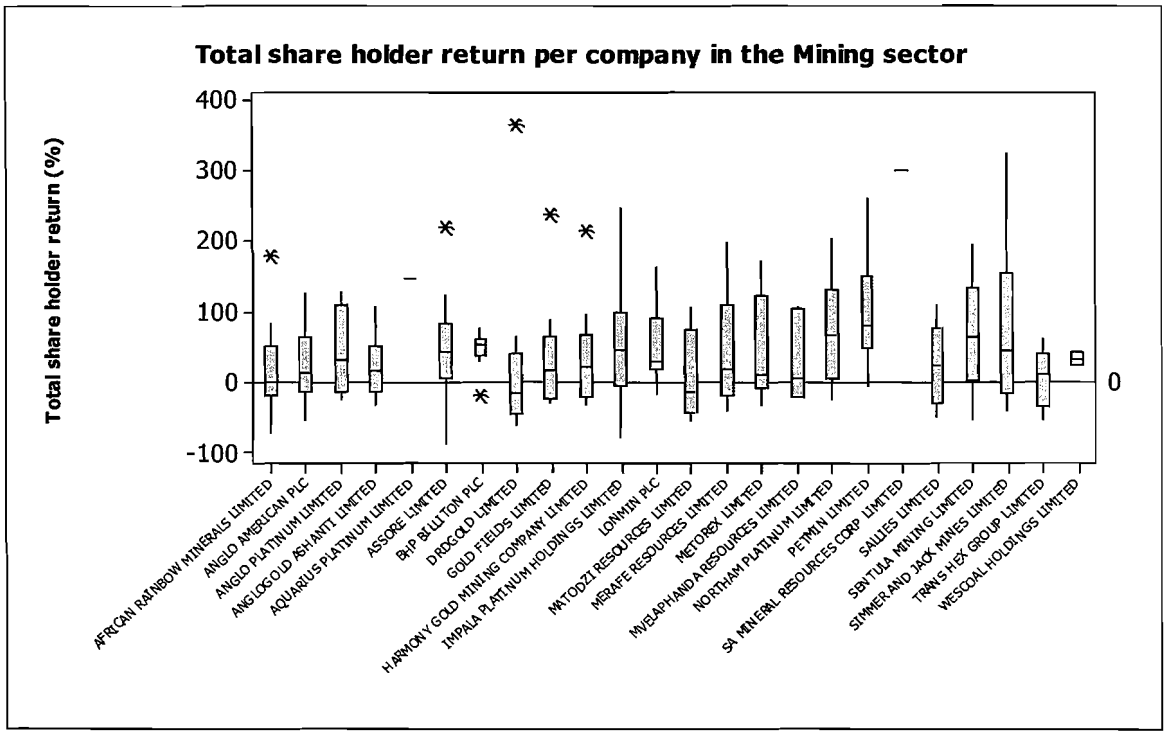

Figure 4.10: TSR of firms in the Mining Sector in South Africa from 1999 to 2008.

In order to examine the relationship between the internal value drivers and TSR, the data for all the firms are combined in one dataset. Figure 4.11 illustrates the combined performance of the firms on an annual basis. The graph shows significant differences between the years in the period 1999 to 2008. The variation in individual years is significant. The mean TSR per year varies between -12.065% in 2003 and 85.287% in 2006.

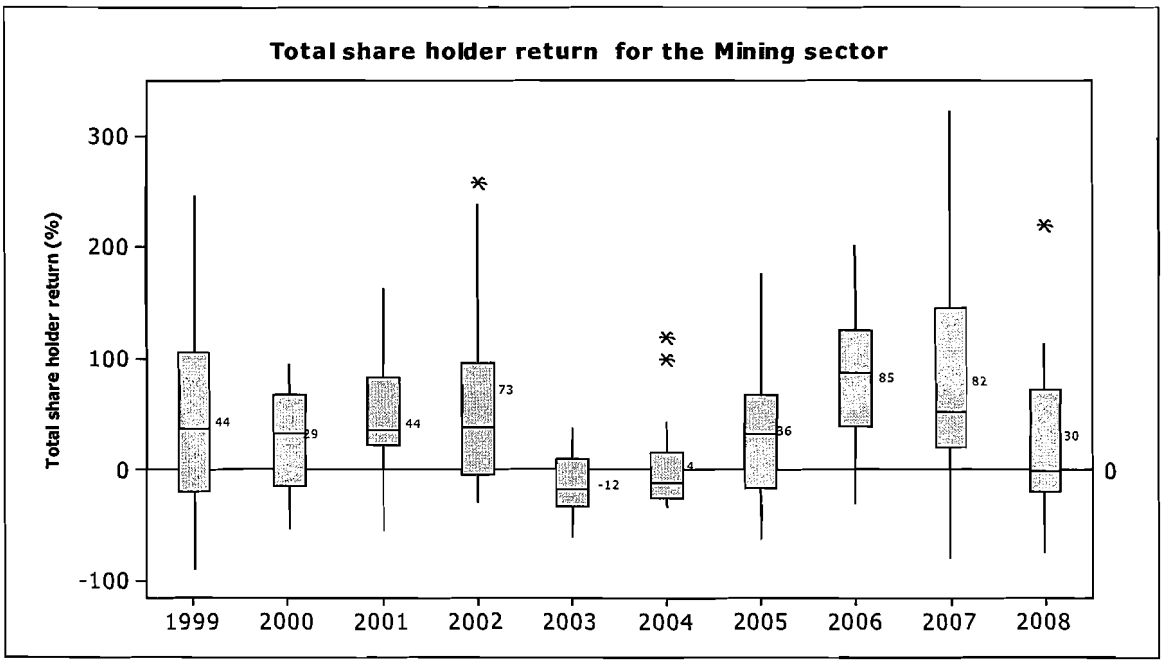

Figure 4.11: Annual TSR of the Mining Sector in South Africa from 1999 to 2008.

Figure 4.12 presents the descriptive statistics for the combined dataset.

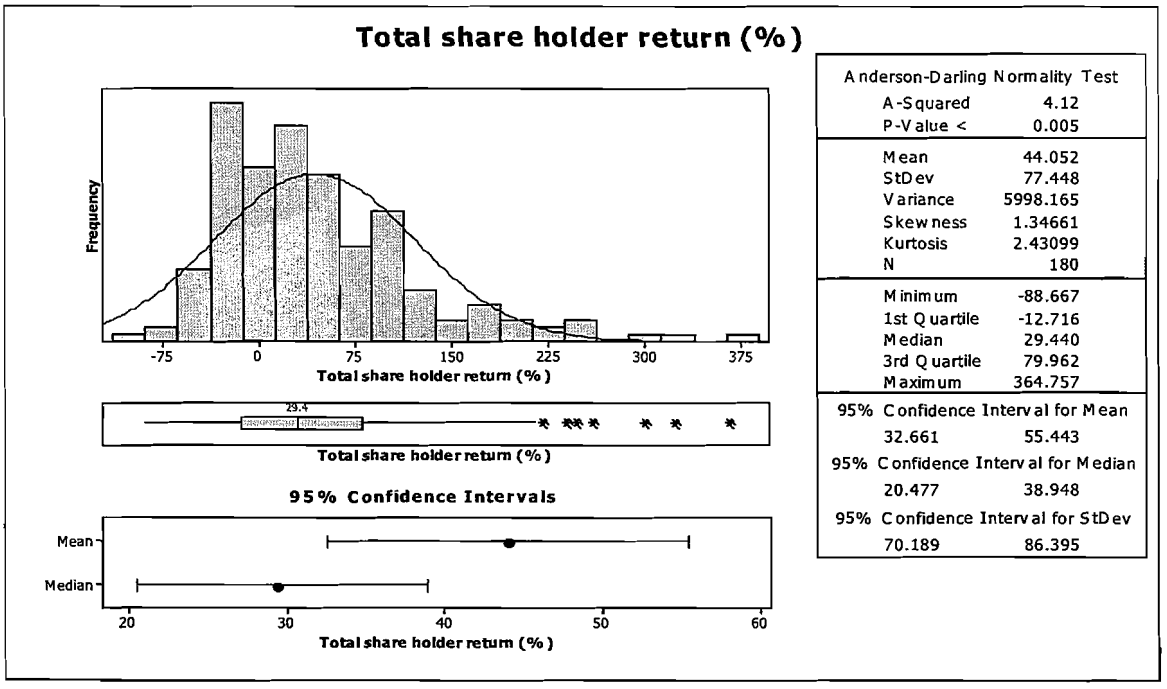

Figure 4.12: Descriptive statistics of the TSR of the Mining sector in South Africa.

The dataset consists of 180 data points distributed asymmetrically around a concentration depicted by the histogram. The data are not normally distributed; the probability of the distribution being normal is less then 0.005, indicated by the P-value calculated using the Anderson-Darling normality test. The mean of the sample is 44.052% and the median 29.440%. The data displays a large variation quantified by the standard deviation of 77.448%. The descriptive statistics further includes confidence intervals for the mean, median and standard deviation of the population the sample represents.

All the data for the research have been presented in the preceding sections. The following sections explore the relationships between the variables. TSR is evaluated against each of the variables Revenue growth, Operating profitability and Capital requirements to determine the individual effects. This is followed by a determination of the combined effect.

4.2.5 The relationship between Revenue growth and TSR

Revenue growth for the firms in the research sample is quantified in section 4.2.1 and TSR is quantified in section 4.2.4. Simple linear regression, as described in Chapter 3, is applied to the data to investigate the relationship between Revenue growth and TSR. Figure 4.13 depicts a scatter plot of TSR versus Revenue growth.

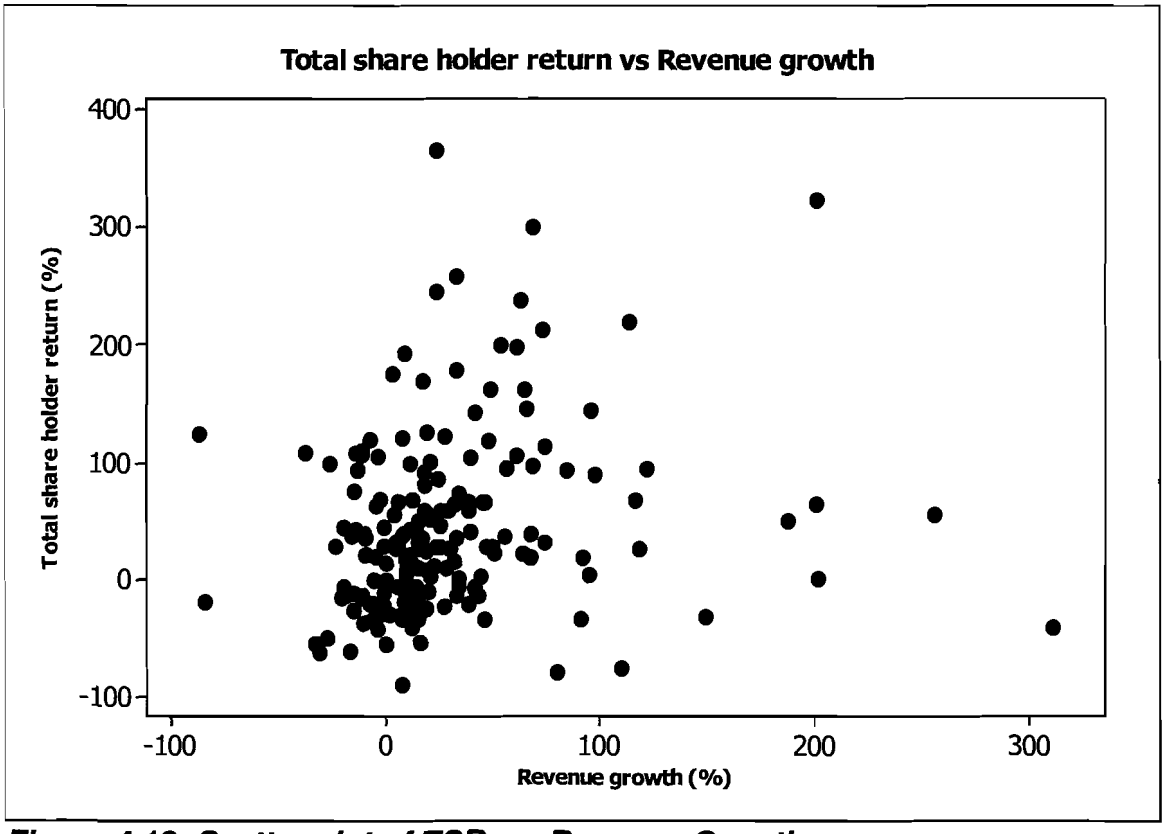

Figure 4.13: Scatter plot of TSR vs. Revenue Growth

The graph does not show a clear relationship between Revenue Growth and TSR. There is however a weak positive tendency visible in the graph: the TSR approximately increases as the Revenue Growth of the firms increase.

In order to explore the possible relationship between Revenue Growth and TSR in more depth simple linear regression is applied on the dataset. The chosen confidence level for the regression analysis is 95%. The regression equation is:

TSR = 35.7 + 0.292 * (Revenue Growth)

Table 4.5 shows the regression results, the standard error of the coefficients (SE of coefficient), the T-value for the coefficient (T) and the probability that the coefficient is zero (P).

Table 4.5: Regression table for TSR vs. Revenue Growth

Predictor	Coefficient	SE of Coefficient	T	P-value	S	R^2
Constant	35.686	6.5	5.49	0.000	76.2	0.038
Revenue Growth	0.292	0.1104	2.64	0.009		

The T-value is the ratio between the coefficients in the table and its standard errors. A larger T-value indicates a more accurate prediction. The Constant in the regression equation is more accurate than the coefficient for Revenue Growth. A P-value below α, which equals 1 - (Confidence level) = 0.05, indicates that the predictor is statistically significant (Levine et al, 2005: 524). In this case, both the Constant and Revenue Growth are statistically significant predictors of TSR. The S-value represents the standard distance data points occur from the regression line and is measured in the units of the response variable. For a given study, the better the equation predicts the response, the lower S is (Minitab Inc, 2007). Table 4.6 shows the ANOVA (analysis of variance) table for the regression.

Table 4.6: ANOVA table for TSR vs. Revenue Growth

Source	DF	SS	MS	F	P-value
Regression	1	40583	40853	6.99	0.009
Residual error	178	1033089	5804		
Total	179	1073671			

The purpose of the ANOVA table is to indicate how well the regression results explain the total variation. The P-value indicates that the regression is statistically

significant. The coefficient of determination or R^2, which is the ratio of the sum of squares (SS) of the regression divided by the total sum of squares, for the regression is 3.8%. This indicates that 3.8% of the variability in TSR can be explained by the variability of Revenue Growth (Levine et al, 2005: 525). DF in the table indicates the degrees of freedom for the predictor. SS is the sum of squares of the difference between each actual value and the predicted value by the regression equation. MS is the mean squares of the prediction equal to SS divided by the degrees of freedom for the predictor. F is the F-statistic for the regression used to test if the coefficient for the predictor is equal to zero. The P-value is the probability associated with the F statistic. If the P-value is smaller than the level of significance for the regression, or in other words the probability that the coefficient is zero, is less than the level of significance, then the predictor is significant (Minitab Inc, 2007). Figure 4.14 shows the residual analysis for the regression to verify the regression assumptions.

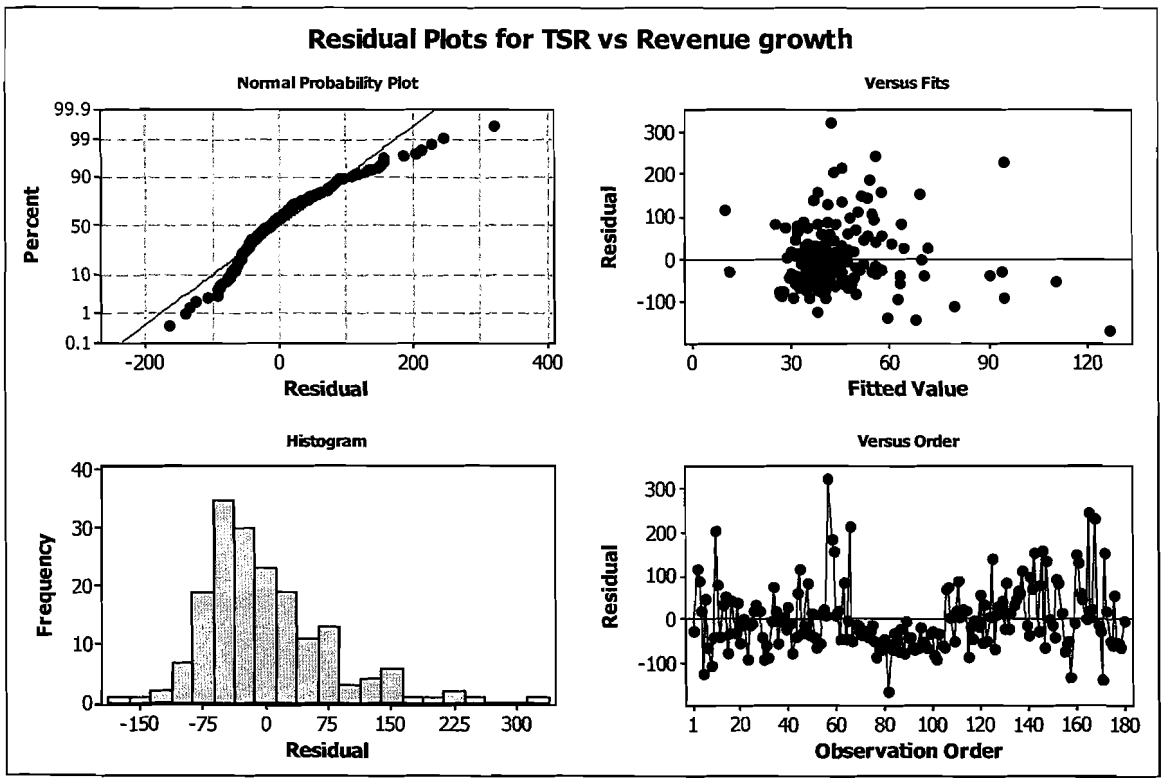

Figure 4.14: Residual plots for TSR vs. Revenue Growth

From inspection of the graphs, the residuals are not normally distributed. This is clear from the normal probability plot and the histogram in Figure 4.14. It is however homogeneously distributed around the zero-line. This is clear from the residuals vs. fits plot in Figure 4.14. The distribution satisfies the assumption of homoscedasticity. The independence of errors can be evaluated by identifying patterns when the residuals are plotted vs. order of observation. The graph in Figure 4.14 indicates that there is not a clear pattern, which implies independence of the residuals. The assumptions of regression are thus sustained with the exception of normality of the residuals. According to Levine et al (2005: 527), the deviation from normality by the residuals is not cause alone to reject the regression results. As long as the residuals are distributed homogeneously around the zero line, the regression results are valid.

The results from the simple linear regression of TSR vs. Revenue Growth indicate that Revenue growth has a positive statistically significant effect on TSR but that only 3.8% of the variation in TSR can be explained by Revenue Growth. The residual analysis indicates that the assumptions of regression are sustained. According to the theory of linear regression, the regression equation is valid but to determine the practical significance, the effect size needs to be quantified.

The first indicator of effect size is the value of S in Table 4.5. It is large, 76.2, indicating that the standard distance of data from the regression line is large, implying a small effect of the predictor, Revenue growth, on the response variable, TSR (Minitab Inc, 2007). The second indicator of effect size for the purpose of this study is to consider the correlation coefficient which is refined as:

$$r = \sqrt{R^2} = 0.195$$

Where:

R^2 is the coefficient of determination as calculated in Table 4.5.

According to Cohen (1988: 430) a value of 0.1 indicates a small effect, 0.3 a medium effect and 0.5 a large effect on the response variable by the predictor. In this case, the value is 0.195 which indicates a small effect size. More analyses are possible, but for the purposes of the current study, it is concluded that there is a theoretically significant relationship between Revenue growth and TSR but because of the small effect size, it is insignificant in practice.

4.2.6 The relationship between Operating Profitability and TSR

Operating Profitability for the firms in the research sample is quantified in section 4.2.2 and TSR is quantified in section 4.2.4. Simple linear regression, as described in Chapter 3, is applied to the data to investigate the relationship between Operating Profitability and TSR. Figure 4.15 depicts a scatter plot of TSR versus Operating Profitability.

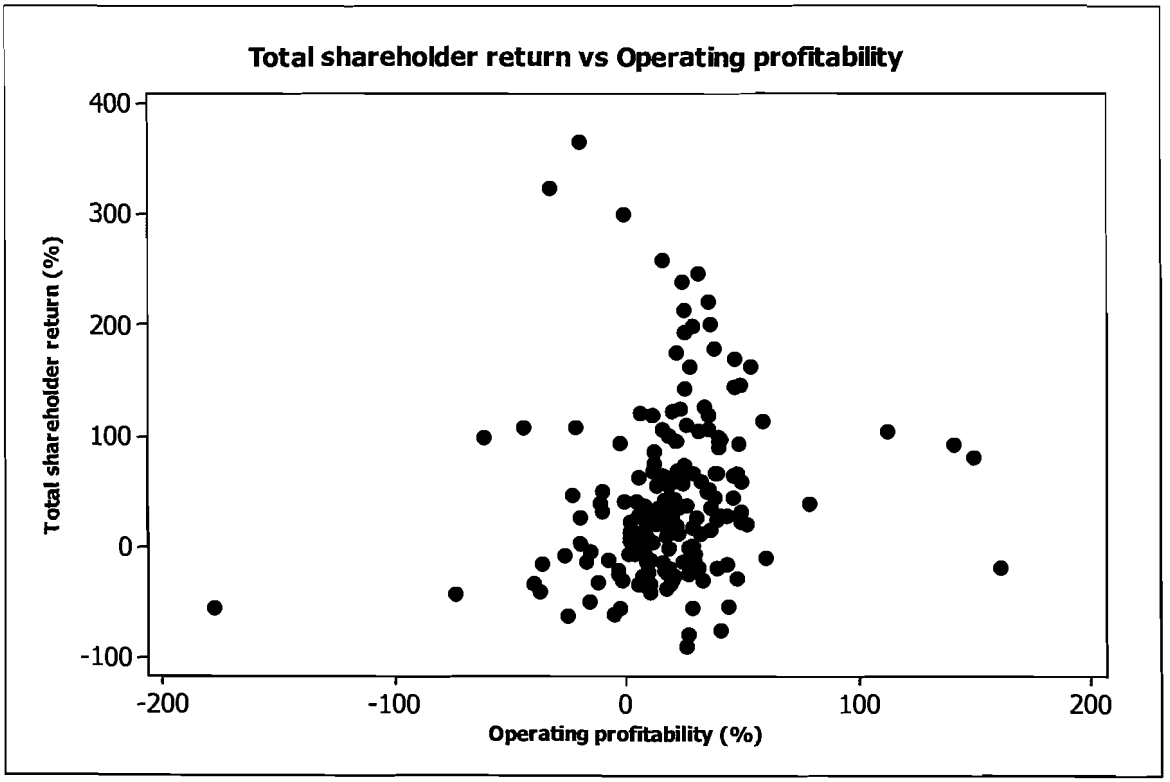

Figure 4.15: Scatter plot of TSR vs. Operating Profitability

The graph does not show a clear relationship between Operating Profitability and TSR. There may however be a weak positive tendency visible in the graph. The TSR seems to increase as the Operating Profitability of the firms increase. In order to explore the possible relationship between Operating Profitability and TSR in more depth simple linear regression is applied on the dataset. The chosen confidence level for the regression analysis is 95%.

The regression equation is:

TSR = 37.6 + 0.348 * (Operating Profitability)

Table 4.7 shows the regression results, the standard error of the coefficients (SE of coefficient), the T-value for the coefficient (T) and the probability that the coefficient is zero (P).

Table 4.7: Regression table for TSR vs. Operating Profitability

Predictor	Coefficient	SE of Coefficient	T	P-value	S	R^2
Constant	37.622	6.576	5.72	0.000	76.82	0.022
Operating Profitability	0.348	0.1752	1.99	0.048		

The T-value is the ratio between the coefficients in the table and its standard errors. A larger T-value indicates a more accurate prediction. The Constant in the regression equation is more accurate than the coefficient for Operating Profitability. A P-value below α, which equals 1 - (Confidence level) = 0.05, indicates that the predictor is statistically significant (Levine et al, 2005: 524). The S-value represents the standard distance data points occur from the regression line and is measured in the units of the response variable. For a given study, the better the equation predicts the response, the lower S is (Minitab Inc, 2007). In this case, both the Constant and Operating Profitability are statistically significant predictors of TSR. Table 4.8 shows the ANOVA table for the regression.

Table 4.8: ANOVA table for TSR vs. Operating Profitability

Source	DF	SS	MS	F	P-value
Regression	1	40583	40853	6.99	0.009
Residual error	178	1033089	5804		
Total	179	1073671			

The purpose of the ANOVA table is to indicate how well the regression results explain the total variation. The P-value indicates that the regression is statistically significant. The coefficient of determination or R^2, which is the ratio of the sum of squares (SS) of the regression divided by the total sum of squares, for the regression is 2.2%. This indicates that 2.2% of the variability in TSR can be explained by the variability of Operating Profitability (Levine et al, 2005: 525).

Figure 4.16 shows the residual analysis for the regression to verify the regression assumptions.

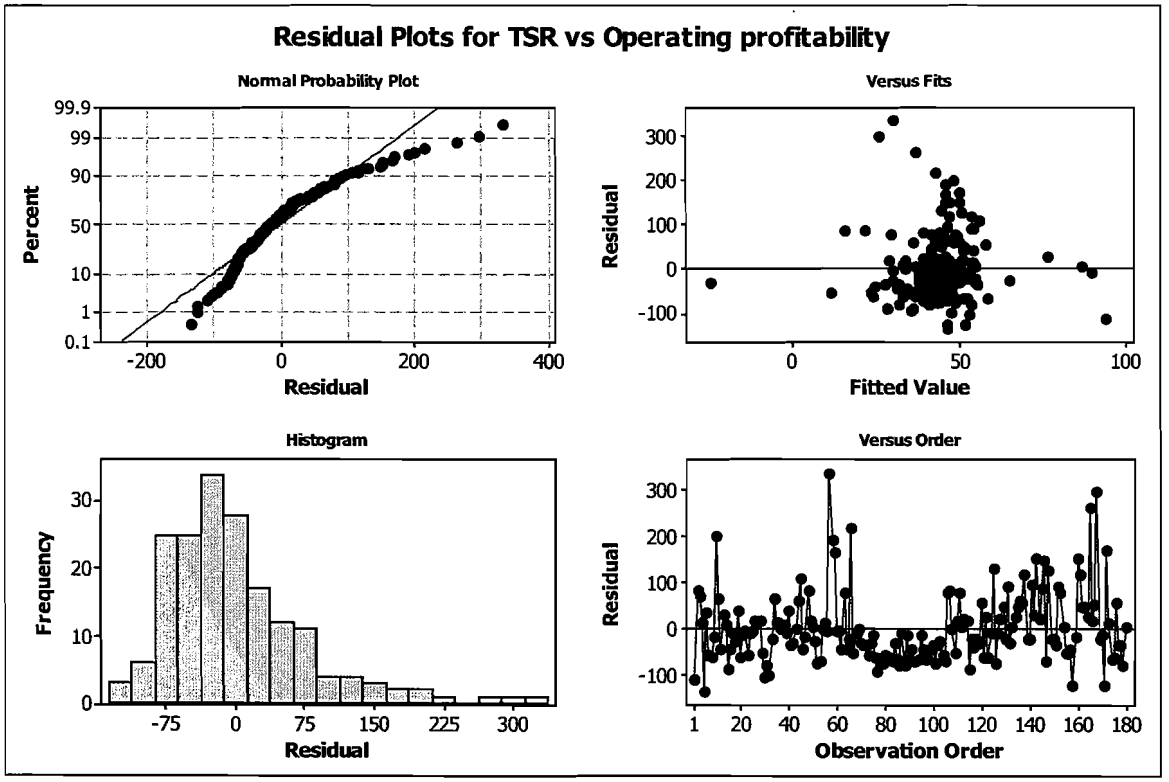

Figure 4.16: Residual plots for TSR vs. Operating Profitability

From inspection of the graphs, the residuals are not normally distributed. This is clear from the normal probability plot and the histogram in Figure 4.16. It is however homogeneously distributed around the zero-line. This is clear from the residuals vs. fits plot in Figure 4.16. The distribution satisfies the assumption of homoscedasticity. The independence of errors can be evaluated by identifying patterns when the residuals are plotted vs. order of observation. The graph in Figure 4.16 indicates that there is not a clear pattern, which implies independence of the residuals. The assumptions of regression are thus sustained with the exception of normality of the residuals. According to Levine et al (2005: 527), the deviation from normality by the residuals is not cause alone to reject the regression results. As long as the residuals are distributed homogeneously around the zero line, the regression results are valid.

The results from the simple linear regression of TSR vs. Operating Profitability indicate that Operating Profitability has a positive statistically significant effect on TSR but that only 2.2% of the variation in TSR can be explained by Operating Profitability. The residual analysis indicates that the assumptions of regression are sustained. According to the theory of linear regression, the regression equation is valid but to determine the practical significance, the effect size needs to be quantified.

The first indicator of effect size is the value of S in Table 4.7. It is large, 76.82, indicating that the standard distance of data from the regression line is large, implying a small effect of the predictor, Operating profitability, on the response variable, TSR (Minitab Inc, 2007). The second indicator of effect size for the purpose of this study is to consider the correlation coefficient which is refined as:

$r = \sqrt{R^2} = 0.148$

Where:

R^2 is the coefficient of determination as calculated in Table 4.7.

According to Cohen (1988: 430) a value of 0.1 indicates a small effect, 0.3 a medium effect and 0.5 a large effect on the response variable by the predictor. In this case, the value is 0.148, which indicates a small effect size. More analyses are possible, but for the purposes of the current study, it is concluded that there is a theoretically significant relationship between Operating profitability and TSR but because of the small effect size, it is insignificant in practice.

4.2.7 The relationship between Capital Requirement and TSR

Capital Requirement for the firms in the research sample is quantified in section 4.2.3 and TSR is quantified in section 4.2.4. Simple linear regression, as described in Chapter 3, is applied to the data to investigate the relationship between Capital Requirement and TSR. Figure 4.17 depicts a scatter plot of TSR versus Capital Requirement.

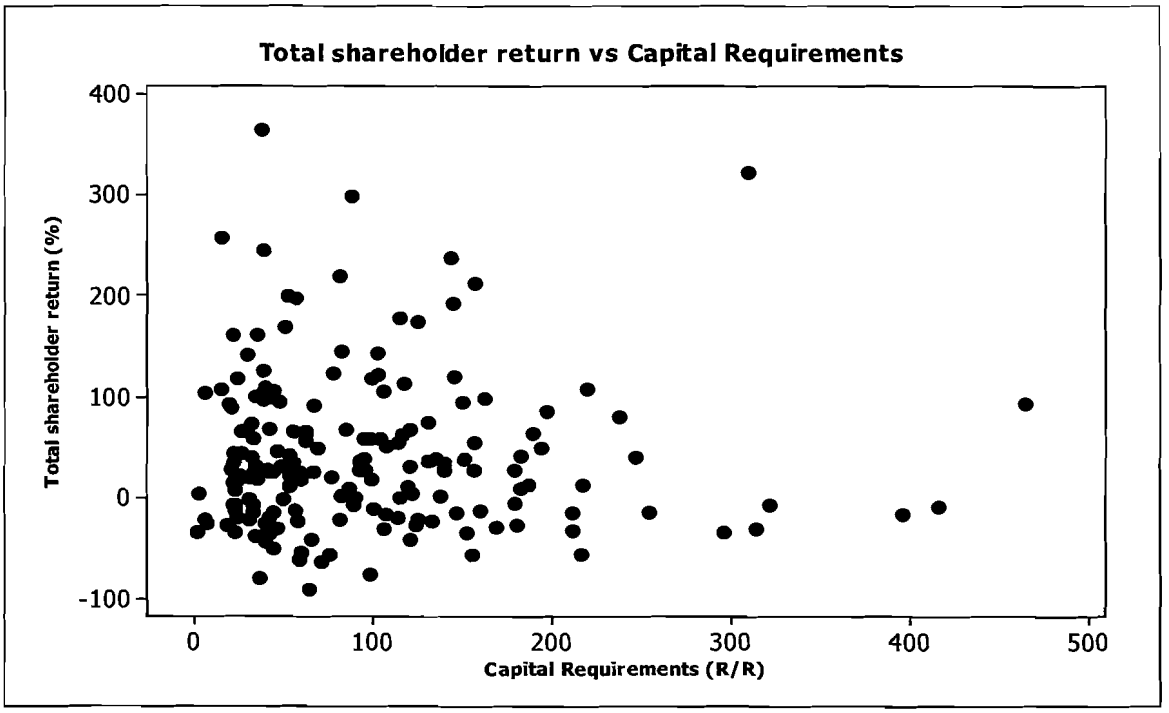

Figure 4.17: Scatter plot of TSR vs. Capital Requirement

The graph does not show a relationship between Capital Requirement and TSR. There is not even a weak tendency visible in the graph. The TSR seems to be independent of variation in the Capital Requirement of the firms.

In order to explore the lack of relationship between Capital Requirement and TSR in more depth simple linear regression is applied on the dataset. The chosen confidence level for the regression analysis is 95%.
The regression equation is:

TSR = 46.5 - 0.027 * (Capital Requirement)

Table 4.9 shows the regression results, the standard error of the coefficients (SE of coefficient), the T-value for the coefficient (T) and the probability that the coefficient is zero (P).

Table 4.9: Regression table for TSR vs. Capital Requirement

Predictor	Coefficient	SE of Coefficient	T	P-value	R^2
Constant	46.848	9.047	5.14	0.000	0.001
Capital Requirement	-0.027	0.07338	-0.35	0.727	

The T-value is the ratio between the coefficients in the table and its standard errors. A larger T-value indicates a more accurate prediction. The Constant in the regression equation is more accurate than the coefficient for Capital Requirement. A P-value below α, which equals 1 - (Confidence level) = 0.05, indicates that the predictor is statistically significant (Levine et al, 2005: 524). In this case, the constant is statistically significant. The P-value for Capital Requirement is 0.727 which is much higher than 0.05 which indicate that Capital Requirement is not a statistically significant predictor of TSR. Table 4.10 shows the ANOVA table for the regression.

Table 4.10: ANOVA table for TSR vs. Capital Requirement

Source	DF	SS	MS	F	P-value
Regression	1	737	737	0.12	0.727
Residual error	178	1072934	6028		
Total	179	1073671			

The purpose of the ANOVA table is to indicate how well the regression results explain the total variation. The P-value indicates that the regression is not statistically significant. The coefficient of determination or R^2, which is the ratio of the sum of squares (SS) of the regression divided by the total sum of squares, for the regression is 0.1%. This indicates that 0.1% of the variability in TSR can be explained by the variability of Capital Requirement (Levine et al, 2005: 525).

The results from the simple linear regression of TSR vs. Capital Requirement indicate that Capital Requirement does not have a statistically significant effect on TSR. The residual analysis or size effect determination is not done because the regression is not statistically significant.

4.2.8 The relationship between Revenue growth, Operating Profitability, Capital Requirements and TSR

In the previous sections a positive relationship between Revenue Growth and Operating Profitability and TSR are determined using simple linear regression. The exploration of the relationship will now conclude with a multiple linear regression of Revenue Growth and Operating Profitability and TSR.

The regression equation is:

TSR = 28.2 + 0.379*Operating Profitability + 0.307*Revenue Growth

Table 4.11 shows the regression results, the standard error of the coefficients (SE of coefficient), the T-value for the coefficient (T) and the probability that the coefficient is zero (P-value).

Table 4.11: Regression table for TSR vs. Operating Profitability, Revenue Growth

Predictor	Coefficient	SE of Coefficient	T	P-value	S	R^2
Constant	28.243	7.2660	3.89	0.000	75.57	0.063
Operating Profitability	0.379	0.1723	2.20	0.029		
Revenue Growth	0.307	0.1095	2.81	0.006		

The T-value is the ratio between the coefficients in the table and its standard errors. A larger T-value indicates a more accurate prediction. The Constant in the regression equation is more accurate than the coefficient for Operating Profitability and Revenue Growth. A P-value below α, which equals 1 - (Confidence level) = 0.05, indicates that the predictor is statistically significant (Levine et al, 2005: 524). In this case, the Constant, Operating Profitability and Revenue Growth are statistically significant predictors of TSR. The S-value represents the standard distance data points occur from the regression line, and is measured in the units of the response variable. For a given study, the better the equation predicts the response, the lower S is (Minitab Inc, 2007). The P-values for Operating Profitability and Revenue Growth are lower than in the individual simple linear regressions done previously. The ANOVA table for the regression are presented in Table 4.12.

Table 4.12: ANOVA table for TSR vs. Operating Profitability, Revenue Growth

Source	DF	SS	MS	F	P-value
Regression	3	68124	22708	3.97	0.009
Residual error	176	1005547	5713		
Total	179	1073671			

The purpose of the ANOVA (analysis of variance) table is to indicate how well the regression results explain the total variation. The P-value indicates that the regression is statistically significant. The coefficient of determination or R^2, which is the ratio of the sum of squares (SS) of the regression divided by the total sum of squares, for the regression is 6.3%. This indicates that 6.3% of the variability in TSR can be explained by the variability of Operating Profitability and Revenue Growth combined (Levine et al, 2005: 525). The combined prediction explains more of the variation than the two separate single predictions in section 4.2.5 and 4.2.6.

The residual analysis for the regression is presented in Figure 4.18.

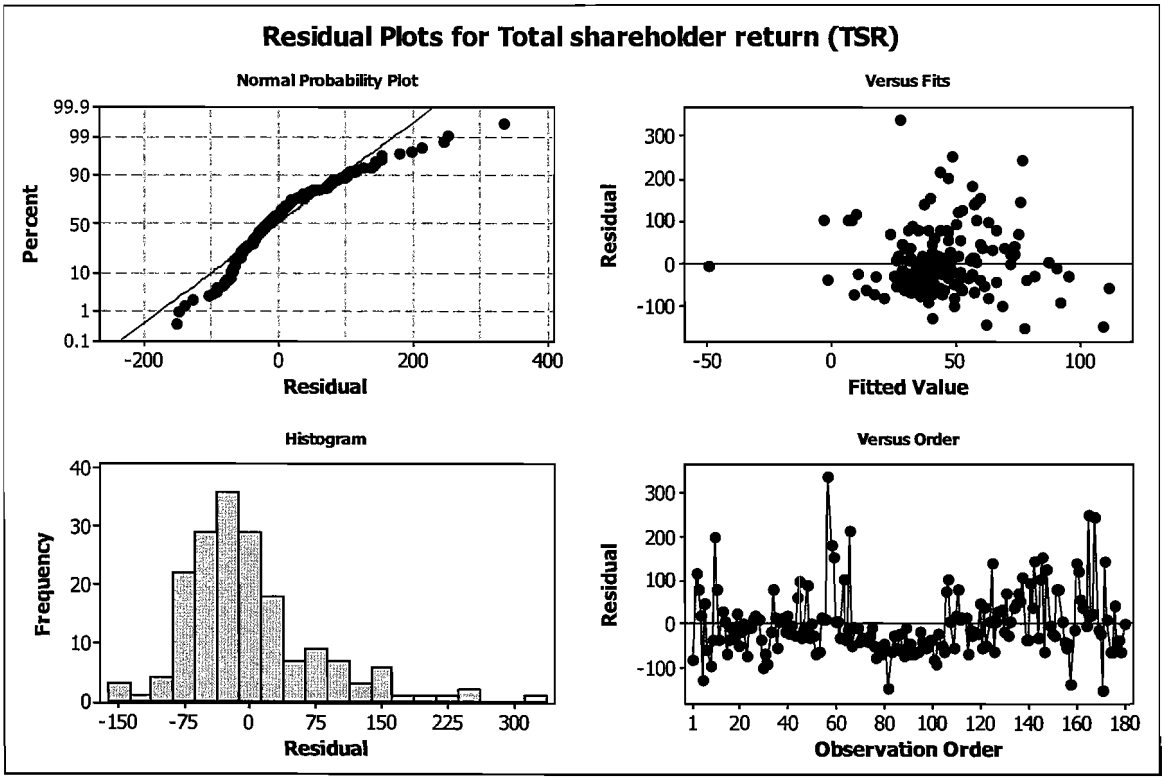

Figure 4.18: Residual plots for TSR vs. Operating Profitability, Revenue Growth.

From inspection of the graphs, the residuals are not normally distributed. This is clear from the normal probability plot and the histogram in Figure 4.18. It is

however homogeneously distributed around the zero-line. This is clear from the residuals vs. fits plot in Figure 4.18. The distribution satisfies the assumption of homoscedasticity. The independence of errors can be evaluated by identifying patterns when the residuals are plotted vs. order of observation. The graph in Figure 4.18 indicates that there is not a clear pattern which implies independence of the residuals. The assumptions of regression are thus sustained with the exception of normality of the residuals. According to Levine et al (2005: 527), the deviation from normality by the residuals is not cause alone to reject the regression results. As long as the residuals are distributed homogeneously around the zero line, the regression results are valid.

The results from the multiple linear regression of TSR vs. Operating Profitability and Revenue Growth indicate that both Operating Profitability and Revenue Growth have a positive statistically significant effect on TSR and that 6.3% of the variation in TSR can be explained by Operating Profitability and Revenue Growth. The residual analysis indicates that the assumptions of regression are sustained. According to the theory of linear regression, the regression equation is valid but to determine the practical significance, the effect size needs to be quantified.

The first indicator of effect size is the value of S in Table 4.11. It is large, 75.57, indicating that the standard distance of data from the regression line is large, implying a small effect of the predictors, Operating profitability and Revenue Growth, on the response variable, TSR (Minitab Inc, 2007). The second indicator of effect size for the purpose of this study is to consider the correlation coefficient which is refined as:

$r = \sqrt{R^2} = 0.25$

Where:

R^2 is the coefficient of determination as calculated in Table 4.11.

According to Cohen (1988: 430) a value of 0.1 indicates a small effect, 0.3 a medium effect and 0.5 a large effect on the response variable by the predictor. In this case, the value is 0.25, which indicates a small effect size. More analyses are possible, but for the purposes of the current study, it is concluded that there is a theoretically significant relationship between Operating profitability and Revenue Growth and TSR, but because of the small effect size, it is insignificant in practice.

4.3 CONCLUSION

The main objective of the study is to investigate the relationship between the internal value drivers of firms and the shareholder wealth creation by the firms in the Mining sector in South Africa. The cornponents by which this is presented in the mini dissertation comprise the background to the problem, a thorough literature survey of the normative theory and previous research in the area of VBM, a description of the research method and the presentation of the research findings. The final section provides a summary of the research findings, grouped in terms of the secondary objective it relates to, conclusions on the research findings and recommendations for further research on the subject of VBM.

4.3.1 Summary of research findings

The following sections provide the summary of the research findings pertaining to each of the secondary objectives defined in Chapter 1 (see Section 1.3).

4.3.1.1 Secondary objective A

Secondary objective A is: To identify the internal drivers of shareholder wealth maximisation. Chapter 2 addresses this objective employing a survey of the

normative literature and previous research focused on VBM. The most important internal drivers of shareholder wealth creation are identified as:

1. Revenue Growth
2. Operating Profitability
3. Capital requirements
4. Weighted average cost of capital (WACC)

For the reasons provided in Chapter 2 (see Section 3.6), WACC is excluded from further analysis in the current study. Secondary objective A is successfully realised in this research.

4.3.1.2 Secondary objective B

Secondary objective B is: To collect comprehensive financial data for firms in the Mining sector in South Africa. Chapter Three addresses this objective by presenting the research method and research instruments to gather the financial data. The data necessary to quantify the internal drivers of shareholder wealth and the actual wealth creation were successfully assembled using the method and are presented in Appendix B.

A total of forty five companies are listed on the JSE in the Mining sector. The calculation of value drivers identified has in common the necessity for the firm under investigation to generate revenue for more than one consecutive reporting period. Firms included in the study are limited to those generating revenue with at least three years of financial statements available. The data set are reduced to thirty after application of these criteria. The data for the research are limited to the period from 1999 to 2008. Secondary objective B is successfully realised by the current research.

4.3.1.3 Secondary objective C

Secondary objective C is: To quantify the internal drivers of shareholder wealth creation of firms in the Mining sector in South Africa. In the current chapter in sections 4.2.1 to 4.2.3 Revenue Growth, Operating Profitability and Capital Requirements are calculated and a full description of the data provided. The data are stacked into a single data set for the whole period for all the companies. This results in one-hundred and eighty data points for each variable in the data set.

Table 4.13 summarises the most important characteristics of the data after outliers were eliminated.

Table 4.13: Internal drivers of shareholder wealth in the Mining sector in South Africa from 1999 to 2008

Variable	Unit	Mean	Median	Standard deviation	Minimum	Maximum
Revenue Growth	%	28.65	16.47	51.57	-87.47	311.67
Operating Profitability	%	18.46	19.37	32.78	-178.02	161.109
Capital Requirement	R/R	94.76	72.95	79.08	0.72	464.36

The values show asymmetrical distributions with large variation. Secondary objective C is successfully realised in the study.

4.3.1.4 Secondary objective D

Secondary objective D is: To determine the actual shareholder wealth creation achieved by the firms in the Mining sector in South Africa. Total shareholder return (TSR) is recognised as an appropriate measurement for the determination of the actual shareholder wealth created or destroyed by a firm. The calculation thereof includes the increase of the share price on the JSE over a financial period plus the dividends paid out for the period divided by the share price at the start of the period. The share prices and dividends are part of the financial

information collected to fulfil secondary objective B. The TSR for the firms in the research sample are calculated and presented in section 4.2.4 in this chapter. Table 4.14 provides a summary of the data.

Table 4.14: Total shareholder return in the Mining sector in South Africa from 1999 to 2008

Variable	Unit	Mean	Median	Standard deviation	Minimum	Maximum
TSR	%	44.05	29.44	77.45	-88.67	364.76

The values show asymmetrical distributions with large variation. The minimum value of below zero indicates value destruction by some companies in some periods. Secondary objective D is successfully realised in the study.

4.3.1.5 Secondary objective E

Secondary objective E is: To investigate the causal relationship between internal value drivers and shareholder wealth creation of firms in the Mining sector in South Africa. The realisation of objectives A, B, C and D allows the study to proceed to the fulfilment of secondary objective E. This involves the analysis of the data for the value drivers and the actual shareholder wealth creation to determine the existence of relationships and the significance of the relationships. Simple linear regression and multiple linear regression are the statistical instruments used to explore the relationship. A full description of the application and validation of the regression process are provided in sections 4.2.5 to 4.2.8 of this chapter. The findings are:

1. A statistically significant relationship exists between Revenue Growth and TSR. (R^2 = 3.8%)
2. A statistically significant relationship exists between Operating Profitability and TSR. (R^2 = 2.2%)

3. A statistically significant relationship does not exist between Capital Requirement and TSR. (R^2 = 0.1%)

Application of multiple regression on Revenue Growth and Operating Profitability as predicting variables and TSR as the response variable yielded a statistically significant relationship, where more of the variability in TSR are explained by the combined effect of the two variables than in isolation (R^2 = 6.3%). The regression equation is:

TSR = 28.2 + 0.379*Operating Profitability + 0.307*Revenue Growth

Only 6.3% of the variability in TSR can be explained by the variability in Operating Profitability and Revenue Growth, and although the regression is statistically significant it is shown that, the practical effect size is insignificant. Secondary objective E is successfully realised in the study.

4.3.2 Conclusions

In section 4.3.1, the realisation of all the secondary objectives is illustrated. The internal drivers of shareholder wealth have been identified, quantified and used to examine the relationship between the value drivers and actual shareholder wealth creation. From the research findings, it is concluded that Revenue Growth and Operating profitability have a positive statistically significant effect on TSR in the Mining Sector in South Africa for the period from 1999 to 2008. The effect size of the relationship is however small, which implies that the relationship is practically insignificant.

The findings in the study concur with several of those found in the literature, where no significant effect of internal value drivers or VBM metrics, such as EVA, could be found on shareholder value creation (see Brown (2006), Garvey & Milbourn (2000), El Mir & Seboui (2006), Ryan & Trahan (2003). The implication of the findings is that there are other effects not considered in this study. One of

these is WACC, which is the cost of capital for a firm. This variable depends on the capital structure of the firm (see Appendix A). In the Mining sector, several external factors may influence the share price of a firm, such as commodity prices, government intervention, mine safety issues and macro econornic conditions.

The primary objective of the study has been fulfilled as the quantification of the relationship between internal drivers of value and shareholder wealth creation has been investigated even though no practically significant relationships were found.

4.3.3 Recommendations for future research

The current investigation resulted in an explanation of only 6.3% of the variation in shareholder wealth creation by the internal value drivers used, the effect size of which is not practically significant. Future studies should aim at quantifying the effect of WACC on the shareholder value creation. A second topic for future studies is to determine from primary data sources the extent to which VBM is practiced in the Mining sector in South Africa and how successful the implementation is. A third investigation could aim at determining which external factors have an effect on shareholder wealth creation.

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APPENDIX A: EQUATIONS

$$V_{op(N)} = \frac{FCF_N(1+g)}{WACC - g}$$

Where:

$V_{op(N)}$ = Value of operations at time N

FCF_N = Free cash flow at time N

g = Growth in revenue

$$FCF = (NOPAT + Depreciation) - Gross\ investment\ in\ operating\ capital$$

Where:

$NOPAT$ = Net operating profit after taxes

$$NOPAT = EBIT(1 - Taxrate)$$

Where:

$EBIT$ = Earnings before interest and taxes

$Taxrate$ = Government tax rate on the firm earnings

$$EBIT = Sales - Costs - Depreciation$$

Where:

$Sales$ = Net sales revenue

$Costs$ = Operating costs excluding depreciation and amortisation

Gross investment in operating capital = Gross fixed asset expense + Operating current Assets – Operating current liabilities

$$WACC = w_d r_d (1 - Taxrate) + w_{ps} r_{ps} + w_{ce} r_s$$

Where:

w_d = Debt ratio of firm

w_{ps} = Preferred share ratio of firm

w_{ce} = Common share ratio of firm

r_d = Cost of debt which is equivalent to the interest rate charged by the banks

r_{ps} = Cost of preferred shares

r_s = Cost of equity

$$r_{ps} = \frac{D_{ps}}{P_n}$$

Where:

D_{ps} = Dividends on preferred shares

P_n = Price of preferred shares

$r_s = r_{RF} + RP_m b_i$ (Capital Asset Pricing Model approach)

Where:

r_{RF} = Risk free rate of return estimated by the rate on long term treasury bonds

RP_m = Market return minus the risk free rate or equity risk premium

b_i = Beta value for the firm which is an estimation of the volatility of a share in relation to the market volatility

$$r_s = \frac{D_1}{P_o} + g$$ (Dividend-yield-plus-growth-rate approach)

Where:

D_1 = Dividend expected to be paid at the end of year one

P_o = Current share price

g = Expected growth in revenue

r_s = *Bond yield* + *Bond risk premium* (Bond-yield-plus-risk-premium approach)

APPENDIX B: FIRM DATA

Revenue per financial year ('thousands)

Firm	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Currency
WESCOAL HOLDINGS LIMITED								194,786.00	178,735.00	269,558.00	376,087.93	R
TAWANA RESOURCES NL						361,787.00	245,466.00	11.00	55.00	39.00	-	$
THABEX LIMITED				247.00	525.00	594.00	211.00	427.00	46.00	80.00	430.07	R
TRANS HEX GROUP LIMITED	333,469.00	315,743.00	366,476.00	506,041.00	831,288.00	972,220.00	1,079,734.00	1,014,798.00	1,087,897.00	1,035,811.00	929,155.00	R
AFRICAN RAINBOW MINERALS LIMITED	16,021,500.00	2,489,000.00	2,934,000.00	2,806,000.00	4,047,000.00	4,896,000.00	3,885,000.00	5,485,000.00	4,622,000.00	6,152,000.00	12,919,000.00	R
ANGLO AMERICAN PLC	92,332,000.00	11,578,000.00	14,824,000.00	14,786,000.00	15,145,000.00	18,637,000.00	24,930,000.00	29,434,000.00	33,072,000.00	25,470,000.00	-	$
ASSORE LIMITED	687,027.00	741,762.00	963,614.00	1,146,082.00	1,514,406.00	1,753,027.00	2,228,091.00	3,093,944.00	3,382,587.00	4,293,036.00	9,158,937.00	R
BHP BILLITON PLC	5,446,000.00	4,622,000.00	4,991,000.00	17,789,000.00	15,906,000.00	15,608,000.00	22,887,000.00	29,587,000.00	34,139,000.00	41,271,000.00	51,918,000.00	$
COAL OF AFRICA LIMITED						1,356.78	17,588.55	31,520.38	32,340.60	61,739.00	53,774.00	$
MATODZI RESOURCES LIMITED			21,994.00	14,868.00	13,239.00	102,000.00	149,391.00	239,900.00	401,523.00	135,760.00	-	R
MERAFE RESOURCES LIMITED	50.00	2,705.00	32,453.00	70,857.00	44,643.00	183,782.00	554,442.00	614,562.00	1,030,486.00	1,655,803.00	-	R
METOREX LIMITED	71,538.00	75,753.00	597,680.00	720,258.00	820,325.00	886,317.00	1,055,417.00	1,030,009.00	1,454,107.00	1,703,757.00	2,438,519.00	R
MVELAPHANDA RESOURCES LIMITED	-	-	20,694.00	323,054.00	2,911,107.00	3,189,576.00	3,487,126.00	3,221,310.00	3,102,432.00	3,461,586.00	3,538,918.00	R
PETMIN LIMITED	47,958.00	56,656.00	342,583.00	276,031.00	366,990.00	-	-	58,737.00	176,676.00	382,341.00	666,879.00	R
SA MINERAL RESOURCES CORP LIMITED	-	-	1,298.00	8,772.00		14,045.00		14,208.00	9,144.00	15,390.00		R
SALLIES LIMITED	-	-	88,876.00	99,031.00	114,115.00	83,288.00		101,157.00	86,882.00	109,315.00		R
SENTULA MINING LIMITED	272,178.00	186,271.00	158,332.00	169,816.00	212,443.00	370,584.00	549,298.00	567,571.00	616,468.00	1,368,760.00	2,659,897.00	R
URANIUM ONE INC								2,730.00	50,449.00	134,024.00		R
ANGLOGOLD ASHANTI LIMITED	2,235,600.00	2,324,000.00	2,299,000.00	2,041,000.00	1,761,000.00	2,029,000.00	2,309,000.00	2,629,000.00	2,964,000.00	3,280,000.00		$
DRDGOLD LIMITED	771,571.00	1,071,058.00	2,043,634.00	2,141,749.00	2,638,994.00	2,192,142.00	2,408,598.00	1,668,562.00	1,599,994.00	1,534,777.00	1,843,912.00	R
GOLD FIELDS LIMITED	2,303,100.00	5,731,200.00	7,065,300.00	7,690,600.00	12,528,400.00	13,892,800.00	11,772,800.00	11,756,300.00	14,604,700.00	19,433,800.00	23,009,500.00	R
HARMONY GOLD MINING COMPANY LIMITED	1172574	2,256,000.00	2,995,600.00	4,495,000.00	7,806,000.00	8,995,000.00	8,789,000.00	7,822,000.00	6,823,000.00	9,148,000.00		R
Pamodzi Gold Limited									38,515.00	369,329.00		R
SIMMER AND JACK MINES LIMITED	5,383.00	3,328.00	10,348.00	29,741.00	46,129.00	51,909.00	38,381.00	30,886.00	200,348.00	602,947.00	854,915.00	R
ANGLO PLATINUM LIMITED	9,489,100.00	8,794,900.00	16,185,600.00	18,690,900.00	20,285,700.00	16,508,600.00	19,624,800.00	23,308,400.00	39,355,700.00	46,961,000.00		R
AQUARIUS PLATINUM LIMITED			47,750.00	98,046.00	94,922.00	96,862.00	191,875.00	212,922.00	417,428.00	690,000.00	929,012.00	$
EASTERN PLATINUM LIMITED	-						-	-	-	101,205.00		R
IMPALA PLATINUM HOLDINGS LIMITED	3,380,600.00	4,183,000.00	6,069,400.00	11,969,100.00	11,901,500.00	11,807,000.00	11,809,100.00	12,540,800.00	17,500,200.00	31,481,500.00	37,616,000.00	R
LONMIN PLC	1,004,000.00	896,000.00	951,000.00	866,000.00	697,000.00	779,000.00	1,030,000.00	1,128,000.00	1,855,000.00	1,941,000.00		£
NORTHAM PLATINUM LIMITED	539,279.00	719,497.00	1,051,953.00	1,567,883.00	1,560,685.00	1,471,999.00	1,720,399.00	1,554,501.00	2,386,326.00	3,739,805.00	3,886,134.00	R

Dividends paid (R cents)											
Firm	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
WESCOAL HOLDINGS LIMITED		-	-	-	-	-	-	-	-	-	-
TAWANA RESOURCES NL	-	-	-	-	-	-	-	-	-	-	-
THABEX LIMITED	-	-	-	-	-	-	-	-	-	-	-
TRANS HEX GROUP LIMITED	110.00	114.00	33.00	42.00	52.50	66.00	73.00	40.00	30.00	20.00	10.00
AFRICAN RAINBOW MINERALS LIMITED	214.00	70.00	1,123.00	-	-	-	-	-	-	150.00	400.00
ANGLO AMERICAN PLC	734.29	914.63	1,439.39	583.33	435.90	360.00	397.73	500.00	1,232.39	848.16	925.15
ASSORE LIMITED	600.00	40.00	30.00	32.00	60.00	65.00	45.00	95.00	230.00	350.00	1,250.00
BHP BILLITON PLC	62.13	63.25	78.47	96.77	134.02	130.63	179.31	187.92	230.76	330.85	535.47
COAL OF AFRICA LIMITED	-	-	-	-	-	-	-	-	-	-	-
MATODZI RESOURCES LIMITED	-	-	-	-	-	-	-	-	-	76.00	-
MERAFE RESOURCES LIMITED	-	-	-	-	-	-	-	-	-	-	-
METOREX LIMITED	-	-	15.00	18.00	12.00	14.00	3.00	-	-	-	-
MVELAPHANDA RESOURCES LIMITED	-	-	-	434.67	-	29.00	-	-	-	-	-
PETMIN LIMITED	10.00	475.20	-	-	-	-	-	-	-	-	-
SA MINERAL RESOURCES CORP LIMITED	-	-	-	-	-	-	-	-	-	-	-
SALLIES LIMITED	-	-	-	-	-	-	-	-	-	-	-
SENTULA MINING LIMITED	3.20	-	-	1.30	2.00	3.00	4.50	7.50	12.00	17.00	21.00
URANIUM ONE INC	-	-	-	-	-	-	-	-	-	-	-
ANGLOGOLD ASHANTI LIMITED	1,550.00	2,000.00	1,400.00	1,800.00	1,350.00	710.00	350.00	232.00	450.00	143.00	-
DRDGOLD LIMITED	-	-	-	-	-	-	-	-	-	-	-
GOLD FIELDS LIMITED	-	80.00	20.00	105.00	90.00	250.00	140.00	70.00	150.00	185.00	1,185.00
HARMONY GOLD MINING COMPANY LIMITED	-	110.00	120.00	120.00	500.00	275.00	70.00	-	-	-	-
Pamodzi Gold Limited	-	-	-	-	-	-	-	-	-	-	-
SIMMER AND JACK MINES LIMITED	-	-	-	-	-	-	-	-	-	-	-
ANGLO PLATINUM LIMITED	203.33	700.00	2,410.00	2,200.00	1,800.00	640.00	735.00	1,180.00	5,300.00	5,200.00	-
AQUARIUS PLATINUM LIMITED	-	-	-	-	-	-	-	33.33	171.43	211.27	146.24
EASTERN PLATINUM LIMITED	-	-	-	-	-	-	-	-	-	-	-
IMPALA PLATINUM HOLDINGS LIMITED	350.00	880.00	1,760.00	6,800.00	3,700.00	2,650.00	2,100.00	2,300.00	8,700.00	975.00	1,475.00
LONMIN PLC	170.30	174.25	362.32	576.58	757.89	500.00	467.53	436.36	709.22	793.10	-
NORTHAM PLATINUM LIMITED	-	25.00	120.00	235.00	245.00	90.00	105.00	70.00	280.00	525.00	330.00

Share price at the end of the financial year (R cents)											
Firm	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
WESCOAL HOLDINGS LIMITED		-	-	-	-	-	-	-	60.00	74.00	105.00
TAWANA RESOURCES NL	-	-	-	-	-	-	-	405.00	108.00	62.00	-
THABEX LIMITED	100.00	24.00	28.00	70.00	65.00	45.00	41.00	36.00	90.00	211.00	200.00
TRANS HEX GROUP LIMITED	1,957.00	1,837.00	826.00	1,276.00	1,517.00	2,009.00	2,798.00	1,770.00	1,229.00	1,462.00	930.00
AFRICAN RAINBOW MINERALS LIMITED	4,244.00	3,412.00	5,064.00	3,716.00	3,862.00	3,994.00	3,443.00	3,260.00	4,532.00	12,465.00	2,800.00
ANGLO AMERICAN PLC	17,297.00	38,111.00	40,885.00	18,045.00	12,507.00	13,625.00	13,361.00	20,829.00	33,837.00	43,087.00	41,502.00
ASSORE LIMITED	18,000.00	2,000.00	2,528.00	3,969.00	6,500.00	8,218.00	6,405.00	10,592.00	11,718.00	25,865.00	81,500.00
BHP BILLITON PLC	1,171.00	1,996.00	2,668.00	4,058.00	5,506.00	4,313.00	5,410.00	8,484.00	12,598.00	18,908.00	29,647.00
COAL OF AFRICA LIMITED	-	-	-	-	-	-	-	-	-	711.00	3,175.00
MATODZI RESOURCES LIMITED	36.00	36.00	33.00	15.00	13.00	60.00	40.00	83.00	116.00	23.00	25.00
MERAFE RESOURCES LIMITED	20.00	31.00	47.00	60.00	125.00	75.00	76.00	62.00	74.00	221.00	-
METOREX LIMITED	255.00	242.00	196.00	378.00	345.00	216.00	233.00	393.00	955.00	2,579.00	2,250.00
MVELAPHANDA RESOURCES LIMITED	528.00	175.00	338.00	1,441.00	2,343.00	2,441.00	1,869.00	1,510.00	3,102.00	6,209.00	-
PETMIN LIMITED	353.00	204.00	148.00	140.00	502.00	23.00	44.00	77.00	127.00	215.00	460.00
SA MINERAL RESOURCES CORP LIMITED	8.00	5.00	7.00	4.00	-	4.00	1.00	2.00	2.00	8.00	8.80
SALLIES LIMITED	60.00	89.00	49.00	60.00	52.00	27.00	34.00	33.00	69.00	101.00	-
SENTULA MINING LIMITED	39.00	18.00	16.00	34.00	42.00	53.00	112.00	301.00	874.00	1,691.00	1,770.00
URANIUM ONE INC	-	-	-	-	-		-	3,326.00	8,695.00	6,027.00	-
ANGLOGOLD ASHANTI LIMITED	11,460.00	15,830.00	11,050.00	21,100.00	29,050.00	31,400.00	20,800.00	29,213.00	32,909.00	31,375.00	-
DRDGOLD LIMITED	1,300.00	1,040.00	700.00	925.00	4,299.00	1,740.00	1,540.00	580.00	951.00	562.00	515.00
GOLD FIELDS LIMITED	3,070.00	2,070.00	2,660.00	3,625.00	12,180.00	8,831.00	6,390.00	7,260.00	13,466.00	11,585.00	9,800.00
HARMONY GOLD MINING COMPANY LIMITED	2,450.00	2,840.00	3,750.00	4,690.00	14,200.00	9,271.00	6,531.00	5,550.00	10,802.00	10,200.00	9,500.00
Pamodzi Gold Limited	-	-	-	-	-				1,902.00	1,300.00	-
SIMMER AND JACK MINES LIMITED	26.00	14.00	12.00	18.00	25.00	15.00	30.00	50.00	146.00	618.00	571.00
ANGLO PLATINUM LIMITED	8,552.00	18,117.00	32,866.00	41,322.00	31,964.00	27,403.00	20,087.00	44,402.00	82,640.00	98,872.00	-
AQUARIUS PLATINUM LIMITED	-	-	-	-	-	-	-	3,686.00	8,881.00	21,612.00	12,443.00
EASTERN PLATINUM LIMITED	-	-	-	-	-	-	-	-	-	1,639.00	2,080.00
IMPALA PLATINUM HOLDINGS LIMITED	4,957.00	16,320.00	25,518.00	41,945.00	57,537.00	48,786.00	46,609.00	58,162.00	110,551.00	22,906.00	30,601.00
LONMIN PLC	2,741.00	5,614.00	9,029.00	10,361.00	14,378.00	11,365.00	12,721.00	14,553.00	37,544.00	47,127.00	-
NORTHAM PLATINUM LIMITED	289.00	481.00	685.00	1,568.00	1,778.00	1,347.00	901.00	1,159.00	3,215.00	5,785.00	6,700.00

Tax paid per financial year ('thousands)												
Firm	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**Currency**
WESCOAL HOLDINGS LIMITED		-	-	-	-	-	-	-	760.00	1,530.00	4,384.00	R
TAWANA RESOURCES NL	-	-	-	-	-	-	-	-	-	-	-	$
THABEX LIMITED	-	-	-	-	-	-	-	4,376.00	-	-	-	R
TRANS HEX GROUP LIMITED	26,499.00	20,084.00	10,455.00	4,802.00	33,759.00	111,633.00	112,728.00	88,693.00	71,114.00	48,883.00	10,354.00	R
AFRICAN RAINBOW MINERALS LIMITED	303,400.00	101,000.00	205,000.00	130,000.00	158,000.00	100,000.00	105,000.00	357,000.00	284,000.00	376,000.00	2,084,000.00	R
ANGLO AMERICAN PLC	2,168,000.00	309,000.00	634,000.00	1,046,000.00	643,000.00	349,000.00	723,000.00	1,308,000.00	2,390,000.00	2,428,000.00	-	$
ASSORE LIMITED	11,297.00	46,902.00	26,322.00	37,441.00	80,469.00	48,009.00	57,207.00	160,041.00	159,256.00	369,048.00	1,509,091.00	R
BHP BILLITON PLC	156,000.00	102,000.00	223,000.00	778,000.00	683,000.00	827,000.00	1,292,000.00	2,237,000.00	4,312,000.00	5,265,000.00	7,521,000.00	$
COAL OF AFRICA LIMITED	-	-	-	-	-	-	-	-	-	2,419.00	919.60	$
MATODZI RESOURCES LIMITED	-	-	-	-	967.00	312.00	5.00	-40,331.00	9,585.00	115,650.00	-	R
MERAFE RESOURCES LIMITED	-	-	-	-	-	-	-	3,535.00	3,834.00	3,584.00	-	R
METOREX LIMITED	-	-	11,830.00	29,044.00	26,555.00	7,009.00	-8,292.00	11,759.00	17,688.00	132,709.00	335,271.00	R
MVELAPHANDA RESOURCES LIMITED	969.00	296.00	307.00	102,959.00	1,724.00	821.00	2,669.00	31,374.00	34,207.00	382,943.00	-	R
PETMIN LIMITED	360.00	-	-	-	1,500.00	67,352.00	216.00	550.00	-637.00	15,613.00	36,736.00	R
SA MINERAL RESOURCES CORP LIMITED	-	-	-	-	-	-	-	-	-	-	-	R
SALLIES LIMITED	-	-	3,286.00	249.00	3,547.00	-	-	11.00	-	-	-	R
SENTULA MINING LIMITED	938.00	-	-	217.00	321.00	199.00	-	645.00	2,053.00	28,957.00	63,889.00	R
URANIUM ONE INC	-	-	-	-	-	-	-	-	42.00	41,346.00	-	R
ANGLOGOLD ASHANTI LIMITED	31,000.00	37,000.00	73,000.00	111,000.00	165,000.00	142,000.00	-41,000.00	-35,000.00	180,000.00	145,000.00	-	$
DRDGOLD LIMITED	40,992.00	2,088.00	-4,872.00	-57,341.00	-181,695.00	474,312.00	3,175.00	15,529.00	24,392.00	-737.00	68,303.00	R
GOLD FIELDS LIMITED	20,200.00	-826,200.00	-38,500.00	-66,100.00	1,227,100.00	1,363,500.00	60,500.00	101,500.00	1,023,900.00	1,522,700.00	-	R
HARMONY GOLD MINING COMPANY LIMITED	-708.00	13,900.00	86,000.00	111,000.00	583,000.00	274,000.00	-294,000.00	-729,000.00	138,000.00	271,000.00	465,000.00	R
Pamodzi Gold Limited	-	-	-	-	-	-	-	-	1,125.00	67.00	-	R
SIMMER AND JACK MINES LIMITED	-	-	-	-	-	-	-	-	1.00	2.00	33,098.00	R
ANGLO PLATINUM LIMITED	557,700.00	591,700.00	2,319,300.00	3,780,700.00	1,735,200.00	449,500.00	449,900.00	636,000.00	3,382,900.00	4,428,000.00	-	R
AQUARIUS PLATINUM LIMITED	-	-	-	-	-	-	-	3,430.00	26,098.00	60,573.00	-	$
EASTERN PLATINUM LIMITED	-	-	-	-	-	-	-	-	-	-	-	R
IMPALA PLATINUM HOLDINGS LIMITED	266,900.00	500,000.00	876,000.00	1,974,300.00	1,694,900.00	1,219,700.00	801,900.00	906,500.00	2,259,700.00	3,379,200.00	-	R
LONMIN PLC	17,000.00	21,000.00	87,000.00	129,000.00	63,000.00	63,000.00	59,000.00	94,000.00	245,000.00	210,000.00	-	£
NORTHAM PLATINUM LIMITED	-	5,469.00	43,108.00	71,935.00	79,741.00	119,817.00	132,361.00	134,803.00	332,731.00	757,435.00	-	R

NOPAT per financial year ('thousands)												
Firm	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	Currency
WESCOAL HOLDINGS LIMITED	-	-	-	-	-	-	-	-	3,586.00	3,293.00	13,510.00	R
TAWANA RESOURCES NL	-	-	-	-	-	-	-	5,676.00	2,300.00	7,386.00	-	$
THABEX LIMITED	955.00	915.00	586.00	1,741.00	2,706.00	9,763.00	1,096.00	11,980.00	3,059.00	3,305.00	12,177.00	R
TRANS HEX GROUP LIMITED	121,956.00	84,318.00	160,034.00	248,876.00	409,008.00	348,863.00	173,136.00	84,866.00	210,853.00	220,463.00	157,615.00	R
AFRICAN RAINBOW MINERALS LIMITED	733,000.00	4,010,000.00	4,378,000.00	1,315,000.00	833,000.00	350,000.00	1,653,000.00	1,610,000.00	1,177,000.00	2,313,000.00	5,223,000.00	R
ANGLO AMERICAN PLC	14,264,000.00	2,638,000.00	1,250,000.00	4,187,000.00	4,903,000.00	5,857,000.00	7,053,000.00	4,986,000.00	7,537,000.00	10,195,000.00	-	$
ASSORE LIMITED	28,725.00	189,728.00	188,570.00	272,477.00	693,974.00	202,041.00	371,658.00	859,168.00	762,469.00	830,862.00	3,216,381.00	R
BHP BILLITON PLC	816,000.00	550,000.00	1,053,000.00	2,193,000.00	2,524,000.00	2,614,000.00	3,646,000.00	6,621,000.00	11,732,000.00	14,459,000.00	16,624,000.00	$
COAL OF AFRICA LIMITED	-	-	-	-	-	-	-	-	-	3,504.00	16,883.60	$
MATODZI RESOURCES LIMITED	98,537.00	2,098.00	77,147.00	26,495.00	2,359.00	15,588.00	27,439.00	85,186.00	315,081.00	698,022.00	-	R
MERAFE RESOURCES LIMITED	727.00	1,591.00	1,936.00	14,491.00	9,935.00	69,709.00	33,241.00	107,164.00	174,759.00	460,314.00	-	R
METOREX LIMITED	3,135.00	2,385.00	117,597.00	128,691.00	5,627.00	40,107.00	10,349.00	113,611.00	365,579.00	788,886.00	706,772.00	R
MVELAPHANDA RESOURCES LIMITED	31,754.00	14,727.00	16,320.00	211,614.00	95,117.00	52,585.00	134,957.00	506,598.00	3,490,693.00	1,367,451.00	1,870,153.00	R
PETMIN LIMITED	23,096.00	79,610.00	18,062.00	20,562.00	54,409.00	458,335.00	6,388.00	17,027.00	27,490.00	82,543.00	391,863.00	R
SA MINERAL RESOURCES CORP LIMITED	1,339.00	2,073.00	2,365.00	3,217.00	-	2,995.00	1,249.00	916.00	1,800.00	185.00	-	R
SALLIES LIMITED	474.00	1,251.00	8,866.00	12,747.00	9,821.00	13,293.00	11,666.00	13,233.00	39,045.00	26,492.00	-	R
SENTULA MINING LIMITED	37,494.00	5,550.00	15,114.00	9,362.00	13,937.00	53,401.00	61,333.00	118,498.00	149,816.00	288,358.00	280,382.00	R
URANIUM ONE INC	-	-	-	-	-	-	-	38,863.00	30,688.00	26,499.00	-	R
ANGLOGOLD ASHANTI LIMITED	392,000.00	420,000.00	210,000.00	303,000.00	356,000.00	341,000.00	176,000.00	37,000.00	80,000.00	534,000.00	-	$
DRDGOLD LIMITED	136,092.00	45,998.00	825,686.00	231,602.00	541,989.00	116,958.00	203,312.00	430,649.00	82,108.00	1,142,263.00	1,102,397.00	R
GOLD FIELDS LIMITED	1,175,100.00	735,300.00	639,800.00	893,600.00	3,019,000.00	2,841,200.00	785,200.00	158,700.00	1,765,900.00	2,881,800.00	-	R
HARMONY GOLD MINING COMPANY LIMITED	19,377.00	184,900.00	402,800.00	232,000.00	1,926,000.00	907,000.00	184,000.00	2,912,000.00	210,000.00	667,000.00	65,000.00	R
Pamodzi Gold Limited	-	-	-	-	-	-	-	-	11,822.00	205,694.00	-	R
SIMMER AND JACK MINES LIMITED	6,149.00	11,195.00	4,336.00	3,243.00	3,271.00	5,316.00	23,939.00	39,167.00	2,659.00	202,447.00	235,579.00	R
ANGLO PLATINUM LIMITED	2,995,800.00	3,054,500.00	7,837,000.00	9,141,100.00	7,901,300.00	4,004,400.00	5,165,400.00	7,709,300.00	15,893,900.00	17,941,000.00	-	R
AQUARIUS PLATINUM LIMITED	-	-	-	-	-	-	-	36,436.00	193,096.00	335,396.00	-	$
EASTERN PLATINUM LIMITED	-	-	-	-	-	-	-	-	-	4,347.00	-	R
IMPALA PLATINUM HOLDINGS LIMITED	674,600.00	1,274,100.00	2,302,000.00	4,737,500.00	4,511,900.00	3,133,100.00	2,105,700.00	6,038,900.00	5,321,800.00	8,256,500.00	-	R
LONMIN PLC	122,000.00	228,000.00	452,000.00	444,000.00	315,000.00	240,000.00	372,000.00	322,000.00	506,000.00	585,000.00	-	£
NORTHAM PLATINUM LIMITED	30,088.00	175,964.00	406,772.00	837,498.00	666,415.00	442,756.00	355,733.00	348,371.00	851,826.00	1,472,411.00	-	R

Operating capital per financial year ('thousands)												
Firm	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**Currency**
WESCOAL HOLDINGS LIMITED		-	-	-	-	-	-	-	46,938.00	67,730.00	116,949.00	R
TAWANA RESOURCES NL	-	-	-	-	-	-	-	5,961.00	4,435.00	1,162.00	-	$
THABEX LIMITED	1,809.00	2,257.00	1,350.00	735.00	3,089.00	2,290.00	2,000.00	20,678.00	12,301.00	5,141.00	3,494.00	R
TRANS HEX GROUP LIMITED	156,635.00	155,294.00	216,164.00	164,870.00	438,437.00	537,966.00	571,276.00	425,014.00	502,081.00	359,247.00	315,683.00	R
AFRICAN RAINBOW MINERALS LIMITED	7,928,500.00	2,814,000.00	6,951,000.00	4,719,000.00	5,568,000.00	4,039,000.00	4,143,000.00	4,889,000.00	4,248,000.00	7,021,000.00	12,595,000.00	R
ANGLO AMERICAN PLC	45,098,000.00	8,954,000.00	12,741,000.00	11,163,000.00	16,072,000.00	22,125,000.00	28,648,000.00	28,712,000.00	27,834,000.00	23,391,000.00		$
ASSORE LIMITED	149,925.00	475,514.00	641,124.00	702,149.00	943,294.00	1,025,387.00	1,267,319.00	1,692,261.00	1,775,443.00	4,365,484.00	7,376,719.00	R
BHP BILLITON PLC	5,143,000.00	6,024,000.00	6,518,000.00	20,228,000.00	21,367,000.00	19,403,000.00	21,834,000.00	27,779,000.00	23,290,000.00	44,041,000.00	53,443,000.00	$
COAL OF AFRICA LIMITED	-	-	-	-	-	-	-	-	-	77,062.00		$
MATODZI RESOURCES LIMITED	1,213.00	1,937.00	35,757.00	32,129.00	27,998.00	1,351.00	1,076.00	106,232.00	376,595.00	21,704.00	-	R
MERAFE RESOURCES LIMITED	29.00	5,600.00	24,540.00	31,350.00	97,673.00	119,712.00	497,849.00	695,606.00	615,870.00	937,256.00	-	R
METOREX LIMITED	15,111.00	16,833.00	170,036.00	241,971.00	264,653.00	194,662.00	235,830.00	421,910.00	423,148.00	869,619.00	3,562,361.00	R
MVELAPHANDA RESOURCES LIMITED	38,116.00	37,686.00	31,727.00	126,853.00	536,517.00	85,148.00	225,669.00	172,827.00	183,041.00	1,510,100.00	1,065,627.00	R
PETMIN LIMITED	15,528.00	37,639.00	56,888.00	59,268.00	53,961.00	37,478.00	32,230.00	103,590.00	333,326.00	459,310.00	777,605.00	R
SA MINERAL RESOURCES CORP LIMITED	15,561.00	13,898.00	15,320.00	14,857.00	-	16,620.00	14,333.00	15,378.00	13,202.00	13,537.00	-	R
SALLIES LIMITED	282.00	301.00	34,130.00	30,431.00	49,963.00	36,153.00	34,627.00	26,910.00	12,765.00	49,932.00	-	R
SENTULA MINING LIMITED	317,765.00	287,912.00	251,879.00	246,440.00	295,452.00	443,668.00	545,874.00	706,322.00	886,385.00	2,040,300.00	3,234,829.00	R
URANIUM ONE INC	-	-	-	-	-	-	-	136,015.00	485,280.00	944,135.00	-	R
ANGLOGOLD ASHANTI LIMITED	2,430,000.00	3,635,000.00	3,043,000.00	2,158,000.00	3,197,000.00	3,690,000.00	6,819,000.00	6,477,000.00	6,444,000.00	5,872,000.00	-	$
DRDGOLD LIMITED	709,905.00	863,989.00	825,944.00	714,910.00	964,433.00	1,271,932.00	1,340,135.00	1,174,640.00	1,856,935.00	605,600.00	1,853,500.00	R
GOLD FIELDS LIMITED	5,308,100.00	12,077,300.00	12,632,600.00	11,540,100.00	17,932,000.00	17,213,500.00	21,150,400.00	21,889,800.00	28,671,700.00	49,329,700.00	-	R
HARMONY GOLD MINING COMPANY LIMITED	1,654,105.00	2,218,900.00	4,173,700.00	7,014,000.00	12,195,000.00	13,613,000.00	27,609,000.00	30,960,000.00	31,683,000.00	29,384,000.00	29,266,000.00	R
Pamodzi Gold Limited	-	-	-	-	-	-	-	6,787.00	284,231.00	173,794.00	-	R
SIMMER AND JACK MINES LIMITED	64,114.00	71,290.00	71,987.00	57,626.00	60,758.00	62,227.00	61,941.00	- 47,029.00	490,188.00	1,861,403.00	3,551,876.00	R
ANGLO PLATINUM LIMITED	1,778,800.00	2,088,900.00	3,067,300.00	9,005,100.00	4,812,500.00	5,440,700.00	7,776,500.00	8,788,800.00	15,075,800.00	15,306,000.00	-	R
AQUARIUS PLATINUM LIMITED	-	-	-	-	-	-	-	288,440.00	427,522.00	561,878.00	-	$
EASTERN PLATINUM LIMITED	-	-	-	-	-	-	-	-	-	33,417.00	-	R
IMPALA PLATINUM HOLDINGS LIMITED	2,181,900.00	1,601,900.00	1,756,600.00	2,371,300.00	2,535,600.00	2,618,700.00	3,530,900.00	5,022,600.00	6,742,500.00	11,282,200.00	19,540,000.00	R
LONMIN PLC	277,000.00	347,000.00	586,000.00	666,000.00	181,000.00	326,000.00	223,000.00	271,000.00	654,000.00	813,000.00	-	£
NORTHAM PLATINUM LIMITED	155,613.00	224,797.00	265,350.00	338,297.00	306,749.00	452,932.00	302,393.00	329,305.00	1,237,675.00	1,768,462.00	-	R