

Developing a share portfolio selection framework for the mining sector

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Mini-dissertation submitted in partial fulfillment of the requirements for the degree *Master* in Business Administration at the Potchefstroom Campus of the North-West University

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November 2015

ACKNOWLEDGEMENTS

I wish to express my sincere appreciation to everyone who contributed towards completion of this mini-dissertation.

The following people deserve special mention, I would not have been able to complete the MBA program without your support.

Thanks to our Lord and all His Glory giving me this great opportunity.

To my remarkable wife Liezel, who supported and encouraged me during the last three years completing the MBA program.

To my son André who became part of our lives during the last year and sharing my attention between times.

To all my friends and family who supported myself, Liezel and André during the last three years.

My supervisor, Prof. Ines Nel for his insight, direction and comments on this study.

To Mrs. Marelize Pretorius for the statistical analysis.

ABSTRACT

In order to make the right investment decision about future share prices one must be able to predict accurately. Nonetheless investment will still be bound to risk and volatility due to share market fluctuations. Therefore in the investment industry future share price prediction relies crucially on accurate forecast models. These models are constructed by analysts using a set of current and historical data available in order to predict what will play out in the near future.

The mining industry within South Africa and globally are experiencing enormous pressure due to commodity price constraints. In order to retain positive investor sentiment towards mining companies, companies are working around the clock to secure dividend pay-out as promised. Profit sharing through dividend pay-out is still a lucrative tool to keep investors within the mining sector.

The aim is to develop a share portfolio selection framework based on assertive criteria identified within the mining sector. The criteria will be utilised to develop a framework by which investors can indicate shares with high share price growth potential. This framework should reduce the risk of selecting poor performing shares within the mining sector.

Seventeen independent variable/criteria were selected in the process to develop a regression model. Only five variables/criteria were included in the final regression model namely: Price/Book value, Price/Earnings ratio, Dividend/Share, Revenue and Margin of Safety.

Only five years produced workable results for multiple regression models. It can therefore be concluded that no constant repeatable share portfolio selection framework for the mining sector in South Africa could be developed with the criteria set out in this research study.

ABBREVIATIONS

Abbreviation	Definition
CPI	Consumer Price Index
EBIT	Earnings Before Interest And Tax
EBITDA	Earnings Before Interest Tax Depreciation And Amortisation
EPS	Earnings Per Share
EPSGR	Earnings Per Share Growth Rate
EVA	Economic Value Added
FCF	Free Cash Flow
JSE	Johannesburg Securities Exchange
PGM	Platinum Group Metals
PPI	Purchase Price Index
PWC	Price Waterhouse Coopers
ROA	Return On Assets
ROE	Return On Equity
ROI	Return On Investment
ROIC	Return On Investment Capital
SML	Security Market Line

KEYWORDS: JSE, Share portfolio, Risk, Volatility, Investment Criteria, Investment framework, Mining Sector, Financial indicators, Shares, Stocks, Securities and Equity.

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CHAPTER 1

DEVELOPING AN INVESTMENT PORTFOLIO SELECTION FRAMEWORK FOR MINING SECTOR SHARES

1.1 INTRODUCTION

By diversifying through an investment portfolio, growing one's financial freedom can become a reality. This can be challenging but also rewarding. Including the right segments of shares in your portfolio can make all the difference. Not only is the mining sector in South Africa currently experiencing one of the biggest downfalls in terms of share price, but internationally this is also happening. In general, most of the commodity prices are stressed and investors are more cautious about investing in mining companies. Excessive turmoil was experienced in South Africa over the last decade – labour unrest, falling commodity prices, the weakening rand and recent downgrading by rating agencies. Mining companies have still managed; however, to attract major investors due to the lucrative returns and dividends on offer. Risk averse investors have benefited throughout the years by including mining sector shares in their portfolios. General observations from the press and other communication media, one may argue that these days, individuals and organisations are looking worldwide for attractive investment opportunities that will generate exceptional returns.

According to Olivier (cited by Investopedia, 2011:1), “investing in common stock, also called shares, securities or equities, is buying a part of a company listed on a stock exchange, in this case the JSE Limited. As an equity owner, voting rights are obtained to take part in the election of board members of the company. Profits are also generated per security in the form of dividends, although all companies do not pay out dividends”.

Investment involves making a capital commitment in order to gain capital or to generate income flow or a combination of both. In economic terms, investment utilises capital for maximum possible return (Olivier, 2011:1).

Analysing the current economic and political state within South Africa, investors need to consider various factors in order to fully understand the mining sector before investments can be considered. These factors include but are not limited to labour unrest, poor economic growth, a weakening rand, unemployment levels and corruption (Deloitte, 2014). South Africa is slowly losing its position as one of Africa's preferred investment destinations. These factors will be addressed in detail later in this study.

It is generally known that the mining sector plays a significant role in the growth rate of Gross Domestic Product (GDP). It is also important to keep in mind that South Africa and specifically the mining sector severely depends on exports to the international community. One may also argue that South Africa has the largest and most developed mining economy in Africa due to the abundance of resources (Kearney, 2012).

The mining industry contributes significant value in terms of GDP to the South African economy. Exceptional leadership will; however, be required from all stakeholders within the mining industry to ensure sustainable production outputs in order to secure investor confidence (PWC, 2014).

Taking all the above-mentioned into consideration, investing in shares within the mining sector poses a certain degree of risk. For investment consideration purposes, one has to remember the financial rule of thumb that the higher the risk, the greater the expected returns.

Cilliers (2004:110) recognises certain quantitative criteria in a five-step model approach. The purpose of this model is to determine the investment potential of individual securities based on the investment philosophy of Warren Buffet. The criteria of Cilliers will be discussed and evaluated in this study amongst other criteria suggested by previous research.

Olivier (2011:48) further developed these criteria proposed by Cilliers by making these criteria applicable to the South African mining industry. By evaluating the criteria suggested by previous economic studies, a workable investment framework will be created in this study to pinpoint which shares should be included within an investment.

1.2 BACKGROUND

Cilliers (2004:3) stated: "Investors are faced daily with numerous different investment opportunities; however, it seems as if there are only a few businesses worth buying into." To include the right shares in order to build acceptable rates of return for investment portfolios are sought after by probably all investors. The question should rather be which shares should be included in order to have the best possible return on a portfolio. The correlation between different types of shares is also of high importance and investors preferably choose portfolios with a low correlation in order to limit risk and in turn have an acceptable rate of return on a portfolio. The main reason from an investment point of view why investors combine portfolios is to diversify in order to gain maximum returns at minimum risk. This in itself can be challenging because merely looking at certain financial indicators will not be sufficient.

The main challenge is to develop a more user-friendly selection framework in the South African mining industry. This can be viewed as an unmanageable task due to lack of literature regarding

investment models especially when commodity prices have fallen to record lows in 2015. This argument is confirmed by PricewaterhouseCoopers (2014): “The scale of the challenges facing the industry is reflected in the relative decline in the JSE Mining Index in comparison to the JSE All Share Index over the last two years.”

By re-evaluating previous models, this study will aim to develop and establish a framework for investors to consider including mining sector shares to their investment portfolios. As stated by Olivier (2011:2), identifying these portfolios of common stocks within the mining sector in order to minimise risk and to generate maximum returns can be challenging. The study aims to develop a framework for the mining sector to assist investors in selecting the best possible shares that should be included within investment portfolios. By limiting the risks of investing within the mining sector and ensuring that investors can utilise the proposed framework, the best possible shares could be included thereby generating acceptable rates of return.

1.3 PROBLEM STATEMENT

Taking the above-mentioned into consideration, there seems to be a lack of existing share portfolio selection frameworks in the mining sector that can maximise return at minimum risk.

1.4 AIM OF THE STUDY

1.4.1 Main objective

To develop a share portfolio selection framework in order to select mining sector shares for investment. The selected shares should maximise returns and reduce risks as far as possible.

1.4.2 Secondary objectives

- I. To identify investment selection criteria for mining sector shares.
- II. To develop a theoretical framework for share selection in the mining sector.

1.5 SCOPE AND BOUNDRIES

In this study the focus will be on companies listed under the general mining sector of the JSE. In addition companies selected must have majority of operations in South Africa.

Companies with a market capitalisation of more than R500 million at the end of June 2014 are included in this study. The researcher decided to exclude companies with suspended listings as from 2014 onwards.

Only companies who met the criteria were selected. A list of all mining companies included in the study, meeting the above mentioned criteria will be tabled and named COM1 to COM18.

South African Government bond R157 rate for the last five years will apply as the risk free rate of return at 6.6%.

1.6 METHODOLOGY

The study consist of a literature review section followed by the empirical research section.

1.6.1 Literature review

Library searches was done using various search engines like EbscoHost and Google Scholar. Google searches for relevant websites with information regarding share portfolio selection framework and investment within the mining sector.

Keywords like Investment framework, Share portfolio, Mining Sector, Investment criteria, Investment criteria, Market, Financial indicators, Shares, Stocks, Securities and commodities were used.

A complete review of the literature will be included in the literature review section and references will be cited under reference list.

1.6.2 Empirical research

The population of this study will consist of listed companies in the general mining sector of the JSE, mostly operational within South Africa.

Sample size will consist of all mining companies meeting the criteria set out earlier in section 1.5.

Statistical Analysis Software will be used to interpret the data by means of regression analysis over the last 9 Years in order to see how the most important criteria were established, and how it changed over time from previous studies.

Information will be obtained from McGregor's I-net BFA expert and prepared in Excel for statistical analysis.

1.7 LIMITATIONS

Selection criteria excluded some global mining companies with their majority operations outside of South Africa. Small and medium size companies with high growth rates was excluded due to the criteria of R 500 'million market capitalization at the end of June 2014.

1.8 EXPOSITIONS OF CHAPTERS

Chapter 1: provides a road map to the research performed. It provided insight into the study that will be done. The impact of the general mining sector on the JSE is also highlighted. Contributing risk factors within the South African mining industry are emphasised for investment purpose. The general difficulties currently within the mining sector of South Africa is also explained.

Chapter 2 Literature review: Consist of general theoretical aspects and previous models/frameworks used to distinguish between shares/stocks. Most importantly criteria used in previous research studies will also be included. Established and contemporary theories on individual share investments will be investigated.

Chapter 3 Research Methodology: Address the background on investment research methodology. The investment criteria will be examined by means of regression analysis. The empirical process in order to evaluate the data obtained from the sample is provided through statistical analysis software. The empirical research of the study will include. Research methods, Research sample, Statistical methods etc.

Chapter 4 Results section: Report findings from the statistical analysis. Output tables and figures will be explained from the regression analysis.

Chapter 5 Recommendations/Findings & Conclusion: the final chapter of the mini-dissertation, will entail recommendations and conclusions on the research performed. Conclusions will be drawn from the empirical research performed in Chapter 4. Recommendations for execution of the process followed in order to determine the most important investment criteria are followed by recommendations for further study.

CHAPTER 2

CRITERIA SELECTION FOR INDIVIDUAL SHARES

2.1 INTRODUCTION

Within this section relevant theories will be discussed with specific reference to investment theories on how different financial indicators, ratios and investment analyses form part of the selection criteria used in this study. In order to build share portfolios that will yield acceptable returns within the mining sector, risk return relationship theories will also form part of this section.

2.2 INVESTMENT

Investment is seen as a crucial part of economics. Economists describe investment as the production of goods to enable the production of other goods. This definition is contrary to the popular use of the term where the acquisition of a share is seen as an investment. Investment takes many forms – machines in a factory used for production, roads and bridges as infrastructure and human capital as a non-physical investment are just a couple of examples (Hasset, 2008).

It is important to focus on the type of investment, either domestic or foreign. Foreign investment allows money to flow, even during times of low savings. In contrast, domestic investments are restricted to local sources. One of the key factors to consider is that foreign investment leads to returns or earnings leaving South Africa. This means that it is very difficult to generate savings (Hasset, 2008).

According to Magnusson and Wydick (2002:141), one of the key difficulties for emerging stock markets is to deliver high return on investments at a sustainable rate. Only when the economy as well as the equity market are stable and a decent return on investment is produced will international investors be willing to invest due to the attraction generated by the return on investments (Snyman, 2008:1).

From a book keeping perspective “financial assets on the other hand, can be defined as no more than entries on a bookkeeping system and do not contribute directly to the productive capacity of the economy but financial assets are also viewed as a type of investment (Cilliers, 2004:11). For purposes of this study, investment can be viewed as the return on average share price growth over time by investing in shares that will yield positive growth. The positive growth will be seen as the inflation on the share value. These shares will be indicated by the proposed share portfolio selection framework within the mining industry.

2.3 MARKET EQUILIBRIUM

According to Brigham and Erhardt (2005:269), if the expected rate of return is more than the required rate of return investors will invest in that specific market. Investors will start buying the shares and the demand for these specific shares will increase. If the demand for these shares outweigh the amount of shares available to purchase, a price increase will be experienced (Snyman, 2008:2).

The same principle can be applied to intrinsic value explained later on in 2.7.8 (page 17). If shares are priced lower than its intrinsic value these shares will be perceived as a good investment. The share price will rise due to an increase in demand from investors until the share price and intrinsic value are equivalent. When this level is reached the market equilibrium for a specific share is reached. If the demand for a specific share continues until the share price outweighs the intrinsic value this specific share will start to be overvalued (Snyman, 2008:2).

2.4 COMMON STOCKS

Common stocks are also known as equity or shares. Holders of common stock have voting rights within companies. Holders of common stock exercise control by electing a board of directors and exercise their voting right on corporate policy. Common stockholders are on the bottom of the priority ladder with regard to the structure of ownership. In the event of liquidation, common shareholders have a right to the assets of the company only after bondholders, preferred shareholders and other debt holders have been paid in full (Cilliers, 2004:14).

According to Cilliers (2004:13), “companies are not obliged to pay dividends to common stockholders and in the case of a company that is enjoying rapid growth in sales and earnings, investors would prefer that the earnings be retained in the business to fuel further growth”.

The Securities Services Act no 36 of 2004 entails that public companies listed on the Johannesburg Stock Exchange (JSE) should make financial reports available on a quarterly and yearly basis (Steinberg, 2000:27). This will allow investors to make informed decisions when purchasing shares from a specific firm.

For the purpose of this study only quantitative criteria will be evaluated by making use of common stock data also known as shares.

2.5 MARKET OVERVIEW

In 2013 the mining sector accounted for 8.3% of GDP directly, down from 8.6% in 2012. In 1970 the mining sector contributed 21% to South Africa's GDP (Anon, 2011). The mining industry; however, still remains one of the main contributors to the South African economy.

According to Statistics South Africa (2013), the South Africa population was an estimated 53.59 million with a labour force of 18 444 000 whereof 13 721 000 were employed and 4 723 000 (25.6%) were unemployed in the second quarter of 2013. A projected directly employed 2.7% (374 000) and indirectly 6.2% (850 000) of the 13 721 000 employed work force were employed in the mining industry whereof 91.7% of these were permanent contract holders during the second quarter of 2013 (Stats SA, 2013).

Unemployment is a huge challenge in South Africa due to the majority of unskilled labourers. Recent labour unrest within the mining industry has definitely damaged investor sentiment. The researcher is of the opinion that mining companies and especially top management should carefully consider all the options to manage difficult economic periods before letting employees go – especially if they are going to rehire employees shortly after an economic recovery (PWC, 2014).

Due to the significant impact labour unrest have on mining outputs a number of African countries decided that additional measures should be put in place. This was done to stabilise the mining industry in terms of volatility and more specifically labour unrest damaging investor relationships. By formulating new policies and strategies, private sector capital investments within the mining sector were increased (Basu, 2006:54). These policies included contingency plans, Skills development and reviewed remuneration packages. Giller (2006:45) stated that these new policies and strategies have led to healthy competition amongst mining investors seeking new opportunities in Africa.

Capital intensive projects; however, had to be parked in South Africa and production was either stopped or scaled down significantly due to the volatility of the mining industry and devastating effects such as declining markets (Hill, 2007:31).

South Africa's mining industry are left with only a few option and most importantly needs to grow its economy at a sustainable rate. This must be done in order to still be a priority as an investment destination. The indicated sustainable rate also used by Schaefer (1995) of 2.5% is in line with the global industry benchmark currently. This can only be achieved through intervention by increasing the international competition for the mining industry in Africa. Mining companies should

carefully consider and measure the viability of cost reducing alternatives before making investments (Ezzy, 2002:24).

As stated by Clasen (2011:1) and according to Oman (2000), “South Africa recognises that it must be globally competitive in order to magnetise and preserve mining investments.”

Table 2.1: indicates the financial highlights of the mining sector compiled by PricewaterhouseCoopers in 2014 (PWC, 2014).

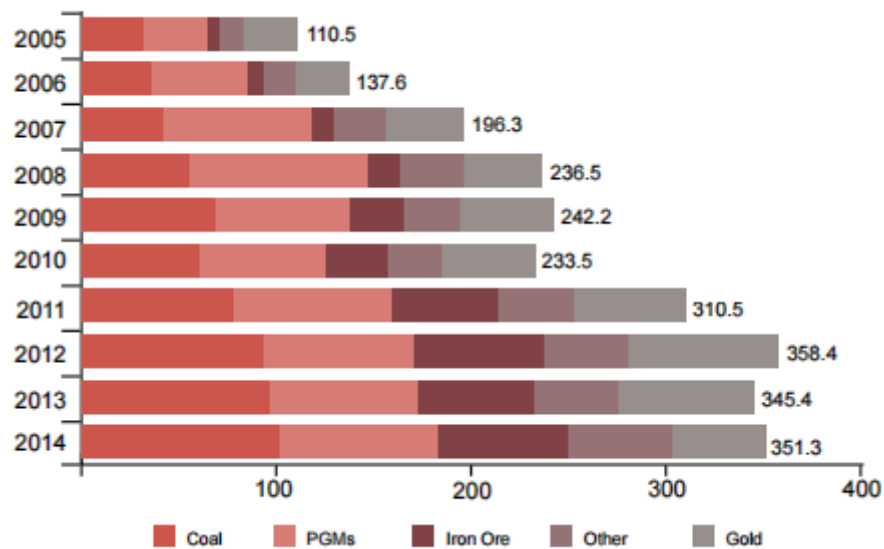
Table 2.1: Financial highlights, mining sector

SA mining sector 2014	2014 R 'billions	2013 R 'billions	Difference R ' billions	% Change
Revenue from ordinary activities	327	291	36	12%
Adjusted EBITDA	91	83	8	10%
Impairment charge	49	20	29	145%
Net profit	6	27	(21)	-78%
Distribution to shareholders	19	29	(10)	-34%
Net operating cash flow	70	75	(5)	-70%
Capital expenditure	57	70	(13)	-19%
Total assets	694	687	7	100%

Source: (PWC, 2014:3)

It is clearly notable in Table 2.1 that the mining industry in South Africa is under pressure. Capital expenditure due to cost cutting initiatives declined from R70 billion (2013) to R57 billion (2014) while net profit declined from R27 billion (2013) to R6 billion (2014). Revenue over the same period for the mining sector increased from R291 billion (2013) to R327 billion (2014). A lower profit margin was recorded due to the weakening rand/dollar and lower commodity prices. Investors should; therefore, tread carefully before making investment commitments and decisions within the mining sector. Although it is the distribution portion of R29 billion (2013) and R19 billion (2014) to the shareholders ensuring investor sentiment are retained within the mining industry.

Figure 2.1: Annual mining revenue per commodity group



Source: (PWC, 2014:3)

From Figure 2.1 above the annual revenue per sector can be compared. Overall the industry have not publicised any significant growth over the last three years. The gold sector once the cash cow of the South African mining industry now showing major declining revenue year on year. While the growing coal sector, Iron ore and other commodity groups compensating for the reduction in gold revenue dragging the revenue bar chart back in line with previous years.

2.5.1 Mining market summary

Taking the above-mentioned figures portrayed in Figure 2.1: Annual mining revenue per commodity group (PWC, 2014:3) and information from Table 2.1: Financial highlights, mining sector 2014 (PWC, 2014:3) into consideration, one can conclude that the mining sector still accounts for a significant part of investment in the South African economy. Private investments and total investments contribute 19.4% and 12%, respectively, to the South African economy.

Distribution of dividends to shareholders illustrated in Table 2.1 decreased from R29 billion in 2013 to R19 billion in 2014. Although dividends decreased, investors can still look forward to profit share at the end of the financial year.

2.6 SALES AND EXPORT

South African mineral sales increased by 5.8% in 2013 to R384.9 billion in 2014. See below Table 2.2: Export sales SA mining sector 2013 (CHOM, 2014).

Gold, Platinum Group Metals (PGMs), iron ore and coal accounted for 79.5% of South Africa's total mineral sales in 2013, compared to 81% in the previous year. Total primary mineral sales exports increased by 4% in 2013 to a total of R279.5 billion from R269 billion in 2012. This accounted for 30.5% of South Africa's total merchandise exports (CHOM, 2014).

Table 2.2: Export sales SA mining sector

Export sales 2013 (SA mining sector)	Local sales R 'billion	Total sales R 'billion	Total export R 'billion	Total export/ Total sales %
Gold	3.31	57.15	53.84	94.2%
Platinum Grp Metals	8.88	84.23	75.34	89.4%
Diamonds	7.54	12.33	4.7	38.1%
Silver	0.043	0.452	0.409	90.5%
SUBTOTAL	19.78	154.18	134.39	
Chrome	5.87	11.76	5.89	50.1%
Copper	4.05	5.81	1.76	30.3%
Iron ore	5.78	63.14	57.36	90.8%
Lead concentrate	0	0.683	0.683	
Manganese	1.5	14.41	12.9	89.5%
Nickel	1.21	6.95	5.74	82.6%
Other metallic	0.011	0.54	0.528	97.8%
Coal	49.56	101.38	51.813	51.1%
Feldspar	0.101	0.101	0	0.0%
Limestone & lime	2.8	2.82	0.02	0.7%
Other non-metallic	9.21	9.38	0.168	1.8%
Miscellaneous	5.47	13.74	8.26	60.1%
SUBTOTAL	85.61	230.75	145.14	62.9%
GRAND TOTAL	105.399	384.94	279.54	72.6%

Source: (CHOM, 2014)

2.7 VALUATION OF SHARES

2.7.1 Introduction

In order to evaluate stocks or shares there will be elaborated on valuation models for commons stock in this section only. For the purpose of this study, the researcher will only focus on valuation of common stocks.

The characteristics of bonds and stocks may seem quite different form each other, although the principle in valuing debt and equity are much the same. Applying these principles; however, to equity securities can be challenging.

2.7.2 Common stock valuation

The benefits that investors expect in value from a share of common stocks is the future value the share will be able to provide based on the current value investors are willing to pay. Non-contractual cash flows that are unspecified are recognised with common stocks. If shareholders sell these common stocks, benefits and rights are simply conveyed to the buyer or buyers (Megginson, *et al.*, 2010:131)

$$P_0 = \frac{D_1 + P_1}{(1 + r)^n}$$

Where:

P_0 = Equals the price today

D_1 = Dividend after one year

P_1 = Selling price

r = Required rate of return

One may argue that the common stock valuation model will be sensitive to the denominator r = required rate of return below the line. It is; therefore, important that analysts calculate the required rate of return as accurately as possible (Megginson, *et al.*, 2010:134).

2.7.3 Dividend model

In order to calculate the current share price one would have to know what the future dividend and discount rate will be for each year in calculation. Analysts do not find this an easy task to calculate. The discount rate also known as the required rate of return is highly dependent on the stocks risk on the return.

$$P_0 = \frac{D_1}{(1 + r)^1} + \frac{D_2}{(1 + r)^2} + \frac{D_3}{(1 + r)^3} + \frac{D_4}{(1 + r)^4} + \frac{D_5}{(1 + r)^5} + \dots$$

Where:

P_0 = Equals the price today

D_1 = Forecasted dividend after one year

D_2 = Forecasted dividend after two years.

r = Required rate of return

According to Olivier (cited by Muradoglu, 1999:17), "the aim of the discount rate is to take the time value of money into consideration". By repeating these steps over and over depending on

the number of years the forecasted data are available for one would be able to calculate the current share price.

According to Brigham and Ehrhardt (2005:507), the Dividend Growth model is occasionally unsuitable for valuation purposes of new companies and companies not declaring any dividends during the year.

Other critique against this model was stated by Rutherford (2004:141): “The model is very sensitive to change in dividends as an input variable.” This was verified by Beneda (2004:248) who is of the opinion that high value shares with a relative low dividend yield make it very difficult to predict share price based on the sensitivity of the dividend estimates used to calculate share price by using the dividend model.

2.7.3.1 Zero Growth model

If analysts use the Zero Growth model they assume that dividends will not grow over a certain period meaning that the dividends paid will be exactly the same year after year (Megginson, *et al.*, 2010:133).

This equates to:

$$P_0 = \frac{D}{r}$$

Where:

P_0 = Price today

D = Expected dividend

r = Required rate of return

The problem arising from the Zero Growth model is that it is assumed that both the dividend payout as well as the required return stays constant. This will only be valuable to analysts if proper evidence exists that shows that a specific firm shows zero growth in dividend pay-outs for numerous years.

2.7.3.2 Constant Growth model

According to Megginson *et al.* (2010:134), the Constant Growth model is probably the most used model and assumes that dividends grow at constant rate forever. In this case the value of a cash flow stream can be calculated using the constant growth formula:

$$P_0 = \frac{D_1}{r - g}$$

Where:

P_0 = Current share price

r = Required rate of return

g = Constant growth rate

D = Expected dividend

The constant growth rate g , is also a function of the retention rate multiplied by the return on equity and formulated as:

$$g = RR \times ROE$$

Where:

RR = Retention rate

ROE = Return on Equity

The Constant Growth model is also known as the Gordon Growth model named after Myron Gordon who promoted this model during the 1960's and 1970's. This model will be the most accurate when the assumption regarding constant growth rate is accurately estimated (Megginson *et al.*, 2010:135).

According to Plenborg (2002:308), by assuming what the dividend growth is, the share value estimation might be biased when using the Constant Growth model.

According to Jennergren (2008:1561), "a possible reason why the growth rate can cause this biased estimation is possibly due to the scenario created by the analyst performing the analysis. In other words, when the analyst sets out to determine a share value the estimation is based on historical values of growth."

2.7.3.3 Variable Growth model

This model is mostly used by analysts to evaluate companies that grow rapidly during a certain period of time and then stabilise again after the rapid growth period. The Variable Growth model will then be applied in order to evaluate stock prices. As stated by Megginson *et al.* (2010:135), the first part of the equation calculates dividends that are expected during the growth period. The second part of the equation calculates the present value at a constant growth rate during the stable period.

$$P_0 = \frac{D_0(1 + g_1)^1}{(1 + r)^1} + \frac{D_0(1 + g_1)^2}{(1 + r)^2} + \frac{D_0(1 + g_1)^N}{(1 + r)^N} + \left(\frac{1}{(1 + r)^N} \times \frac{D_N + 1}{r - g_2} \right)$$

Where:

D_0 = Per share dividend paid during the last month

g_1 = Fast growth rate during the rapid growth stage

g_2 = Stable growth rate

r = Required rate of return

Plenborg (2002:308) is of the opinion that the Variable Growth model can also be biased due to the assumption made with regards to the growth rate referred to g_1 and g_2 .

2.7.4 Free Cash Flow model

Free Cash Flow (FCF) represents the amount of cash companies can distribute to their investors after meeting all of their obligations. FCF can also be distributed to all types of investors that can include bondholders, preferred stock holders and common stock holders. If the FCF of companies generated over time is estimated, the total enterprise value can also be estimated. The FCF approach can be followed to establish a method that would enable one to evaluate a firm's share of common stocks without assuming what the dividend would be (Megginson *et al.*, 2010:140).

FCF can be calculated as follows:

$$FCF = NOPAT - \Delta NOWC - \Delta FA$$

Where:

FCF = Free Cash Flow

$NOPAT$ = Net Operating Profit After Tax

$\Delta NOWC$ = Change in the Operating Working Capital from year to year

ΔFA = Year to year change in fixed assets

And NOPAT can be calculated as follow:

$$NOPAT = EBIT \times (1 - T)$$

Where:

$EBIT$ = Earnings Before Interest and Tax

T = Corporate tax rate

2.7.5 Book value and book value per share

Book value can be described as a measure of the equity of companies indicated on their balance sheets. Book value is also known as book equity which includes the asset cost of companies that will be adjusted for depreciation minus the total firm liabilities (Megginson *et al.*, 2010:140). Book value is also related to liquidation value as both are measured to determine the value of a company.

The formula to determine Book value is as follows:

$$\text{Book value} = \text{Total assets} - \text{Total liabilities}$$

When all assets are sold and debts have been settled the amount left will comprise of the Book value (Megginson *et al.*, 2010:140).

According to Kemp (2012), “Book value can also be expressed on a per share basis. This is calculated by dividing the Book value of the company by the total number of shares on issue. This usually differs from the market price.”

Book value per share can then be employed to determine how the Book value per share for different companies compares to one another for investment purposes.

$$\text{Book value per share} = \frac{\text{Book value}}{\text{Total number of shares}}$$

According to Pourheydari (2008:16), Book value has the minutest value relevance to the valuation of stock analysis if the technique is compared to dividend and earnings valuation methods. The author then concluded that the low relevance of Book value to the share price valuation technique is due to high inflation rates (Olivier, 2011:18).

2.7.6 Liquidation value

When all liabilities have been settled with relevant stakeholders and all the assets have been sold, the total amount left will consist of the liquidation value. This value may either be less than the relevant Book value of a firm or more than the Book value depending of the value of assets and liabilities (Megginson *et al.*, 2010:142).

Investors of common stock will evaluate the liquidation value in order to establish if they will be able to recover a portion of the initial investment if the relevant firm is liquidated. The risk involved for investors would equate to losing the total investment sum due to common stock holders standing last in line for pay-out after liquidation. Common stock holders can only claim after

bondholders, preferred shareholders and other debt holders have been paid in full (Cilliers, 2004:14).

2.7.7 Price-to-Earnings Ratio (P/E)

In most cases the Price-to-Earnings Ratio (P/E) is used in order to determine what investors would be willing to pay for each amount of earnings. Financial press usually predicts a growth forecast for companies going forward using the P/E. Before applying the P/E, the Earnings Per Share (EPS) must firstly be accurately forecasted for the coming year by analysts. Secondly, analysts need to calculate the P/E of companies in their specific industry. Then lastly, the P/E forecasted per share should be multiplied with the EPS ratio in order to calculate what the estimated stock price for a relevant firm will be (Megginson *et al.*, 2010:143).

The equation for P/E multiples is as follows:

$$P_0 = \frac{dE_1}{r - g}$$

If a firm pays out a constant percentage of its earnings as dividends, the formula can be changed to the following:

$$\frac{P_0}{E_1} = \frac{d}{r - g}$$

Where:

E_1 = Next year's Earnings per Share

$\frac{P_0}{E_1}$ = Price-to-Earnings Ratio

r = Required rate of return

g = Constant growth rate

d = Pay out percentage

Thus, if g increase the P/E will also increase and strengthens the argument that companies with high P/E do have greater growth potential.

2.7.8 Intrinsic Value Per Share model

When using fundamental analysis, the true value of a company or stock can be calculated by means of the Intrinsic Value Per Share model. According to Olivier (as cited by Vick, 2001),

looking at Warren Buffet's way of intrinsic value per share calculations, the security attractiveness compared to the bond is stated in terms of a rate:

$$\text{Intrinsic value per share} = \frac{\text{Estimated earnings per share for next year}}{\text{Discount rate}}$$

Intrinsic value per share will indicate an accurate rate at which shares should trade if rightly priced in the market. The higher the intrinsic value per share, the higher the earnings (Olivier, 2011:18).

According to Brigham and Erhardt (2005:255), the intrinsic value per share can be obtained by calculating the present value of the expected future cash flow stream. The expected cash flow consists of two parts, the dividends expected annually as well as the price which investors expect to receive when they sell the share.

2.7.9 Market value of equity

According to Olivier (2011:19), the Market value symbolises the price the investors are willing to pay per share at a certain point in time. Market value of equity is also referred to as "market capitilisation". This value can be calculated as follows:

$$\text{Market value of equity} = \text{Current stock price} \times \text{number of shares outstanding}$$

2.7.10 Margin of safety

Investment poses a certain degree of risk due to unpredictability. Analysts; therefore, build into their models a margin of safety that serves as a book keeper in order to evaluate if investors can purchase company shares at a discounted rate compared to the intrinsic value (Cilliers, 2004:49).

The formula for the safety margin is as follows:

$$\text{Margin of safety} = \text{Share price} - \text{Per share intrinsic value}$$

The calculated margin of safety value must be relatively large in order to secure maximum return even in declining market as well as a bull market. This value will vary from one investor to another due to different risk appetites.

2.8 INVESTMENT RISK

2.8.1 Introduction

According to Snyman (2014:1), “there exists a perception that equity is a high risk investment due to the fact that risk is a measure of volatility in an investment”. Risk can; therefore, be defined as the likelihood of the estimated return not realising (Mayo, 2001:181).

It is of the utmost importance that investors limit the risks of investing by ensuring that they have ample knowledge about companies and their shares before investing money (Cilliers, 2004:2). Knowledge obtained; however, will vary from one investor to another due to different risk appetites.

Fabozzi (1995:4) stated that an “efficient portfolio is one that provides the greatest expected return for a given level of risk, or equivalently, the lowest risk for a given expected return”.

Volatility, also known as risk, is simply the likelihood of the value of the investment to change. The more volatile the investment is perceived to be, the higher the risk will be to invest. The best possible way of dealing with investment risk is to familiarize oneself by learning how to identify and manage these risks (Cilliers, 2004:19).

2.8.2 Capital Asset pricing model (CAPM)

The CAPM was developed during the 1960’s and is a tool used by analysts to predict risk return characteristics of individual assets. This in turn can be measured against the market in order to determine the covariance of individual assets within a market portfolio. According to Megginson *et al.* (2010:142), the CAPM requires the following assumption about investors and current markets:

The higher the risk, the higher the return required by investors due to being risk averse (Megginson *et al.*, 2010:142).

According to Megginson *et al.* (2010:142), the CAPM indicates the expected return on a specific asset, $E(R_i)$, that equals the risk-free rate plus a premium that depends on the beta, B_i , of the asset and the expected risk premium on the specific market portfolio, $E(R_m) - R_f$:

The formula that the CAPM uses is as follows:

$$E(R_i) = R_f + \beta_i[E(R_m) - R_f]$$

Where:

R_f = Line intercept

β_i = Beta

$[E(R_m) - R_f]$ = Slope of the line

2.8.3 Beta

According to Cilliers (2004:22), Beta is the “the sensitivity of a portfolio (stocks return) to market movement”. By using a regression analysis Beta can be calculated and will indicate volatility (Olivier, 2011:35). Volatility also indicates an unpredictability of returns and the more volatile and unpredictable the return of a stock tends to be, the more risky the investment.

The risk associated with investment is expressed by two factors, namely standard deviation and variance (Cilliers, 2004:22). As stated by (Megginson *et al.*, 2010:140): “The Beta of an asset equals the covariance of the assets return with the returns on the overall portfolio divided by the portfolio variance.”

Beta ($\beta=1$), the relationship of the values plotted on the X-axis (market), should equal the value on the Y-axis (specific share). This ratio is indicated as 1:1 which indicates the average risk for a specific share. If the ratio; however, is $\beta > 1$, the specific share is more risky than the average. If the ratio is $\beta < 1$, the specific share is less risky than the average.

2.8.4 The Real Risk-Free Rate

The Real Risk-Free Rate (RRFR) can be described as the basic interest rate, if no inflation is expected. Investors in an inflation-free economy who knows with certainty what cash flows they would receive at a certain point in time will demand the (RRFR) on an investment. This can also be called the pure Time Value of Money (TVM), because the only disadvantage to the investor is the money he/she had to spend for a period of time. The (RRFR) of interest is the price charged for the risk-free exchange between current goods and future goods (Reilly & Brown, 2011:15).

2.8.5 Risk Premium and Portfolio theory

An alternative view of risk has been derived from extensive work in portfolio theory and capital market theory by Markowitz (1952, 1959) and Sharpe (1968), as stated by Reilly & Brown (2011:15). These prior works by Markowitz and Sharpe indicate that investors should use an external market measure of risk. Under a specified set of assumptions, all rational profit-maximising investors want to hold a completely diversified market portfolio of risky assets, and they borrow or lend to arrive at a risk level that is consistent with their risk preferences. Under these conditions the relevant risk measure for an individual asset is its movement within the market portfolio. This movement, which is measured by the covariance of assets within market

portfolios, is referred to as the systematic risk of assets – the portion of the total variance of an individual asset that is attributable to the variability of the total market portfolio. In addition, individual assets have variance that is unrelated to market portfolios (the nonmarket variance of assets) that is due to the unique features of assets. Nonmarket variance is called unsystematic risk, and it is generally considered unimportant because it is eliminated in large, diversified portfolios. Under these assumptions, the risk premium for an individual earning asset is; therefore, a function of the systematic risk of an asset with the aggregate market portfolio of risky assets. The measurement of the systematic risk of an individual asset is referred to as its beta (Reilly & Brown, 2011:21).

$$\text{Risk premium} = f(\text{Systematic market risk})$$

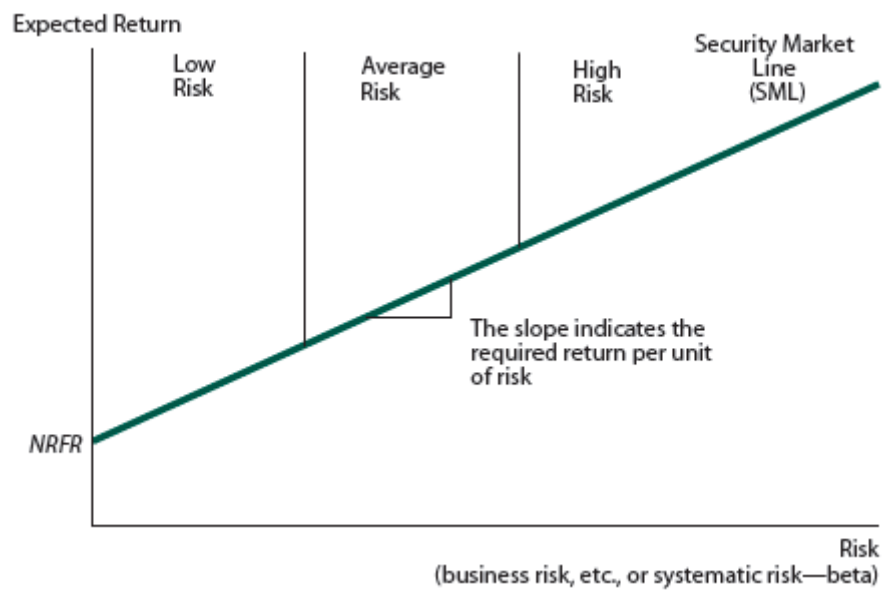
The measurement can also be understood as follows, according to Reilly and Brown (2011:19):

$$\text{Risk premium} = f(\text{Business risk, Financial risk, Liquidity risk, Exchange rate risk, Country risk})$$

2.8.6 Relationship between risk and return

This section discusses the risk-return combinations that are available and illustrates the factors that cause changes in these combinations. Figure 2.2 shows the expected relationship between risk and return. The graph shows that investors increase their required rates of return as perceived risks (uncertainties) increase. The line that reflects the combination of risk and return available on alternative investments is referred to as the Security Market Line (SML). The SML reflects the risk-return combinations available for all risky assets in the capital market at a given point in time. Investors should select investments that are consistent with their risk preferences; some should only consider low-risk investments, whereas other investors welcome high-risk investments (Reilly & Brown, 2011:21).

Figure 2.2: Security Market Line



Source: (Reilly & Brown, 2011:21)

Investors will utilise the SML as a tool to decide where to investment based on their perceptions of the risk of a specific investment (Reilly & Brown, 2011:21).

2.8.7 Standard deviation

Standard deviation measures the probability of a specific shares return in relation to the average return. When statistical measurements are used, standard deviation will measure the distance on a normal distribution graph to the left (negative) or to the right (positive) from the mean (average) expected return. The bigger the difference to the left or right of the mean, the more volatile the investment and the greater the risk for investing (Cilliers, 2011:23).

Standard deviation is formulated as follows:

$$\text{Standard deviation} = \sigma = \sqrt{\sum_{i=1}^n (k_i - \hat{k})^2 p_i}$$

2.8.8 The coefficient of variation

The formula for the coefficient of variation is used by investors when one investment has a high expected rate of return while the other investment with lower expected return has a lower standard

deviation. This makes the second investment less risky, but with a slightly lower return analysts will use the formula for the coefficient of variation formula to determine which investment will be the best option.

$$\text{Coefficient of variation} = CV = \sigma/\hat{k}$$

This will indicate the risk per unit of return for each investment (Cilliers, 2004:24).

2.9 RATIOS

Financial ratios helps to evaluate apples with apples. It compares relationships between financial statement accounts to identify the strengths and weaknesses of a company (Anon, 2015).

2.9.1 Number of years to pay off long-term debt

The number of years to pay off long-term debt can be viewed as a coverage ratio because the focus is mainly on income statements and the concern is usually with the ability to generate an adequate cash flow to pay off principals (Megginson *et al.*, 2010:44). A maximum of five years to pay off long-term debt is set as a criterion by Cilliers (2004:112) and is calculated as follows:

$$\text{Number of years to pay of long term debt} = \frac{\text{Long term debt}}{\text{Current annual profit}}$$

The ratio indicates how many years a company will take to service its total long-term debt if the profit for each year was used to service the debt amount. This ratio can be used to compare companies against each other.

2.9.2 Price-to-Cash Flow Ratio (P/CF)

Many analysts favour the Price-to-Cash Flow Ratio (P/CF) to evaluate the value of a share. Just like the P/E, is the P/CF calculated by dividing the price by its earnings per share. The P/CF is calculated by dividing the price by its cash flow per share. The same principle can be applied to P/CF as P/E and a value of less than 15 to 20 is generally considered good.

According to Matras (2013), a P/CF between 0-10 produces the best results. Meaning that by mathematically calculating the P/CF ratio in his tests an answer between 0-10 will result in an above average return on share price growth. In fact, the tests completed by Matras yielded a 17.1% over the last ten years (using a 1-week rebalancing period). The second best results are between the ranges of 10-20 with a 10.2% gain. However, once 30 is reached, the odds point to a loss (-2.8%). And over 40, the odds of a loss are even greater at -6.9% (Matras, 2013).

The equation for P/CF is as follows:

$$\text{Price – to – Cash Flow Ratio} = \frac{\text{Stock price per share}}{\text{Operating cash flow per share}}$$

According to Olivier (as cited by Kennon, 2010:1), the P/CF is believed to denote conditions more accurately due to the fact that cash flow cannot be manipulated as easily in income statements as in earnings. The P/CF is; therefore, more favoured than the P/E.

2.9.3 Profit margin

A profit margin is one of the most valuable measures of determining if companies are worth buying into. A profit margin is also a consistent measure indicating how sound the management of companies are. High profit margin companies usually have cost conscious managers that spend money wisely (Cilliers, 2004:66).

A profit margin is calculated as follows:

$$\text{Profit margin} = \frac{\text{Net income}}{\text{Net sales}}$$

In order to make useful predictions, analysts should evaluate at least the profit margin data of the last five years when analysing companies.

2.9.4 Return on Investment Capital (ROIC)

The ROIC or invested capital of businesses attempts to measure the return earned on capital invested in investments. In practice, it is usually defined as follows (Damodaran, 2007):

$$\text{Return on Investment Capital (ROIC)} = \frac{\text{EBIT}}{\text{Book value of invested capital}}$$

Where:

$$\text{EBIT} = \text{Operating income} (1 - \text{tax rate})$$

Note than one should be careful considering this equation as non-operating income can produce skewed results on the efficiency of the operation.

2.9.5 Return on Equity (ROE)

ROE gives an indication to investors on how much income is generated per share. The total assets of a company minus the total liabilities of a company provide the total shareholder equity.

There is also a correlation between ROE and the future earnings of a company, according to Cilliers (2004:63).

Cilliers (2004:65) argues that the investment philosophy of Warren Buffet evaluates companies by using the ROE ratio in order to establish if companies have performed consistently well over a number of years. According to Warren's philosophy, it is wise to only invest in companies that earn consistently high returns on shareholder equity.

ROE also helps investors and analysts to calculate and predict future earnings more confidently (Cilliers, 2004:65).

The equation for ROE is as follows:

$$ROE = \frac{Net\ income}{Shareholder's\ equity}$$

2.9.6 Return on Assets (ROA)

ROA is also called Return on Investment (ROI) and measures the ability of the management of companies to generate returns from company assets to common stock holders. The equation for ROA is as follows:

$$ROA = \frac{Net\ income}{Total\ assets}$$

The term ROA will be used in this study instead of ROI.

2.9.7 Earnings Per Share (EPS) growth rate

The EPS growth rate is an important figure for valuing companies. When the EPS history is compared with the stock price history, it helps to determine the most likely future direction of the stock price.

In calculating the EPS growth rate of companies, analysts need to decide whether growth should continue at the same rate. Studying companies, their products, and their competitive environment will help guide the decisions made by analysts to adjust the growth rate up or down (Victor, 2012).

Stock with the highest EPS growth rate rise the fastest in a given year when compared to competitors in the same industry. If companies can maintain a 10% or more EPS growth rate, these companies may be good investment choices. However, growth rates of 10% or more in EPS are more reliable in the case of "matured companies" which have already experienced complete economic cycles of expansion and contraction through bear market phases and bull

runs. New and fast growing companies may not yet have such financial histories available to rely on and may exhibit greater volatility in their earnings history. The earnings histories of new and fast growing companies are less reliable in projecting growth rates than large matured companies with a consistent earnings history of ten years or more. The chances of accurately predicting the EPS growth rate increase when looking at companies with greater financial histories (Victor, 2012).

When investors want to invest in a company that is consistent with regard to the above-mentioned factors, investors need to make sure that the company in question has a consistent earnings growth history of at least 10% (Victor, 2012).

2.10 RETAINED EARNINGS

According to Cilliers (2004:72), as stated by Warren Buffet companies, profit can be spent in two ways: (1) Pay out dividends to shareholders or as bonus payments and shares buy backs. (2) Utilise profits in order to boost company profitabilities. This ability to utilise retained earnings in order to maximise future returns even further is a sign of well-managed companies.

Moreover, analysts can determine whether the management of companies are utilising retained earnings in a sensible manner, according to Buffet and Clark (as cited in Cilliers, 2004:73). Firstly, analysts should calculate the retained amount for a specific period. The retained amount should then be compared to any increases in per share earnings for the same period. The earned return on the retained earnings over that period will then be provided (Cilliers, 2004:73).

2.11 SHARE REPURCHASES

Since 2004 share repurchases have grown in popularity and have become a favoured measure applied by investment analysts. Companies have started to repurchase shares by distributing cash for some of their outstanding shares (Megginson *et al.*, 2010:143).

Companies are allowed to make use of several methods in order to buy back shares:

- Open market share repurchases (companies buy back shares in the open market).
- Tender offers or self-tenders (companies offer to buy back shares at a premium price above the market price at that point in time).
- Dutch auction repurchases (prices must be submitted by shareholders indicating at what price they are willing to sell off their shares. In a Dutch auction share all shareholders will be paid exactly the same amount per share).

According to Cilliers (as cited in Warren Buffett Secrets, 2004) companies should only repurchase outstanding shares under the following conditions:

- When companies have excessive funds available.
- If shares can be repurchased at a lower rate than the intrinsic value of these shares.
- Companies should never repurchase shares in order to prevent the share price from falling or to increase the value.

2.12 EIGHT POINT CHECKLIST

Considering the background thus far given the aforementioned on previous research. Victor's eight point checklist gives guidance on how to select criteria in order to evaluate stocks for a portfolio. According to Victor (2012), the following criteria should be evaluated in order to identify companies with the necessary means.

The eight point check list proposed by Victor (2012):

1. *Revenues*: Companies can only grow by increasing their sales. Hence, revenues of companies over that last ten years are the first important number to collect. Promising companies should have a minimum growth of 15% every year.
2. *EPS*: Profit and earnings per share should be in proportion to revenues.
3. *Book value*: Book value is simply the value of companies right now as indicated on their balance sheets – the assets of companies minus their liabilities. The Book value shows how much would be left for ordinary shareholders after all the outstanding debentures of companies are paid off when companies are closed. This figure could then be divided by the number of shares and the answer will be the Book value per share. The Book value per share should show a minimum consistent growth of 15% annually.
4. *ROIC*: ROIC measures the profitability of companies by revealing how much profit companies generate with the total money the companies have invested. Total money invested in business includes long-term debt, and common and preferred shares. Invested capital can be contained in buildings, projects, machinery and shares in other companies. Investors are advised to check whether companies are recording a consistent growth in their ROIC.
5. *ROE*: ROE measures the profitability of companies by revealing how much profit they generate with the money shareholders have invested. A positive growth in ROE is of the utmost importance.
6. *Debt/Equity ratio*: This ratio indicates what proportion of equity and debt companies are using to finance their assets. An ideal debt equity ratio would be less than 1.0. A

debt/equity of *0.60* or less is excellent. A higher ratio would demonstrate a heavy reliance on loans.

7. *Debt to net profit ratio*: As previously mentioned, borrowed money forms the “debt” of businesses. It is; therefore, common for businesses to borrow money from banks. This ratio answers one important question: Do businesses generate enough earnings to repay their financial commitments? If yes, the probable time frame within which businesses would be able to pay back their commitments is very important.
8. *Historical share price*: Investors should also have an idea about how share prices have moved in the past. How share prices have reacted to key events such as recessions are of key importance.

Only fundamentally strong and well-managed companies will pass the eight point criteria set out by Victor (2012).

2.13 CONTEMPORARY THEORY

2.13.1 Cilliers’ six point criteria

Cilliers’ (2004:84) study focused on the quantitative criteria used by Warren Buffet and concluded that the following fourteen variables are important:

1. Return on Equity
2. Debt
3. Profit margin
4. Per share intrinsic value
5. Earnings per share growth rate
6. Company management (book value)
7. Retained earnings (earnings retained per share)
8. Share price
9. Companies that have been public for more than ten years
10. Margin of safety
11. Share repurchases
12. Price-to-Earnings Ratio
13. Dividend policy
14. Book value & Book value per share

Cilliers (2004:128) then identified the six most important criteria by means of multiple regression models and these criteria are as follows:

1. The margin of safety
2. Book value
3. Book value per share
4. Intrinsic value per share
5. Debt
6. Profit margin

2.13.2 Olivier's criteria

Olivier (2011:48) conducted her study to evaluate specific criteria used in the mining sector. She obtained the following criteria through her literature study and population sample and investigated the following chosen valuation indicators:

1. Free cash flow
2. Intrinsic value
3. Economic Value Added (EVA)
4. Margin of safety
5. Price-to-Earnings Ratio
6. Years to pay off debt
7. Price/Book Value
8. Price/cash flow
9. Net profit margin
10. Beta
11. Return on invested capital
12. Annual change in sales
13. Book value per share

2.14 Summary

Previous studies have been discussed in the literature review section and different investment criteria were used over different economic areas. These criteria have been compared and summarized in Table 2.3 below in order to evaluate the criteria which overlap from previous research more than one's.

Table 2.3: Summary of investment criteria

Cilliers (2004:84)	Victor (2012)	Olivier (2011:47)	All variables
Book value per share		Book value per share	Book value per share
Years to pay off debt	Years to pay off debt		Years to pay off debt
Net profit margin		Net profit margin	Net profit margin
Earnings per share	Earnings per share		Earnings per share
Intrinsic value per share		Intrinsic value per share	Intrinsic value per share
ROE	ROE		ROE
	ROIC	ROIC	ROIC
Price/Earnings		Price/Earnings	Price/Earnings
Margin of safety		Margin of safety	Margin of safety
	Debt/Equity ratio		Debt/Equity ratio
Share price	Share price		Share price
	Revenue	Revenue	Revenue
		FCF	FCF
		Beta	Beta
		EVA	EVA
Retained earnings			Retained earnings
Debt			Debt
Dividend policy			Dividend policy
Share repurchases			Share repurchases
Debt to net profit		Debt to net profit	Debt to net profit
		Price/Book value	Price/Book value
		Price/cash flow	Price/cash flow

Source: Own

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

The empirical study for this research will be discussed in this chapter. The research methodology that was followed and how the sample population were constructed will also receive attention. This chapter will explain how the most important quantitative criteria used in previous studies were selected and analysed statistically by means of descriptive statistics and multiple regression within the South African mining sector. The testing of the criteria on the companies identified in the sample population will also be evaluated and discussed. This chapter can be divided into research methodology followed by the results section.

3.2 RESEARCH DESIGN

3.2.1 Main objective of the study

To provide investors with a share portfolio selection framework in order for them to select mining sector shares that will maximise returns for the shares selected and reduce risks as far possible.

3.3 CRITERIA SELECTION

The researcher chose to test the criteria set out in chapter 2 by evaluating the quantitative criteria provided by previous research studies. The criteria set out below were chosen and will be tested with descriptive statistics and then by means of multiple regression to establish the most important criteria in order to predict share price growth.

The criteria used for the purpose of this study were selected from Table 2.3 and also form the applicable data that could have been obtained in order to evaluate these variables.

Variables is as follow:

- Book value per share
- Debt/Equity ratio
- EPS (Earnings Per Share)
- Net profit margin
- Price/Book value
- Price/cash flow
- Price-to-Earnings Ratio
- Share price
- Retained earnings (earnings retained per share)

- ROE (Return on Equity)
- Dividend policy (dividend/share)
- Revenue
- EPS growth rate
- Intrinsic value per share
- Margin of safety
- Years to pay off debt (long-term interest bearing/profit after tax)
- ROA (Return on Assets)

3.4 POPULATION DESCRIPTION

The population consisted of all the mining companies listed on the JSE on 30 June 2015. Seventy seven mining companies represented this sector on the JSE. Data were extracted using I-net BFA Expert for all the mining companies by making use of only the mining sector filter.

3.5 SAMPLE SIZE

Data were obtained from the I-net BFA Expert for all 77 companies for the last ten years from 2005 till 2014. 2015 was not included because the financial books of some companies close at the end of June 2015 for the 2014 financial year end and some December 2014.

As mentioned earlier in this study, due to the scale of mining industries in South Africa only companies exceeding a market capitalisation of more than R500 million were selected. A minimum of nine years were chosen due to the availability of data which increased the sample size quite significantly from five companies with ten years of historical data to 18 companies with nine years of historical data available. A bigger sample size is more ideal in order to make inferences more accurately and have statistical significance.

18 companies in the mining sector listed on the JSE met the final criteria set out earlier in the study by means of a non-probability sample technique.

These companies are tabled below in Table 3.1:

Note: The companies will not be made public in this study due to the sensitivity of data used for research purposes. The companies were rather named **COM1** (Company 1) to **COM18** (Company 18).

Table 3.1: Companies that met the sample criteria

Company	Market capitalization @June 2015	Years of data available
COM1	R 1 175 420 489.00	9
COM2	R 1 396 117 814.00	9
COM3	R 2 494 298 124.00	9
COM4	R 2 920 033 031.00	10
COM5	R 6 267 248 336.00	9
COM6	R 13 575 962 674.00	9
COM7	R 18 090 167 095.00	9
COM8	R 24 447 835 416.00	10
COM9	R 29 752 651 238.00	9
COM10	R 40 529 981 354.00	9
COM11	R 49 598 997 442.00	10
COM12	R 49 792 232 620.00	9
COM13	R 67 571 061 818.00	9
COM14	R 71 734 457 044.00	10
COM15	R 109 187 000 000.00	9
COM16	R 124 342 227 178.00	10
COM17	R 365 773 005 360.00	10
COM18	R 738 522 035 156.00	9

Source: Own

3.6 DATA ANALYSIS

All the data extracted from the I-Net BFA Expert included, but were not limited to, financial statements, income statements, balance sheets and financial ratios. Data were analysed and organised on an Excel-spreadsheet and all 18 companies were assessed year by year. The data obtained from the I-Net BFA Expert were sorted according to the criteria set out in chapter 2.

Share price growth was calculated year by year by means of the following equation:

$$\Delta P = \frac{P_n - P_{n-1}}{P_{n-1}} \times 100\%$$

Where:

ΔP = % Change in share price

P_n = Current year market share price

P_{n-1} = Market share price of the previous year

Intrinsic value per share as well as the margin of safety were calculated as previously discussed within the literature section. In order to calculate intrinsic value per share, the average EPS growth rate was calculated year by year according to the same mathematical principle applied for share price growth provided above. Estimated earnings per share for the next year was calculated by multiplying the average EPS growth rate calculated per company from 2005 to 2014 to the EPS rate of the required year.

The discount rate below the line of the intrinsic value per share was calculated using the bond rate for the last five years for bond R157. The R157 bond rate was used by the researcher due to the overlapping time period of both, R157 bond and data obtained for the variables. Previous research also made use of the R157 bond.

The calculated average rate was applied at 6.6% and the intrinsic value per share year by year for all 18 companies was calculated on the Excel-spreadsheet.

$$\text{Intrinsic value per share} = \frac{\text{Estimated earnings per share for next year}}{\text{Discount rate}}$$

The margin of safety was calculated by subtracting the calculated intrinsic value per share from the share price for each of the required years.

3.7 STATISTICAL ANALYSIS

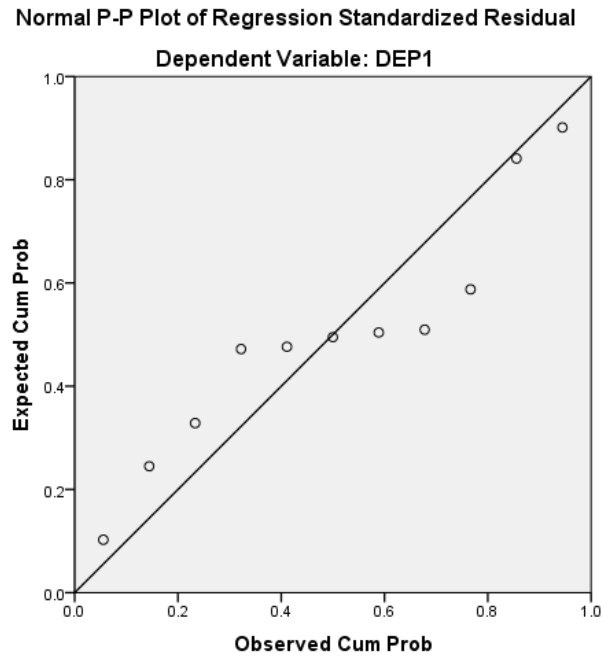
A quantitative analysis was conducted by using statistical software. A descriptive statistical method was followed by making use of a regression analysis. In order to test and verify the regression analysis, the following four assumptions of multiple regression should be visible in the data obtained. These assumptions should then be verified to test for validity.

The four assumptions of multiple regression are as follows:

- I. Linearity
- II. Independence of errors
- III. Normality of errors
- IV. Equal variance

- I. The linearity assumption was proved by means of plotting the standardised regression residuals observed against the expected residuals of the independent variables/criteria. Please see Figure 3.1 below:

Figure 3.1: Linearity, Stats Soft Inc. 2011

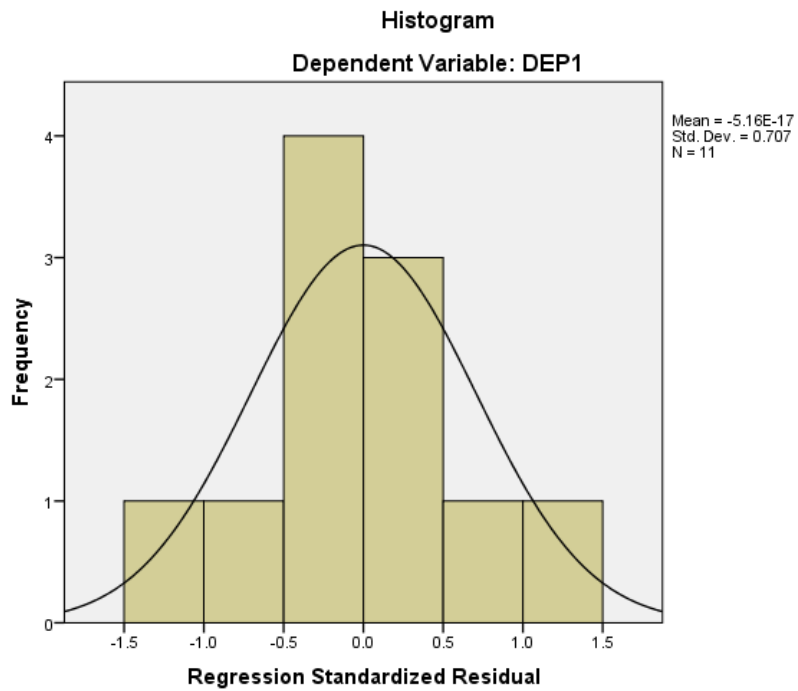


Source: (Pretorius, 2015)

- II. The independence of errors assumption was illustrated by plotting the residuals in order of collection. Since no relationship between the residuals could be found over time, it was concluded that autocorrelation did not exist.

III. Normal distribution was proved by the histogram shown below in Figure 3.2 indicating the normality of errors.

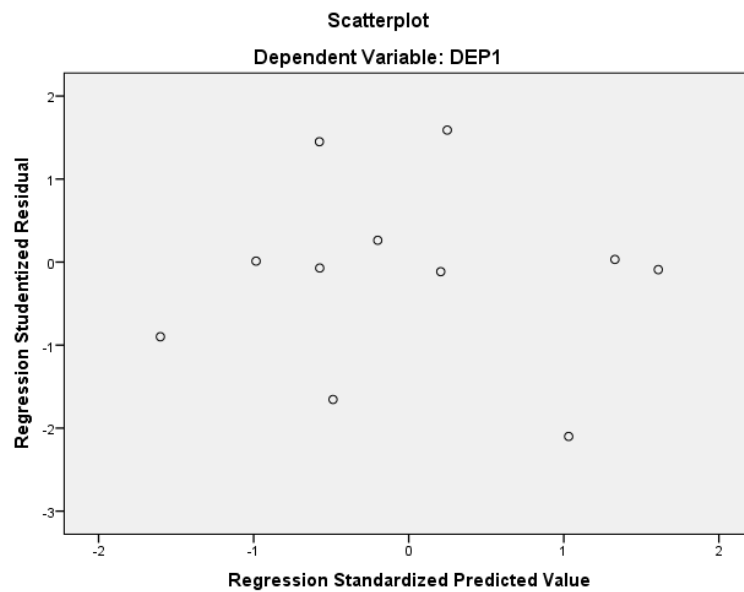
Figure 3.2: Histogram for normal distribution



Source: (Pretorius, 2015)

IV. The equal variance assumption was tested by observing the scatter plots of the residuals as shown in Figure 3.3:

Figure 3.3: Scatterplot



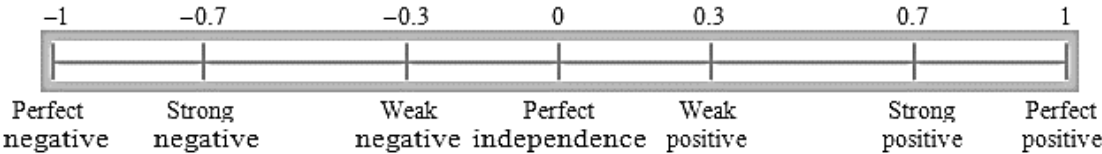
Source: (Pretorius, 2015)

After all four of the assumptions were validated for multiple regression, a correlation matrix was set up in order to evaluate the most important criteria within the mining sector from 2005 to 2014.

3.7.1 Correlation

A correlation coefficient enables the researcher to quantify the strength of the linear relationship between two ranked or numerical variables. The coefficient (usually represented by the letter r) can take on any value between one (1) and minus one (-1). Figure 3.4 below illustrates that a value of (1) represents a perfect positive correlation and (-1) a perfect negative correlation. A correlation coefficient value of (+/-0.7) represents a relative strong correlation (positive or negative).

Figure 3.4: Correlation coefficient



Source: (Saunders *et al.*, 2009)

In this study a correlation matrix was set up in Excel to compare all the independent variables/criteria to see whether a correlation (highly positive or negative) could be found. All of the independent variables/criteria with a positive or negative correlation of more than (0.67) were analysed and rejected keeping only the independent variables/criteria with the highest reoccurrence. This was done in order to keep the most important independent variables/criteria within the regression analysis per year.

In Table 3.2 below the correlation coefficients between the independent variables/criteria for the year 2010 can be observed. Values of more than (0.67) for high correlations and less than (-0.67) for high negative correlations are highlighted. A similar table was designed for each year by which the independent variables/criteria correlating high with one another were identified and screened. Some of the independent variables/criteria correlating highly positive or negative were rejected and only the independent variables/criteria with the most occurrences between the variables per year were kept.

Table 3.2: Correlation matrix 2010

		DEP1	VAR1	VAR2	VAR3	VAR4	VAR5	VAR6	VAR7
DEP1	2010	1	-0.1	0.04	0	0.18	-0.2	-0.4	-0.3
VAR1	2010	-0.1	1	0	0.829	0.43	0.15	0	0
VAR2	2010	0.04	0	1	0.23	0.23	0.678	0.04	0.4
VAR3	2010	0	0.829	0.23	1	0.748	0.41	0	-0.1
VAR4	2010	0.18	0.43	0.23	0.748	1	0.36	0.15	-0.2
VAR5	2010	-0.2	0.15	0.678	0.41	0.36	1	0.525	0.577
VAR6	2010	-0.4	0	0.04	0	0.15	0.525	1	0.662
VAR7	2010	-0.3	0	0.4	-0.1	-0.2	0.577	0.662	1

Source: Own

Note: Table 3.2 indicates only a portion of the correlation matrix for year 2010 from VAR1 to VAR7. The entire Correlation matrix can be seen in Annexure A.

The logic behind the correlation matrix above from 2005 to 2014 for each separate year is to test for correlations between two or more independent variables/criteria for (collinearity or multicollinearity).

This process is critical during a multiple regression analysis because collinearity and multicollinearity makes it difficult to control the single effects of individual variables within the study. Meaning that for instance both VAR1 and VAR4 correlates highly with VAR3. This VAR1 and VAR4 will have more or less the same impact on the dependent variable within a regression model making it difficult to establish which independent variable/criteria will have the highest statistical significance on the dependent variable. One with the biggest influence are kept within the data.

After all of the independent variables/criteria were screened per year, those less significant were rejected due to collinearity or multicollinearity explained earlier.

The independent variables/criteria with the most statistical significance have been included within the regression analysis. By excluding those independent variables/criteria with the same prediction intervention, one will be able to pinpoint which independent variable/criteria will have the greatest influence on the dependent variable share price growth.

The descriptive statistical method can be viewed in Table 3.3 below, followed by the statistical process to evaluate relationships between the different independent variables/criteria. The multiple regression used in this study can be viewed in Table 3.4.

Table 3.3: Descriptive statistics by data type: a summary

To calculate a measure of:		Numerical	
		Continuous	Discrete
Central tendency that	represents the value that occurs most frequently.	Mode	
	represents the middle value.	Median	
	includes all data values (average).	Mean	
Dispersion that	states the difference between the highest and lowest values.	Range (data need not be normally distributed but must be placed in rank order).	
	states the difference within the middle 50% of values.	Inter-quartile range (data need not be normally distributed but must be placed in rank order).	
	states the difference within another fraction of the values.	Deciles or percentiles (data need not be normally distributed but must be placed in rank order).	
	describes the extent to which data values differ from the mean.	Variance, or more usually, the standard deviation (data should be normally distributed).	
	compares the extent to which data values differ from the mean between variables.	Coefficient of variation (data should be normally distributed).	
	allows the relative extent that different data values differ to be compared.	Index numbers.	

Source: (Saunders *et al.*, 2009)

Table 3.4: Statistics to examine relationships, differences and trends by data type

	Numerical	
	Continuous	Discrete
To test whether two variables are associated.	Chi square if variables are grouped into discrete classes.	
To test whether two groups (categories) are different.	Independent t-test or paired t-test (often used to test for changes over time) or Mann-Whitney <i>U</i> test (where data are skewed or used in a small sample).	
To test whether three or more groups (categories) are different.	Analysis of variance (ANOVA).	
To assess the strength of relationship between two variables.	Pearson's product Moment Correlation Coefficient (PMCC).	

To assess the strength of a relationship between one dependent and one independent variable.	Coefficient of determination (regression coefficient).
To assess the strength of a relationship between one dependent and two or more independent variables.	Coefficient of multiple determination (multiple regression coefficient).
To predict the value of a dependent variable from one or more independent variables.	Regression equation (regression analysis).
To examine relative changes (trends) over time.	Index numbers.
To compare relative changes (trends) over time.	Index numbers.
To determine trends over time of a series of data.	Time series: moving averages or Regression equation (regression analysis)

Source: (Saunders *et al.*, 2009)

3.7.2 Multiple linear regression

After all the pre-assumptions for regression were proved, the regression models was built by use of the stepwise-enter method. This is a manual process by which the independent variables/criteria are included or excluded by hand in order to build the best-suited model per year with the highest statistical significance. A 90% confidence interval was used in this study meaning only models with a p-value lower than ($p < 0.1$) were included.

Multiple regression analysis was utilised to predict the values of dependent variable, in this case share price growth. The values of the independent variables statistically looks at the relationship with the dependent variable share price growth within regression analysis. By calculating the multiple regression equations per year one would be able to predict what the dependent variable, share price growth would have been. This is done from looking at the relationship between a numbers of independent variables/criteria within the multiple regression equation below. Within this study the researcher will attempt to predict the share price growth rate of eighteen (18) companies identified in the sample section Table 3.1.

The regression equation is as follows:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots \beta_n X_n + \epsilon_i$$

Where:

Y_i = Dependent variable

β_0 = Y intercept

β_1 = Slope of Y with variable, holding variables X_1 and constant X_2

β_n = Slope of Y with variable, holding variables X_1, X_2 constant

X_1 = Independent variable 1

X_n = Independent variable n

ϵ_i = Random error in Y for observation

3.8 Research methodology

3.8.1.1 Step 1

The study population was selected from all the mining companies listed on the JSE. Companies with a market capitalisation of less than R500 million and nine years of historical data listed on the JSE from 2005 to 2014 were dismissed.

The criteria applied were as follows:

- Companies should have at least nine years of historical data listed on the JSE from 2005 to 2014.
- Companies should have a market capitalisation of more than R500 million at the end of June 2014.

The above-mentioned criteria were applied to select the study population where after the relevant information was extracted from I-Net BFA Expert. The information consisted of relevant financial ratios, share data and financial statements obtained from the I-Net BFA Expert.

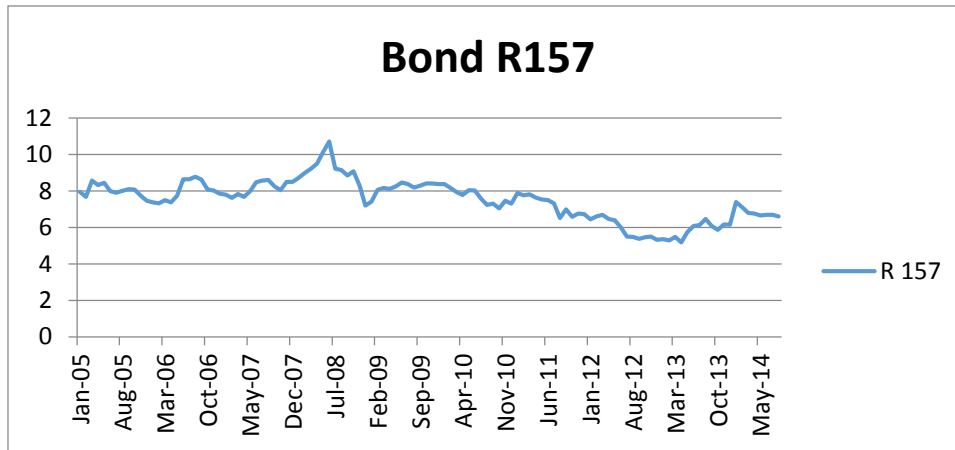
3.8.1.2 Step 2

The information obtained was processed by making use of Excel. All of the independent variables (criteria) were identified from the literature review and mining companies meeting the criteria were tabled.

The dependent variable share price growth was calculated as well as two of the independent variables namely intrinsic value per share and margin of safety. Earnings Per Share (EPS) growth rate was calculated in order to calculate the intrinsic value per share based on Warren Buffet's method.

The average bond rate for the past five years was calculated. The average bond rate was then used to calculate the intrinsic value per share. The bond rate of R157 matured on 15 September 2014 which makes it a suitable rate to work with for the period 2005 to 2014. The following data were obtained from the South African Reserve Bank (SARB, 2015):

Figure 3.5: Bond R157



Source: (SARB, 2015)

3.8.1.3 Step 3

Statistical software was used to analyse the data obtained from I-Net BFA Expert. A correlation matrix was established to identify all the independent variables which correlate the highest with the dependent variables and other independent variables not noted.

The independent variables/criteria were screened keeping only those with the highest occurrence for variables/criteria correlating high with one another. A correlation coefficient value of 0.67 was used as a rejection point. Variables occurring more than 50% in the data after rejection were included within the final regression analysis

3.8.1.4 Step 4

The final sample population consisted of five independent variables/criteria that remained after the data screening process was completed. A decision was made by the researcher to not standardise the data but to use the data as received from I-Net BFA Expert.

The data were read into the software program manually (per hand). If the independent variable/criterion did not have any significant influence on the model, it was removed one by one to determine the statistical significance. The stepwise-enter method was utilised.

3.8.1.5 Step 5

The models were then evaluated and statistically only five out of nine years delivered a valid regression model. 2008, 2009, 2010 and 2012 were disregarded due to poor or even no statistical significance in order to build a valid model.

3.9 LIMITATIONS OF THE RESEARCH

The data were limited to the mining sector of the JSE in South Africa. The decision was made to only use companies with historical data available for nine years or more to increase the sample size. Companies with a market capitalisation of more than R500 million were screened and have been identified as per the criteria set out earlier in the study. The study might be biased due to the new fast-growing companies with smaller market capitalisation that were excluded from the study. 2015 is known for its volatility, especially with regard to commodity prices. 2015 was excluded due to absence of data from the I-Net BFA Expert and because the specific financial year in mention was not finished when conducting the study. The study was limited by not including a volatile year within this specific study.

Only quantitative criteria were analysed in this study. Qualitative criteria will also have an effect on share price selection criteria within the mining sector and could be investigated for future research.

CHAPTER 4

RESULTS SECTION

4.1 INTRODUCTION

In this chapter the empirical results obtained by performing statistical analysis will be discussed.

4.2 CORRELATION RESULTS

As discussed previously in chapter 3, page 36 the results from the correlation matrix were screened. The independent variables/criteria with the highest statistical significance per year were kept in the regression analysis while the independent variables/criteria that occurred less in the specific time frame were rejected while independent variables/criteria correlating highly with the dependant variables were kept.

This was individually done in each year from 2005 to 2014. In Table 4.1 below the process followed in order to screen the independent variables/criteria can be seen as well as the independent variables/criteria with the highest statistical significance from 2005 to 2014. The results were analysed after the screening process took place and only the independent variables/criteria present in more than 50% of the years from 2005 to 2014 were kept. The independent variables/criteria that remained were represented in most of the companies more than 50% of the time. After the screening process was completed the independent variables/criteria with high correlations were rejected. Only five independent variables/criteria remained, namely VAR5, VAR7, VAR11, VAR12, and VAR17.

These five independent variables/criteria for the period 2005 to 2014 within the mining sector were:

- Price/Book value
- Price-to-Earnings Ratio
- Dividend/Share
- Revenue
- Margin of safety

For the eighteen (18) companies left within the sample and for the ten years of data available, 180 data points in total were available to work from. The occurrence was calculated by summing the number of times the independent variables/criteria were represented within the data after the screening process took place. The percentage occurrence was then calculated by dividing the number of occurrences with the total. See Table 4.1 below:

Table 4.1: Variables left after a correlation analysis was completed

Variable	Description	Total:	Occurrence:	% Occurrence
VAR1	<i>Book value per share</i>	180	36	20%
VAR2	<i>Debt/Equity ratio</i>	180	88	49%
VAR3	<i>EPS (Earnings Per Share)</i>	180	54	30%
VAR4	<i>Net profit margin</i>	180	17	9%
VAR5	<i>Price/Book value</i>	180	106	59%
VAR6	<i>Price/cash flow</i>	180	70	39%
VAR7	<i>Price-to-Earnings Ratio</i>	180	117	65%
VAR8	<i>Share price</i>	180	51	28%
VAR9	<i>Retained earnings (earnings retained per share)</i>	180	81	45%
VAR10	<i>ROE (Return on Equity)</i>	180	69	38%
VAR11	<i>Dividend policy (dividend/share)</i>	180	142	79%
VAR12	<i>Revenue</i>	180	151	84%
VAR13	<i>EPS growth rate</i>	180	50	28%
VAR16	<i>Intrinsic value per share</i>	180	36	20%
VAR17	<i>Margin of safety</i>	180	126	70%
VAR18	<i>Years to pay (long-term interest bearing/profit after tax)</i>	180	83	46%
VAR19	<i>ROA (Return on Assets)</i>	180	54	30%

Source: Own

Note: VAR14 and VAR15, respectively, are the average earnings per share growth rate and the R157 bond rate average for five years. These independent variables/criteria were rejected during the statistical analysis process but included on the Excel-spreadsheet in order to calculate the intrinsic value per share as an independent variable.

Table 4.2: Correlation matrix with DEP1

		VAR5	VAR7	VAR11	VAR12	VAR17
	DEP1	2005	0	0	0	0
	2006	0.35	0.29	0.47	0.17	0.07
	2007	0.13	-0.2	0.741	0.529	0.31
	2008	0.22	0.558	0.43	0.16	-0.2
	2009	0	0	-0.2	0	0.15
	2010	-0.2	-0.3	0.33	0.1	0.23
	2011	0.25	-0.2	0.721	0.486	0.616
	2012	0.41	-0.1	0.41	0.01	0.3
	2013	0.05	0.27	0.01	0.45	0.13
	2014	0.1	0.55	-0.6	-0.3	-0.4

Source: Own

Remarks from Table 4.2:

- The independent variables/criteria with a correlation coefficient of (0.3) (positively or negatively) with the dependent variable DEP1 (Share price growth) are highlighted.
- VAR5 (Price/Book value) correlated highly with share price growth only in 2006 and 2012 with the highest correlation of 41% in 2012.
- VAR7 (Price-to-Earnings Ratio) had a positive correlation in 2008 of 55.8%.
- VAR11 (Dividend per share) correlated positively with six of the ten years with one high negative correlation of -60% in 2014.
- VAR12 (Revenue) had three positive correlations of more than (0.3) with the share price growth. The highest correlation of 52% was in 2006.
- VAR17 (Margin of safety) correlated only three times with share price growth. There was a negative correlation of -40% in 2014 and the highest positive correlation of 61% in 2011.

4.3 REGRESSION MODEL BUILDING

The five independent variables/criteria utilised to build the regression models by use of the stepwise-enter method for all ten years from 2005 to 2014. The stepwise-enter method is a manual process by which the independent variables/criteria are included or excluded per year with the aid of a regression analysis in order to yield the best possible results with a regression model in a given year. This was done to predict share price growth for mining sector shares.

4.3.1 Multiple regression results

The selection of the independent variables/criteria was done through the screening process explained in chapter 3. The independent variables/criteria that were left after the screening process were then used as the final set of criteria within the regression analysis.

These independent variables/criteria can be defined as follows:

X1 = VAR5 = Price/Book value

X2 = VAR7 = Price-to-Earnings Ratio

X3 = VAR11 = Dividend/Share

X4 = VAR12 = Revenue

X5 = VAR17 = Margin of safety

Table 4.3 below contains the data obtained from the regression analysis. Only five years – 2006, 2007, 2011, 2013 and 2014 – produced results for a workable regression model with a confidence interval of 90%, $p = 0.01$.

The results of the following years were excluded: 2008, 2009, 2010 and 2012. These years produced no workable outcomes through the process of multiple regression when a statistical software analysis was completed.

Table 4.3: Multiple Regression analysis

Year	R	R Square	Adjusted R Square	Std. Error of the Estimate	F Change	Sig. F Change = p-value	Durbin-Watson	N	B0	B1	B2	B3	B4	B5
2006	0.879	0.773	0.547	0.518	3.41	0.102	2.484	11	0.188	0.570	-0.003	0.001	-0.009	1.59E-05
2007	0.949	0.900	0.843	0.294	15.78	0.001	2.288	12	0.532	-0.025	0.006	0.002		6.16E-06
2011	0.713	0.508	0.374	0.277	0.508	0.044	2.187	15	0.105			0.002	0.008	2.72E-06
2013	0.860	0.740	0.685	0.430	13.305	0.000	2.571	18	-0.233	0.040			0.006	5.95E-06
2014	0.610	0.372	0.282	0.260	4.149	0.081	2.467	9	-0.206				-0.005	

Source: Own

As can be understood from Table 4.3, 2007 has the highest R-square value of 0.843 and a p-value of $p = 0.001$.

B4 = Revenue and B5 = Margin of safety were represented four out of the five years by which the researcher can conclude that Revenue and Margin of safety are the two most important independent variables/criteria.

The regression equations developed below in Table 4.4 were developed from the regression analysis data obtained from the statistical analysis. The process that was followed in order to develop these models can be found in 3.7.2.

Table 4.4: Regression models per year

Year	Model
2006	$Y_i = 0.188 + 0.57X_1 - 0.003X_2 + 0.001X_3 - 0.009X_4 + 1.593E-05X_5$
2007	$Y_i = 0.532 - 0.025X_1 + 0.006X_2 + 0.002X_3 + 6.156E-06X_5$
2011	$Y_i = -0.105 + 0.002X_3 + 0.008X_4 + 2.723E-06X_5$
2013	$Y_i = -0.233 + 0.04X_1 + 0.006X_4 + 5.949E-06X_5$
2014	$Y_i = -0.206 - 0.005X_4$

Source: Own

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

In this section the conclusion obtained from the empirical study will be discussed. Recommendations for further research will also be made.

5.2 CONCLUSION

The mining sector within South Africa and mining sectors globally are subjected to severe limitations due to commodity price constraints. Capital expenditure budgets have been reduced significantly in order to reduce costs as far as possible. The labour unrest in South Africa as well as the recent downgrading by rating agencies has led to the uncertainty that necessitates further investment into the South African mining sector.

Despite all these factors contributing towards a highly volatile market, some mining companies have still managed to distribute consistent portions of their profits to their shareholders. Although the mining sector in South Africa is risky for investors, one might still manage to obtain reasonable returns through investing in the right companies.

In this study the researcher aimed at developing a share portfolio selection framework that will assist investors to select shares that will yield acceptable rates of returns to reduce risks as far as possible. Through the empirical study five independent variables/criteria were identified. These independent variables/criteria are:

- Price/Book value
- Price-to-Earnings Ratio
- Dividend/Share
- Revenue
- Margin of safety

Through the empirical process multiple regression analysis was done using the stepwise-enter method. By including or excluding the independent variables/criteria manually within the multiple regression analysis per year the best possible regression equation could be obtained. This was done with a 90% confidence interval with p-value smaller than 0.1 for statistical significance per year. Only five years produced workable results for multiple regression models with p-values smaller than (0.1).

It can thus be concluded that no workable constant year on year share portfolio selection framework for the mining sector in South Africa could be developed with the criteria set out in this research study.

5.3 RECOMMENDATIONS

Further research should be done on the criteria selection within the mining sector of South Africa. Qualitative criteria could also be considered as important. Emerging fast-growing companies with less data available could also be investigated due to the high growth rate of these companies.

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Figure A-1: Correlation matrix, Stats software (Pretorius, 2015)

Residuals Statistics ^a						
	Minimum	Maximum	Mean	Std. Deviation	N	
Predicted Value	-.563	1.610	.521	.677	11	
Std. Predicted Value	-1.602	1.609	.000	1.000	11	
Standard Error of Predicted Value	.238	.510	.372	.093	11	
Adjusted Predicted Value	-.146	4.173	.831	1.256	11	
Residual	-.657	.668	.000	.366	11	
Std. Residual	-1.268	1.289	.000	.707	11	
Stud. Residual	-2.101	1.590	-.144	1.116	11	
Deleted Residual	-3.311	1.311	-.310	1.207	11	
Stud. Deleted Residual	-5.479	2.022	-.437	2.015	11	
Mahal. Distance	1.192	8.787	4.545	2.572	11	
Cook's Distance	.000	6.070	.690	1.798	11	
Centered Leverage Value	.119	.879	.455	.257	11	

Figure A-2: Descriptive statistics, Stats Software (Pretorius, 2015).

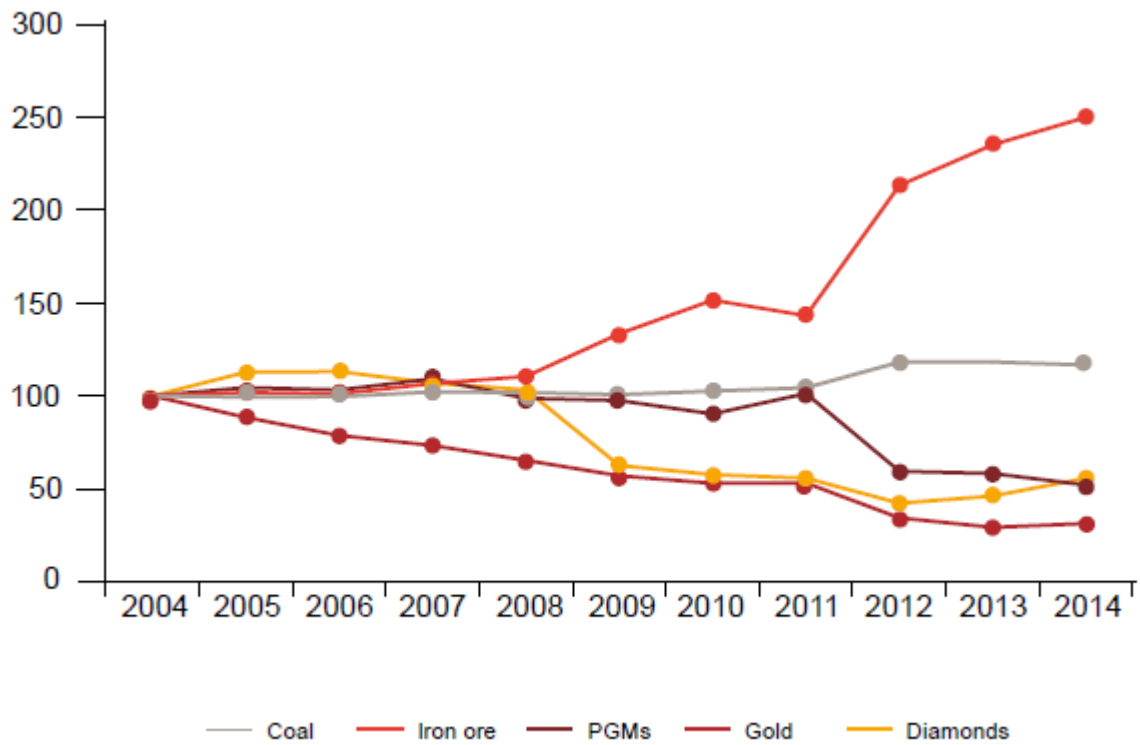


Figure A-3: Annual production per commodity (PWC, 2014)

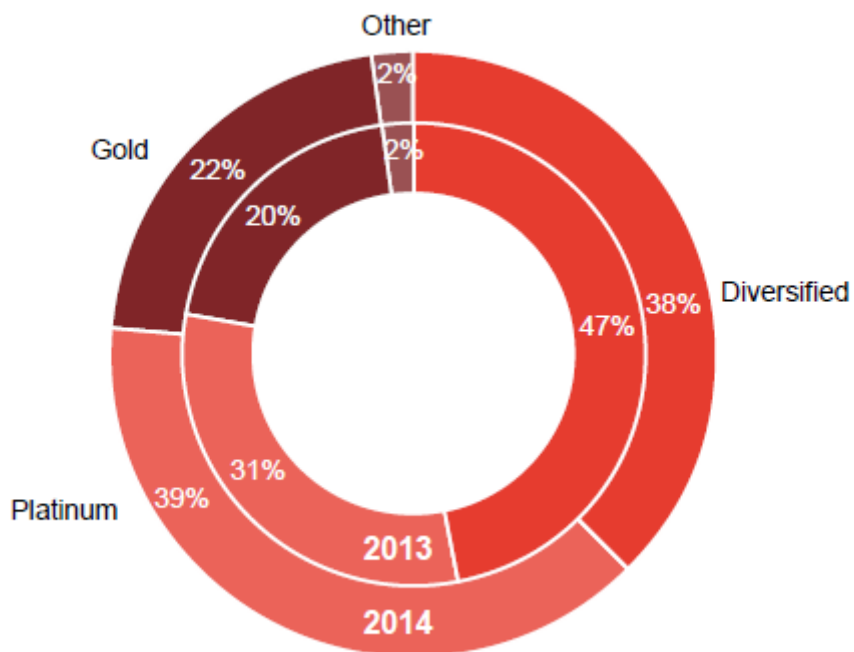


Figure A-4: Market Capitalisation per commodity type (PWC, 2014)