

A value-based investment selection framework for platinum shares on the JSE (Ltd)

Anna Maryna Olivier
M.B.,Ch.B

STUDY LEADER: PROF. I. NEL

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Abstract

Fundamentally at the root of financing is the core principle that investors expect compensation for the risk taken, since investing in equity embodies an opportunity cost.

The Platinum Sector of the Johannesburg Stock Exchange (JSE) is notorious for its volatility, but seems to be very attractive to the investor due to increasing demand for platinum. The JSE is also an emerging market, with potentially stronger growth potential.

The aim of the study is to develop a selection framework based on a limited number of key identified indicators, to incrementally reduce the risk of selecting poor performing assets/shares from the Platinum Sector, with anticipated higher rates of return.

Eight variables were selected to develop a regression model, but only two variables, namely: *Margin of Safety* and *Intrinsic Value* were incorporated in the final regression model.

Only four of the twenty years studied revealed a 10% level of significance. It was therefore concluded that no overall reliable selection framework could be developed for the Platinum Sector of the JSE.

Individual companies were therefore tested against the regression model, with periods of good fit, but no persistent fit. Aquarius Platinum was the single company to demonstrate a reliable overall fit.

Stand-alone risk of each company was hence evaluated against the average Johannesburg Stock Exchange All Share Index. By using the Security Market Line, investment potential in individual companies was identified.

Acknowledgements

“Everything has an opportunity cost” are the words spoken by one of the lecturers presenting the course of MBA at the University of North West.

The wisdom of these words reflected in the support and tolerance of my husband and family. My children encouraged me to face the challenges of the electronic era, and I would have been lost without their guidance.

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I feel humble that the opportunity was given to me to discover new facets of life’s kaleidoscope.

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List of Abbreviations

ANC	African National Congress	LP	Liquidity Premium
BEE	Black Economic Empowerment	M/B	Market to Book Ratio
BBBEE	Broad Based Black Economic Empowerment	MOS	Margin of Safety
BVPS	Book Value per Share	MRP	Market Risk Premium
CAPM	Capital Asset Pricing Model	MVA	Market Value Added
CEO	Chief Executive Officer	NCF	Net Cash Flow
CFROI	Cash Flow Return on Investment	NCR	Net Cash Receipts
CVA	Cash Value Added	NOA	Net Operating Assets
DCF	Discounted Cash Flow	NOPAT	Net Operating Profit after Tax
DMR	Department of Mineral Resources	NOPLAT	Net Operating Profit less Adjusted Taxes
DRP	Default Risk Premium	NOPLAT	Net Operating Profit less Adjusted Taxes
EBDIT	Earnings before Depreciation, Interest and Taxes	NOWC	Net Operating Working Capital
EBITA	Earnings before Interest, Taxes and Amortization	OA	Operating Assets
EBM	Expectation-based Management	OCF	Operating Cash Flow
EPS	Earnings per Share	OCFD	Operating Cash Flow Demand
ESOP	Employee Stock Ownership Plan	OL	Operating Liabilities
EVA	Economic Value Added	P/E	Price/Earnings
FA	Fixed Assets	PGMs	Platinum Group Metals
FCF	Free Cash Flow	PV	Present Value
GAAP	Generally Accepted Accounting Principles	Q ₁ ; Q ₂ ; Q ₃	First Quartile; Second Quartile; Third Quartile
GDP	Gross Domestic Product	RIM	Discounted Residual Income Model
IC	Invested Capital	ROIC	Return on Invested Capital
IP	Inflation Premium	SML	Security Market Line
IV	Intrinsic Value	T	Tax
JSE	Johannesburg Stock Exchange	VBM	Value Based Management
LCD	Liquid Crystal Display	WACC	Weighted Average Cost of Capital

Chapter 1: Risk and return

1.1 Introduction

“Sometimes risk and reward are correlated in a positive fashion.... The exact opposite is true in value investing. If you buy a dollar for 60 cents, it is riskier than if you buy a dollar for 40 cents, but the expectation for reward is greater in the latter case.” -

Warren Buffett in: *The Intelligent Investor*, 2003.

1.2 Background

The common investor, who wants to build a nest-egg, has but a few options: investing in the stock exchange, buying government bonds or bills, or acquiring property. The pivotal concept of a manager's responsibility to create value for shareholders, is fundamental to investing in the stock exchange. The superiority of returns earned by investing in the stock exchange, however, is diluted by a certain amount of risk-taking, stemming from the difference between anticipated future cash flows of an asset, and virtual returns (Megginson *et al.*, 2010:156). These cash flows comprise not only growth in capital, but also in dividend pay-out. There are no rigid rules regarding the latter, hence increased uncertainty.

Fundamentally at the root of financing, is the core principle that investors expect compensation for the risk taken, since investing in equity embodies an opportunity cost. A portion of this risk can be diminished by diversification (Muradoglu, 1999:17). Unsystematic risk, associated with the internal factors of a company, might be minimized by increasing the portfolio of shares. This is in contrast with market or systematic risk, dictated by external factors such as global economic cycles, politics, interest rates, inflation and gross domestic product, which cannot be diversified away, posing a special challenge to the investor.

The risk associated with a single asset, can be ascertained by determining the variance, and its square root, the standard deviation, from the mean (of the industry or market), in

a normal distribution curve, using a probability approach. One standard deviation includes about 68% of a variable's dispersion around the mean, and two standard deviations represent 95% of the values.

The Capital Asset Pricing Model (CAPM), that measures market risk, uses a single parameter, called an asset's beta (β), to illustrate the vulnerability of an asset's returns (r), in comparison with the return of the industry or overall market. Beta takes into account both the time value of money in the form of a risk-free rate (r_f), such as government bonds, as well as the market risk premium (r_m), which is the difference between the returns of the market and the risk-free rate (Meggison *et al.*, 2010:181). This situation can be depicted by the following formula:

$$r = r_f + \beta (r_m - r_f) \quad (1.1)$$

The beta of the overall market is arbitrarily chosen to equal 1, and since government bonds are perceived to carry no default risk, the beta value is represented by 0. The risk-free rate is determined by calculating the average returns on government bonds over a specified period. An asset's beta can be graphically plotted against the Security Market Line (SML), representing the line connecting the risk free rate of return and the overall market's return, (in this study the overall return of the JSE). Theoretically, a beta higher than 1.0 implies more risk than the overall market and, hence, a rate of return higher than the market, whereas a beta smaller than 1.0 implies the opposite. The Platinum Sector of the JSE had an industry beta of 1.57 in 2009 (Bradfield, 2009:10).

Researchers investigating the ability of the CAPM model to accurately predict the risk-return relationship found contradictory results in several studies conducted since 1965. In 2004, however, Eugene Fama and Kenneth French demonstrated, in a large study of stocks listed on three stock exchanges, namely New York Stock Exchange, American Stock Exchange and NASDAQ, during the period 1929 and 2003, a very weak relationship between returns and beta (Fama & French, 2004:32). They postulate a new model, called The Fama-French Model. In the Fama-French 3-Factor model, the size of a firm, as well as the equity book-value/market-value ratio combined with the original CAPM model, is pinned to the returns of an investment. Currently even the Fama-

French model (Fama & French, 2004) has not been proved totally reliable since it does not offer consistent answers in the risk-return relationship issue. Although other models are also proposed by different researchers, such as correlating corporate governance with returns, such proposals are still being treated with cynicism.

From the above discussion, it can be deduced that beta gives an indication of the vulnerability of a stock in comparison to a benchmark index, but is not a reliable indicator for return prediction. Even so, it seems from the practical experience (of investment experts) that beta is currently still the most regularly used metric for assessing the risk-return relationship. One probable reason is that it is easy to determine and use beta.

The statistical metric, r-square (R^2), is the coefficient of determination and tells what percentage of change in Y can be attributed to a change in X. It can be applied to measure the percentage movement of a variable such as a share or portfolio (Y), when benchmarked to a reference statistic (X), such as the market. This metric is obtained through regression techniques. Being a percentage, this metric restricts information to alignment with the reference statistic, and does not reveal any information about expected returns superior to the benchmark statistic. It cannot be aligned more than 100%. Although a handy metric, it is rejected, therefore, as a reliable indicator for return prediction.

The Sharpe Ratio is a risk-adjusted performance metric. It is calculated by dividing the difference between the return of a stock and a risk-free return, by the standard deviation of the stock's return. It is a useful indicator of historical returns, but Lo (2002:45) and the panel at www.investopedia.com (Investopedia, 2010b) questions its reliability in forecasting hedge fund returns, due to the possible 65% overstatement of hedge fund returns when ignoring serial correlation. Hence it is rejected as an indicator of future returns.

Another adjusted performance metric, is the alpha value (α). Alpha represents the risk-adjusted sticker price volatility of a share with a benchmark index. An alpha of 1 represents a 1% superior performance to the benchmark index.

Markowitz (1959:3) realized that most investors demand a portfolio of shares, and do not settle for a single share purchase. When utilizing a portfolio of shares, the risk associated with the portfolio is dependent on the variance, the weights, and the covariance of the different assets constituting the portfolio. This covariance may be positive when the assets follow the same economic cycle, or negative when opposite movement is present. Historical data is used to construct the covariance, depending on the metric applied. Since this data is not uniform, the correlation coefficient, symbolized by the Greek letter, rho (ρ), is used to standardize the covariance. Correlation is unit-free and ranges between -1 and +1, the former implying total independence, and the latter complete parallelism. Although the variance of a portfolio can be reduced by increasing the number of assets constituting the portfolio, marginal reduction in risk declines parabolically.

Portfolios can be constructed to deliver optimal returns with any specified volatility aligning an investor's risk profile. These portfolios are located on the so-called "efficient frontier" curve. Selecting individual shares to be elements of the value creating portfolio, depends largely on the application of financial and economic indicators.

Most stock markets globally have industrial shares as their backbone. South Africa, however, is resource driven. Heavy metals, such as gold and platinum, have a major impact not only on the JSE, but also on the Gross Domestic Product (GDP). The Platinum Group Metals (PGMs) was the second largest sector of mining activities in South Africa in 2010, with sales of R57.8 billion. Its exports contributed 9.6% to the total South African merchandise exports in 2009. Furthermore, this sector presented 2.1% of the GDP in 2010 (Chamber of Mines, 2010:60).

Unfortunately, the Platinum Sector of the JSE is notorious for its volatility, being subject to intense commodity price fluctuations, as well as exchange rate influences. Thirteen companies are listed currently on the JSE in this sector, but each differs in their prospects of creating value for the shareholder.

Through analysis of this sector by means of financial and economic indicators, portfolio selection can be streamlined to outperform the market. Risk-averse investors are in dire

need to identify and utilize crucial criteria as a guide in the selection and managing of a portfolio.

A plethora of financial indicators exist, each with its own set of disciples. These indicators give glimpses of a scenario from different angles, and it seems that no single indicator can be embraced as the unique key unlocking universal success.

According to Cilliers (2003:128) investment gurus, such as Warren Buffett, and his mentor, Benjamin Graham, laid the foundation for determining the intrinsic value of shares. Research conducted by Cilliers (2003:128) identifies five criteria that can be extracted from Buffett's philosophy, namely: Book Value, Intrinsic Value, Margin of Safety, Profit Margin, and Number of Years to Pay Off Debt. Dr. Steve Sjuggerud, President of *Investment U*, concluded on June 9, 2003:1, that the Benjamin Graham's saga "burns down" to the calculation of Graham's Intrinsic Value Number, which can be derived from subtracting total debt from current assets (in other words: Net Operating Assets). Phil Town (2007:63), another notorious investor and author of the book: *Rule #1*, embraces Return on Invested Capital (ROIC), Sales growth rate, Earnings per Share (EPS) growth rate, Equity – or Book Value per Share (BVPS) growth rate and Free Cash Flow (FCF) or Cash growth rate, as the trustworthy five. Numerous other "recipes" exist, but the focus of this study will be on the models of Benjamin Graham, Warren Buffett and Phil Town.

Consideration of the above models leads to the conclusion that a variety of methods and variables are used in making investment decisions in general. Nothing is mentioned, however, with reference to the Platinum Sector specifically.

1.3 Problem statement

The problem is that it remains unclear what investment criteria are the most appropriate to consider or include in an investment assessment framework when considering investment options for companies listed on the Platinum Sector of the JSE.

1.4 Objectives of the study

1.4.1 Primary Objective

The aim of the study is to develop a selection model based on a limited number of key identified indicators, to incrementally reduce the risk of selecting poor performing assets/shares from the Platinum Sector of the JSE, with anticipated higher rates of return.

1.4.2 Secondary Objective

The first step will be to apply eight indicators to the annual results of the thirteen companies representing the Platinum Sector of the JSE during the period 1991 to 2010. These indicators have been arbitrarily selected from the lists proposed by respected investors, such as Warren Buffett, Benjamin Graham and Phil Town, namely:

- Growth of Return on Invested Capital (ROIC)
- Growth of Sales
- Growth of Book Value per Share
- Earnings per Share growth rate
- Free Cash Flow growth rate
- Intrinsic Value
- Margin of Safety
- Net Operating Assets

The second step will then involve the assortment of some, or all, of these parameters to formulate an investor's selection model. This will be done by means of statistical regression techniques.

1.5 Scope of the Study

The thirteen companies listed in the Platinum Sector of the JSE, as on 1 January 2011, will be studied in this dissertation. Companies that do not have enough data available, due to infancy, will be excluded.

In reaching the primary objectives of this study, macro-economic factors, such as inflation, interest, exchange rates, global economic cycles and politics, will be disregarded, due to the fact that all thirteen companies are exposed to these factors and, therefore, bear similar risk. For these calculations, the beta of each company in the Platinum Sector will be utilized in calculations.

The risk-free rate will be taken as the average 5 year bond yield of the South African Government, which equals 8.25% July 2011 (Fig.1).

FIXED RATES		INFLATION LINKED RATES	
2 Year Fixed Rate	7.50%	3 Year Inflation	1.75%
3 Year Fixed Rate	7.75%	5 Year Inflation	2.00%
5 Year Fixed Rate	8.25%	10 Year Inflation	2.50%

FIGURE 1: S.A. GOVT BOND 5 YR YIELD

Source: <https://secure.rsaretailbonds.gov.za>

1.6 Research Methodology

The study consists of two main sections, namely an intensive review of academic literature relating to value creation and key criteria, followed by empirical research to test the hypotheses of the problem statement mentioned in 1.3 above.

1.6.1 Literature Review

- By using a Bottom-Up approach, this dissertation will firstly present an overview of the platinum group metals that will cover aspects such as (i) the metal itself, (ii) its distribution and (iii) the uses of and threats to the platinum industry, both domestically and internationally.
- A review of the academic literature on value creation and key criteria will be presented to illustrate the fundamental elements identified from an investor's perspective.

1.6.2 Empirical Study

The aim of this empirical study is to develop an investor's algorithm from the key elements identified by the research on the Platinum Sector companies.

The population sample will be drawn from the 13 companies listed in the Platinum Sector of the JSE on 1 January 2011. Secondary data will be collected in this survey research from the annual financial results of the companies for the period 1991 to 2010, as provided by BFA McGregor.

1.7 Limitations of the Study

- This study will be limited to the companies listed in the Platinum Sector of the Johannesburg Stock Exchange, on 1 January 2011.
- Financial data up to a twenty year period will be analysed. Companies with limited data will be included in the annual matrix analysis of correlating parameters, as well as in the overall company matrix, since these companies are young high-growth companies with potentially high returns. When insufficient information exists, precluding the usage of data, such company or companies will be excluded from the analysis.
- Since the Platinum Sector is notoriously volatile, the results from this study will not necessarily be applicable to all the industries listed on the JSE.

- It should be kept in mind that the period 2008 to 2010 includes a global recession, and that, at the time of undertaking this empirical study, the worldwide economy is still recovering slowly.
- South Africa (and thus the JSE), is considered to be an emerging market, with higher growth rate potential than the stabilized first world markets, such as the New York Stock Exchange. The results of this study would therefore not be necessarily applicable to other markets.

1.8 Layout of the Study

This study will be organized into six chapters.

Chapter One describes the basic outlay of this dissertation. It includes an introduction and background information, covering the quest for reducing risk in share-investments, with special emphasis on the Platinum Sector of the Johannesburg Stock Exchange. The problem statement, objectives of the study and scope of the study, are highlighted, taking into account the limitations of the research study.

The aim of Chapter Two is to provide a detailed academic financial literature review of the following issues: Firstly, some background information regarding platinum and platinum-mining is given, followed by local and global factors affecting the stability of the Platinum Sector. The chapter is further devoted to identifying the crucial financial parameters to be applied by an investor when selecting stock.

Value-based Management and the Platinum Sector of the JSE are the focus points of Chapter Three. The background, operational activities and scope of all thirteen companies listed in this sector will be discussed.

The empirical study is described in Chapter Four. This entails an in-depth analysis of the thirteen companies listed on the JSE on 1 January 2011, specifically with regard to extracting the crucial investment criteria identified in Chapter Two.

In Chapter Five, the results of the empirical study are documented, using statistical regression techniques, in order to determine the significance and reliability of the identified criteria. A detailed discussion of the results forms the epilogue to this chapter.

Chapter Six concludes this dissertation, with a summary and inferences. Recommendations for further studies are made, based on identified deficits of this research dissertation.

Chapter 2: Financial Indicators for the Platinum Sector

2.1 Introduction

“First place your army so that you cannot lose,” Sun Tsu in The Art of War

2.2 Platinum and Platinum Mining

Platinum is the 78th element of the periodic table, represented by the symbol Pt. Although ancient Egyptians and the Inca and Maya civilisations used platinum in their artistic crafts, Europe only learned of the new metal during the fifteenth and sixteenth centuries, after the Spanish conquest of the Americas. Gold prospectors in Colombia, South America, found some alluvial sediments of platinum during their activities, but it was regarded as an annoyance.

Platinum's unique properties of being very strong and durable, anti-corrosive, highly conductive and having a melting point of 3 215 degrees Fahrenheit, led to applications in both the industrial and jewellery markets. Currently it is a vital component of catalytic converters, controlling carbon emissions from vehicles. Increasing environmental protective legislation by the United States and Europe, spurs the excessive demand for platinum. It finds industrial application in paints, pacemakers, fibre-optic devices, oncology medicine, gasoline, fertilizers and explosives. Japanese and Chinese jewellers adore platinum and investors may buy legal bullion coins in the form of the Australian Koala, Canadian Maple Leaf, Isle of Man Noble and Chinese Panda, all being 99.95% pure platinum and presented as one ounce and smaller coins (Penoir.com, 2009:3).

2.2.1 Sources of Platinum

Supplies of platinum are limited, due to both geological scarcity, as well as an intensified refining process, which usually lasts up to six months. According to the 2010 Annual Report of the Chamber of Mines, South Africa accounted for 76.5% of global platinum production, and 86.1% of rhodium production (a platinum group metal).

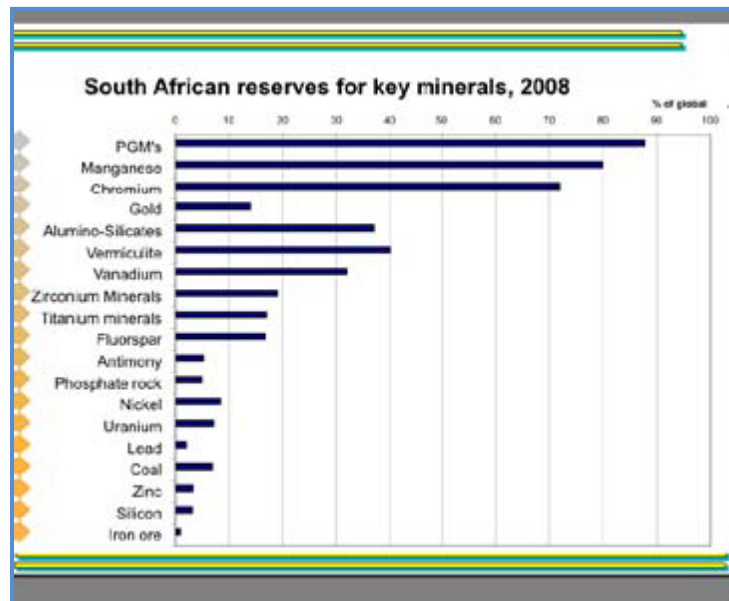


FIGURE 2: S.A. RESERVES FOR KEY MINERALS, 2008

Source: Annual Report Chamber of Mines, 2010

The Igneous Bushveld Complex in North West, South Africa, is home to almost 87% of the world's platinum group metal reserves, with Russia contributing 8.3% from the Norilsk mine in Siberia, and the United States' Still Water Mining Company in Montana accounting for approximately 2.5%, being mainly a palladium producer. According to Cawthorn (2010:1) geologists estimate that the Igneous Bushveld Complex will be able to fulfill the global demand for platinum for several decades, if not a century, due to the richness of deposits. Currently only approximately 5 million ounces are extracted annually from the Merensky and UG2 reefs, which host a concentration of 350 million ounces per one kilometre depth.

2.2.2 Global Factors affecting Platinum Mining

The global economic recession of 2008 impacted heavily upon platinum demand from South Africa, falling 9.6% to 482.9 tons in 2009 (Chamber of Mines, 2010:59). This can mainly be ascribed to the sharp 22% decline in catalytic converter demand of the automotive industry, as well as reduced industrial output. Although the demand

increased for jewellery (25.6%), and investment (31.8%), overall demand for platinum declined.

Anticipated resurgence of the worldwide economy, and especially the automobile industry, which uses catalytic converters in 90% of all automobiles produced, will lead to an increase in platinum demand. Jewellery demand surpassed industrial requirements in 2009.

In November 2008 the mining industry faced an upsetting platinum price of US\$850 an ounce, only five months after topping US\$2000 an ounce. Slow recovery during the first two quarters of 2009 led to an increase to US\$1199, but by the time of writing this dissertation, (February 25, 2011), the price had recovered to US\$1783,50 an ounce.

Currency exchange rates obviously influence the profitability of this sector. The current strong rand (R7,00/US dollar on Feb.25, 2011), counters the increase in platinum price.

Political factors, such as the current unrest in Libya, threaten the stability of the global economy, with investors focusing on historical “safe havens”, such as gold.

Since Russia is the second largest supplier of platinum, its export policy influences world platinum markets considerably. Only in 1999 was the law amended prohibiting the Norlisk mine from selling any platinum produced, since it wasn't a 'state organ'. Stockpile exports were also terminated in 2000, leaving the world in uncertainty about the reliability of Russian supplies (Unctad-Infocomm: 2007:1).

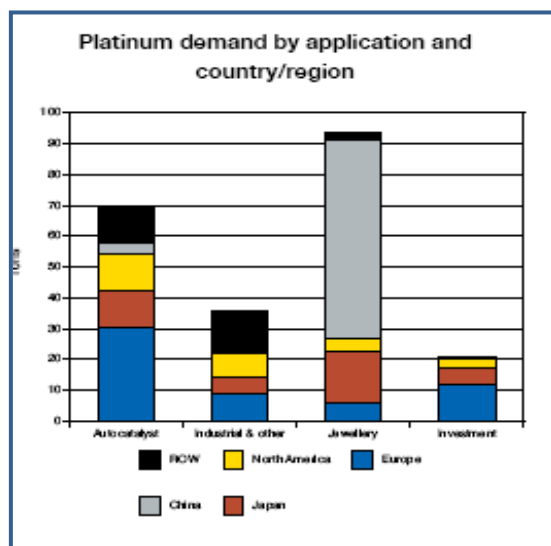


FIGURE 3: PLATINUM DEMAND GLOBALLY BY APPLICATION AND COUNTRY

Source: Chamber of Mines Annual Report 2009 – 2010

Increasing environmental legislation calls for reduced carbon emissions, hence the demand for catalytic converters in automobiles. The ISO 14064:2006 addresses emission standards in order to reduce the greenhouse effect. Europe introduced the Euro 5 standards in September 2009, which aims to restrict particulate matter emissions from diesel automobiles to less than 5mg/km. Euro 4 had a limit of 25mg/km. January 2014 is the target date for Euro 6, aiming to reduce Nitrous Oxide emissions from diesel vehicles to 80mg/km, down from 180 mg/km currently (European Commission Environment, 2010:1) which will further increase the demand for catalytic converters and, likewise, platinum.

2.2.3 Local Factors affecting the Platinum Sector

South Africa is the dominant producer of the platinum group of metals, and thus this country's internal factors play a major role in the stability of the Platinum Sector.

- **Economic growth of South Africa:** Although optimism exists regarding a 3.4% sustainable growth for the South African economy in 2011, (Gordhan, 2011:1), concerns regarding worker productivity have been raised. Fedderke (2010:1) in a research study found that an indirect relationship emerged between increased employment since the millennium and output per capita.

- Unemployment figure: South Africa has an official 25% unemployment rate (www.statssa.gov), prompting the Minister of Finance, Pravin Gordhan, to target 5 million new job opportunities in the next decade. This requires a step-up of the annual growth rate to more than 4%.
- Politics: As a result of the Broad Based Black Economic Empowerment (BBBEE) Act 53 of 2003, the demographics of the Platinum Sector have changed considerably since 1994. The Minister of Mineral Resources, Susan Shabangu, re-announced the target of 26% black ownership of mines in South Africa in 2014 (currently 9%), on 23 February 2011.
- Royalties: The Royal Bafokeng Tribe privately owns the vast bulk of land on which both Anglo Platinum and Impala Platinum operates. After prolonged legal actions, Impala Platinum agreed in 1999 to transfer a 1% share of the company's equity, as well as royalties equal to just over 15% annual pre-tax income of the Impala Lease Area. In 2007, these royalties were converted to equity and currently the Royal Bafokeng Tribe is the largest shareholder of Implats (13%), as well as a 75% shareholder in Royal Bafokeng Platinum, which in turn owns two thirds of the Bafokeng Rasimone Platinum Mine. Angloplats is the remaining shareholder of the latter mine (Carroll, 2010:6).
- Mineral rights legislation: Mineral rights were dually owned by private tenure and the South African Government prior to 1998. The publishing of a White Paper on Minerals and Mines Policy in 2011 expressed the government's aim to unite all mineral rights in the government's treasury. A 'use-it-or-loose-it' standpoint was adopted, which officially became legal in May 2004. This legislation stipulates that 15% of the equity of mining companies must be owned by 'Historically Disadvantaged South Africans' (HDSAs) within five years, and a minimum of 26% in ten years. Mining companies are also compelled to apply the conversion of their existing mining licences and prospecting permits to new order rights.

- Nationalisation of the mines, as proposed by ANC Youth Leader, Julius Malema, is a hot topic and has caused sufficient rippling of the water to oblige Cynthia Carroll, CEO of Anglo American, to make a formal warning regarding investor's confidence, on 8 February 2011, during the annual Mining Indaba, held in Cape Town, South Africa. Nationalisation is regarded with caution by overseas investors.
- Trade Unions, such as NUM, fuel strikes and labour disputes.
- The uncertainty regarding an uninterrupted electricity supply by Eskom, forced many mines to establish their own generator sites during the final years of the last decade and to introduce economic electricity usage policies. Platinum mines are categorized into three classes:
 - (a) 'mine to metal' companies, having the infrastructure to produce finished PGM metal products via their refineries (typically large companies, such as Anglo Platinum, Impala Platinum and Lonmin). These 'mine to metal' companies have different capacity ovens, which have to be preheated for on average six to eight weeks, to reach the optimal temperatures. They can tolerate power interruptions only for six to twelve hours, after which the metal solidifies, leading to total destruction of such an oven;
 - (b) producers and suppliers of concentrates to the refineries of group (a), for example Northam Platinum;
 - (c) Black Economic Empowerment (BEE) companies and exploration companies, such as Mvelapanda Resources and Wesizwe.
- HIV-Aids has impacted heavily on the labour force, increasing not only medical expenditure and separation costs, but also loss of productivity days.

- High crime rates led to increased expenditure on security systems.
- Interest rates: South Africa is classified as an emerging market, and its interest rate policy is attractive to foreign investors.
- The inflation target of 3% set by the South African Reserve Bank, was reached in 2010, but current signals are pointing to rising inflation rates, due to several factors, such as the increasing oil price, political turmoil (such as the unrest in North Africa beginning in 2011), and the increase in government debt. The minister of finance, Pravin Gordhan, announced on 22 Feb. 2011, during his annual budget speech in Parliament that government debt is set to increase from R526 milliard in 2009, to more than R1 300 milliard in 2014.
- Exchange rates: The end of the last decade was marked by a strong rand against other currencies (swivelling around R7 per U.S. dollar), which impacted negatively upon exports. Sensitivity to exchange rates influences the Gross Domestic Product (GDP) considerably, since exports represent a significant factor of the GDP.

2.3 Stock Valuation

The value assigned to a share of common stock represents a shareholder's anticipation of all future gains to be derived from this stock (Megginson *et al.*, 2010:131). Preferred stock, on the other hand, provides a fixed stream of income perpetually to the investor.

Different approaches to valuating stock exist. The most popular is certainly the Dividend Growth Model, but the Free Cash Flow Approach, Discounted Residual Income Model, Book Value, Liquidation Value and Price/Earnings Multiples are also frequently used (Megginson *et al.*, 2010:130 - 144).

Growth is a result of a variety of factors, of which investments in profitable projects are especially important. A simple method to determine growth is by multiplying the retention rate of a company by its return on common equity (ROE), expressed as a

percentage. Historical data may also be applied to determine average growth rates, but it must be kept in mind that this information is regarded as unreliable (Chan *et al.*, 2003:5).

The stage of venture growth determines to a great extent the growth rate of the company. The initial research and development stage has zero growth, since the enterprise is not yet productive. This is followed by slow growth during the start-up phase, and then succeeded by the typical high growth phase. Maturity leads to slower growth, but stable companies have to implement new projects to maintain their growth potential (Timmons & Spinelli, 2010:309).

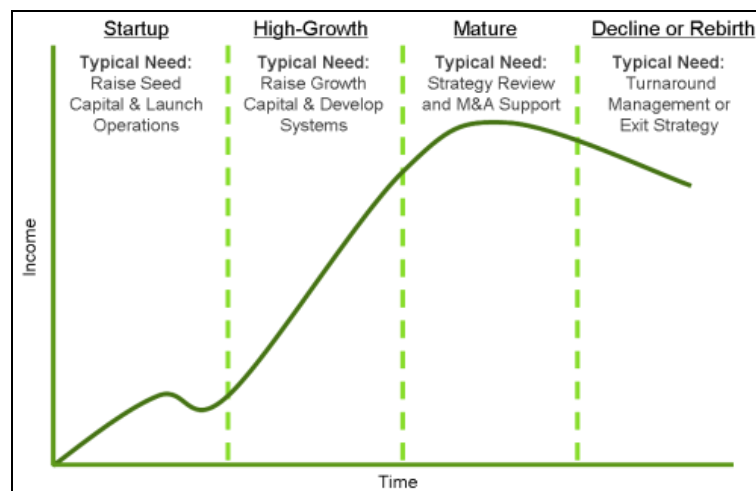


FIGURE 4: STAGES OF VENTURE GROWTH

Source: Google Images

2.3.1 Dividend Growth Model

Returns from a stock include both capital gains, as well as dividends declared by the company. Three models are presented, namely the 'Zero Growth, Constant Growth, and Variable Growth' models.

2.3.1.1 The Zero Growth Model

A fixed dividend pay-out is proposed in this model, equalising it with the formula for valuing preferred stock, namely:

$$P_0 = \frac{D}{r} \quad (2.1)$$

Where:

P_0 = Current Price of Stock,

D = Constant dividend pay-out; and

r = Discount rate, reflecting the required return by the market according to a stock's risk assessment.

2.3.1.2 Constant Growth Model

This model is also known as the Gordon Growth Model (Megginson *et al.*, 2010:83) and can be depicted as follows:

$$P_0 = \frac{D_1}{r - g} \quad (2.2)$$

Where:

r = Required Rate of Return,

g = Growth Factor; and

D_1 = Dividend due.

$$D_1 = D_0(1 + g) \quad (2.3)$$

Where:

D_0 = Current Dividend.

The Gordon growth model is a very popular simplistic model, based on the assumption that dividends will continue to grow at a constant rate g . To be able to apply this model, the required rate of return must exceed the growth rate.

Critique of the Gordon growth model, include the absence of a time factor in the model, as well as limitations during production phases, as are discussed below.

- Aase (2008:293) demonstrated that the Gordon growth model lacks a discrete time framework. By noticing that dividends are usually paid as an amount per share, rather than in required rates, the recommended model to be applied should be the Lucas formula, which has been developed in a discrete time framework. Aase (2008:293) recommended that the square covariance term, appearing usually in continuous-time frameworks, should however also be present in this discontinuous model to find the real market value of an asset.

$$S_t = \frac{1}{\pi_t} E_t \left[\sum_{s=t+1}^T \pi_s \delta_s \right] \quad (2.4)$$

Where:

S_t = the real market value of a security at time t ,

E_t = conditional expected value of a security upon given information at time t ,

δ = security's dividend; and

π = marginal rate of substitution.

The marginal rate of substitution is also known as a pricing kernel, or state deflator. By adding a square covariance term, the standard model supports the usual continuous-time models.

- Kiley (2004:910) was also disappointed in the Gordon growth model during times of production, stating that faster growth leaves the ratio of market value to output unaltered. The Gordon growth model assumes independence between the growth rates of earnings, the returns to equity or risk-free assets, and the

dividend growth rate. These factors are however linked to each other in growth cycles. Kiley (2004:910) concludes that the Gordon growth model was aimed at the valuation of single stocks, not taking into account general inflation rates, interest rates or macro-economic factors.

In his article Kamstra (2003:54-56) discussed variations on the basic Gordon growth model developed by researchers Hurley and Johnson (1994,1998) and Yao (1997), namely the geometric Markov Gordon growth model, which includes zero growth possibility; and the Donaldson-Kamstra Gordon growth model, developed by Donaldson and Kamstra in 1996. This latter model permits more plastic auto-correlated growth rates. It reveals an indirect relationship with fade rates, in other words, converging from high growth to stable long-term growth rates. Scenario analysis is enhanced with this model. A disadvantage of the Donaldson-Kamstra Growth model is the assumption that the stable long-run growth rate will indeed remain stable.

2.3.1.3 Variable Growth Model

Due to periods of irregular growth, the Variable Growth Model model is more appropriate for most firms.

$$P_0 = \frac{D_0(1+g_1)^1}{(1+r)^1} + \frac{D_0(1+g_1)^2}{(1+r)^2} + \dots + \frac{D_0(1+g_1)^N}{(1+r)^N} \quad (2.5)$$

Source: Megginson *et al.*, Financial Management: 2010:135

Where:

P_0 = Current Price of Stock,

g = Growth rate,

r = Required rate of return for a single stock; and

N = Number of years in the initial growth period.

The above model has two stages: the initial fast growth period, followed by the more stable growth phase. Due to the dynamics during these growth periods, dividend pay-

outs vary. The numerator of the last term accounts for both the final dividend payment of the fast growth phase, as well as the present value of all future expected dividends during the stable growth period.

Not all companies pay out dividends, though and Scenario analysis and Discounted Cash Flow Analysis (DCF) may be used for valuation in such companies. Scenario analysis computes the cash flows of a company during different scenarios, using elements of both relative valuation and discounted cash flow analyses. Free Cash Flow Analysis is an example of DCF valuation.

2.3.2 Free Cash Flow Valuation Approach

When a company omits dividend pay-outs, the Free Cash Flow Valuation method (Megginson *et al.*, 2010:140) can be used to obtain the value of a company and its shares. By subtracting both debt holders' and preferred stockholders' claims from the Free Cash Flow value, total value of the company can be established. This is represented in the following equation:

$$V_S = V_F - V_D - V_P \quad (2.6)$$

Where:

V_S = Total Value of the Share,

V_F = Free Cash Flow Value,

V_D = Total Value of Debt holders' claims; and

V_P = Total Value of Preferred stockholders' claims.

Assets-in-place include tangibles, such as buildings, equipment, and inventory. These assets are considered to be operational and to generate free cash flows. When these future cash flows are discounted at the weighted cost of capital (WACC), it represents the present value of operations. Free cash flow can be determined by subtracting the required funds for investment in fixed and current assets, from total operating cash flow. It can be depicted mathematically as:

$$FCF = NOPAT - \Delta NOWC - \Delta FA \quad (2.7)$$

$$NOPAT = EBIT (1 - T) \quad (2.8)$$

Where:

NOPAT = Net Operating Profit after Tax,

NOWC = Net Operating Working Capital,

FA = Fixed Assets: and

EBIT = Earnings before Interest and Taxes.

Net operating working capital includes inventory, accounts receivable, cash and bank, as well as other current assets. The change in NOWC and fixed assets from one year to another is used in the calculation of NOPAT.

$$V_{OP} = \sum_{t=1}^{\infty} \frac{E_t[FCF_{t+1}]}{(1+WACC)^t} \quad (2.9)$$

Where:

V_{OP} = Value of operations of an entity at time t,

FCF_{t+1} = the free cash flow at time $t+1$,

WACC = the average cost of capital of the company,

E_t = the expectation on information available at time t; and

WACC represents also the required rate of return for a company.

Arguments against the Free Cash Flow Model include inaccuracy of intrinsic value determination due to tentative future forecasts (Vardavaki & Mylonakis, 2007:108), and the ignorance of accrual accounting and short term value additions (Penman, 2003:93). A growing company has obligated capital expenditures, which may lead to negative

cash flows and hence negative intrinsic value of equity. Accrual accounting contains provisional estimates, for example for research and development, or depreciation, causing the investor to focus more on cash flows. Free cash flow represents the cash from operations minus investments. A company can increase its free cash flow from operations by liquidating investments such as Government bonds, leading to possible faulty assumptions about operations versus financing activities.

2.3.3 Discounted Residual Income Model (RIM)

This model is also known as the Edwards-Bell-Ohlson (EBO) Model (Frankel & Lee, 1998:285). Residual income represents the excess income above required return on capital, therefore representing Economic Value Added (EVA). The RIM measures both capital invested, and the discounted value of all future residual incomes. RIM takes into account both asset-based financial activities, as well as earnings-based operating activities, and is, consequently, considered to be especially applicable to companies having high fixed and intangible assets. Residual income can be algebraic depicted as:

$$RI_{t+1} = NI_{t+1} - (r_e * BVE_t) \quad (2.10)$$

Where:

RI_{t+1} = the Residual Income at time $t + 1$,

NI_{t+1} = the Net Income for period $t + 1$,

r_e = the Cost of Equity; and

BVE_t = the Book Value of Equity.

2.3.4 Book Value

The balance sheet portrayal of a company's equity is known as its Book Value. This represents the value of assets minus accumulated depreciation. Intangible assets, such as goodwill and patents, as well as liabilities, are subtracted from total assets to derive the Book Value of a company. Book Value represents the total value of assets available to shareholders in the event of the liquidation of a company. Except in financial distress,

the Book Value is usually less than the market value of the company. Book Value can, therefore, be an indicator of the under- or overvaluation of a company. Bae and Kim (1998:467) demonstrate that Book Value is a reliable indicator in trading strategies, especially in combination with a company's earnings.

Book Value has its limitations though. It may reflect the depreciated value of old equipment as having a low Book Value, while this equipment may still contribute significantly towards operational capital.

Disadvantages of using Book Value as an accounting measure:

- It fails to provide information regarding future prospects, being deprived of estimated future earnings;
- It reflects historical data, namely the historical value of assets minus accumulated depreciation; and
- It is subject to accounting variations. Different methods of determining accumulated depreciation exist.

Market value, on the contrary, usually incorporates future earnings potential.

2.3.5 Liquidation Value

The net cash after disposal of all assets and eradication of all liabilities is known as the liquidation value. This value is usually less than the current share price in a normal profitable industry.

Two types of liquidation values exist, namely:

- a) Orderly liquidation value: time is not a constraint and the price is negotiable, and
- b) Distress liquidation value: time and price are constraints. Obviously, this type of value is lower than orderly liquidation.

2.3.6. Price/Earnings Multiples

Earnings per share (EPS) is a popular accounting measure, often considered both internally and externally as a proxy for value creation. Managerial performance assessments are frequently based on EPS.

Due to the fact that EPS only reflects historical data, which is considered by financial analysts not to be a reliable indicator for future earnings, this factor cannot be assumed to be synonymous with value creation.

The formula for EPS is:

$$EPS = NI/AOS \quad (2.11)$$

Where:

NI = Net Income; and

AOS = Average Number of Outstanding Shares.

The P/E ratio is obtained by dividing the price per share by the earnings per share. The simplicity of its calculation contributes to its popularity. The reported P/E ratio in financial scripts usually depicts a trailing P/E ratio, reflecting the previous 12 month period. A forward P/E gives an indication of analysts' forecast for the next 12 month period.

The general notion is that a high P/E reflects expected high dividend growth rates, low possession risk, or high earnings associated with attractive growth rates (Kamstra, 2003:50). While a high P/E ratio may be attractive to the growth investor, the value investor might consider the same P/E ratio as being a sign of overpricing (Investopedia.com, 2011:49).

The equation for the P/E ratio is:

$$\frac{P}{E} = \frac{P_0}{EPS} \quad (2.12)$$

Where:

P_0 = Current Market Price, and
EPS = Earnings per share.

And:

$$P_0 = \frac{D_1}{r - g} \quad (2.2)$$

When considering the value per share, it can be expressed as:

$$\frac{\text{Value}}{\text{Share}} = \frac{EPS(D_1)}{(r - g)(1 + g)} \quad (2.13)$$

Source: Megginson *et al.*, 2010:p.144

Rearranged it becomes:

$$\frac{V}{E} = \frac{D_1}{(r - g)(1 + g)}$$

Where:

g = dividend growth rate percentage,

r = required rate of return,

E = next year's earnings per share,

D_1 = dividend pay-out percentage next period; and

r = required return.

In the above situation, Value/share is equated to Price per share. Dividing the equation by $(1 + g)$ converts the result to the present value. The P/E obtained using the above equation is referred to as a 'fair' or 'affordable' P/E ratio. From this equation it is clear that both an increase in dividend pay-out, as well as a decrease in required return, will result in a higher P/E ratio. The conclusion can thus be drawn that a higher P/E ratio does not necessarily imply higher growth potential. Another limitation of P/E as an

accounting measure is the subjectivity of the denominator to accounting manipulation. The P/E ratio should be used, therefore, in the context of the industry segment, or overall market, to give a more realistic view of anticipated growth and value creation.

Bagella *et al.* (2005:577), questioned the applicability of the P/E ratio in many modern high-tech companies, which foster a high proportion of intangible assets and low dividend pay-outs. It is thus, concluded that a more appropriate approach for calculating P/E would be to identify stocks exhibiting positive differences between mathematical DCF values and actual price earnings.

2.3.7 Conclusions

Despite the fact that all the different valuation models have flaws in situ, their successful application in the past has guaranteed their longevity. The Dividend Growth Model, Discounted Residual Income Model, Market Value, Forward P/E ratio and Discounted Cash Flow (DCF) Analysis, using Free Cash Flow projections, are all future driven valuation methods. Book Value is fundamentally a reflection of historical data. Obviously, the dividend model is only applicable to companies paying out dividends.

It is worth noting the increasing proportion of companies, especially in the United States, that rather re-invest, instead of shedding dividends. Kamstra (2003:50) argues that the variations on the basic Dividend Growth Model represent “ad hoc attempts to capture real-world phenomena”. Furthermore, the Dividend Growth Model can only be applied in the absence of so-called economic ‘bubbles’. The gross overvaluation of a company’s shares, in comparison to its fundamental value during bull market times, may lead to unrealistic expectations of dividends - and capital growth respectively. This euphoric state often collapses suddenly, with a sharp fall in prices. Economic ‘bubbles’ are contradictory to the Efficient Market Hypothesis, which “asserts that financial asset prices fully reflect all available information” (Megginson *et al.*, 2010: 357).

The recession of 2008/2009 changed the ‘rules of the game’, though. Gilani (2010:1) warns that the “New Normal Economy” may exhibit ultra-slow growth, due to the anticipated slow recovery of global sustained markets. Emerging markets, on the other

hand, are classified as “Non-New Normal”, since their growth projections are less impacted. Goedhart *et al.* (2010:14) state that forecasts by analysts for market returns over the 25 year period up to 2009, were found to be far too optimistic. Instead of the projected growth of 10% to 12%, actual growths were only 6%. Goedhart *et al.* (2010:14) also criticise the lagging of analysts to appreciate the detrimental effect of volatility on valuations.

Given the impact of the global recession, it is also debatable whether traditional valuation methods would still be appropriate. The devastating earthquake in Japan during March 2011 still has to disclose its impact on the already struggling global economy, and in particular, whether there will be any significant change in the automobile industry’s demand for platinum in the production of catalytic converters in emission control.

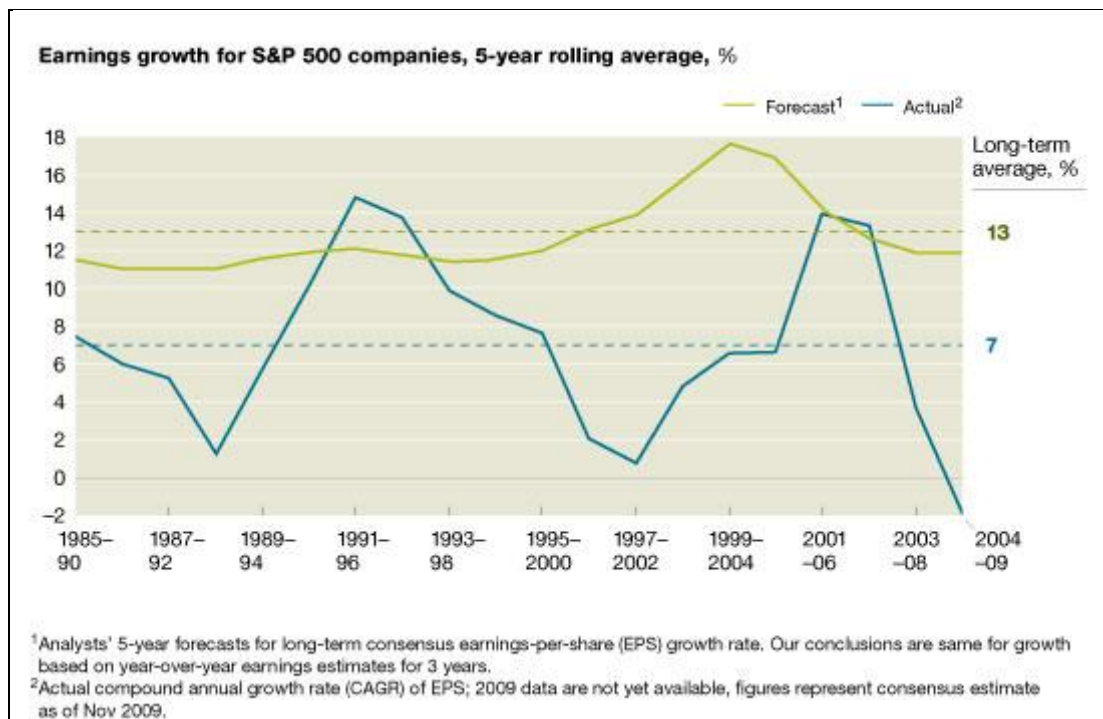


FIGURE 5: EARNINGS GROWTH FOR S&P 500 COMPANIES, 5 YEAR ROLLING AVERAGE%

Source: Thomson Reuters I/B/E/S Global Aggregates' McKinsey analysis, Nov. 2009

2.4 Value Creation in the Platinum Sector of the JSE

Thirteen companies are currently listed in the Platinum Sector of the JSE, namely: Angloplat, Anooraq, Aquarius, Bauba, Eastplats, Implats, Jubilee, Lonmin, Northam, Platfield, Platmin, RBPlat, Village and Wesizwe. Angloplat, Implats and Lonmin constitute the heavy-weights of the sector, while Aquarius is Australian owned. Wesizwe is a mining exploration company.

The Platinum Sector was extremely vulnerable to the effects of the global recession of 2008/2009 and had to abdicate its throne position to coal mining in the financial year 2009 (Chamber of Mines, 2010:60).

Investing in this sector poses a challenge due to the factors mentioned in the previous section. Randomly picking shares just on the strength of platinum demand will not suffice. The investor needs an objective directive to guide investing in this sector.

2.4.1 Value- based Financial Performance Measures

The quest for objectivity in portfolio selection spurred both the traditional accounting analysis of value creation, as well as economic value added (EVA), and market value added (MVA) analysis. The latter two indicators are concepts trademarked by Stern Stewart & Company (Erasmus, 2008:31), and will be discussed in the following section, together with Expectations-based management (EBM). Cash Value Added (CVA), and Cash Flow Return on Investment (CFROI). Since traditional analysis is the anchor of the different investing models dissected in this study, a detailed analysis will conclude this section.

2.4.1.1 Economic Value Added (EVA)

EVA, or economic profit, asserts that shareholder value is only created when the difference between actual returns and the hurdle rate (WACC), exceeds zero. Koller (1994:98) explains that economic profit: "... measures the gap between what a company earns during a period and the minimum it must earn to satisfy its investors". EVA is based on historical data, and is in reality a variant of Net Present Value

calculations, used to determine added value for shareholders (Megginson *et al.*, 2010:243).

Based on the concept of residual income, EVA considers the operating profit of an unlevered firm (financed only with equity), in conjunction with utilized financial resources. Residual Income is “the net operating income that an investment center earns above the minimum required return on its operating assets” (Garrison *et al.*, 2008:537).

Residual Income can be defined as follows:

$$\textbf{Economic Profit} = \textbf{NOPLAT} - (\textbf{Invested Capital} \times \textbf{WACC}) \quad (2.14)$$

Where:

NOPLAT = Net Operating Profit Less Adjusted Taxes.

The calculation of NOPLAT is described by Copeland *et al.* (2000: 131-154) as EBITA (earnings before interest, taxes and amortization) – (income derived from non-operating activities) + (interest, provisions and increases in deferred tax) - (any tax shield benefits).

Invested Capital (IC) = the difference between total assets and non-operating assets, investments and securities in an unlevered firm;

Weighted average cost of capital (WACC) = the sum of the required rates of return of debt and equity utilized in financing a firm, expressed as weighted average percentages. WACC therefore is an expression of the capital structure of a firm and functions as a hurdle rate.

WACC is defined by Megginson *et al.* (2010:320) as:

$$\textbf{WACC} = \left(\frac{D}{D+E} \right) (1 - T_c) r_D + \left(\frac{E}{D+E} \right) r_E \quad (2.15)$$

Where:

D = debt,

E = equity,

T = the corporate tax rate,

r_D = the required rate of return on debt; and

r_E = the required rate of return on equity, also known as the cost of equity.

According to Brigham and Ehrhardt (2005:311), the cost of debt is easy to determine, because it is bound to the interest rates, but the cost of equity may be exigent and thus three methods in particular can be applied to determine this latter variable, namely:

- a) Capital Asset Pricing Model (CAPM);
- b) Discounted Cash Flow (DCF); and
- c) Bond Yield – Risk Premium.

The CAPM seems to be the most popular (although with flaws), to utilize beta as an indicator of risk relative to a benchmark premium (often the market or industry premium)(Megginson *et al.*, 2010:215).

Since all the firms in the platinum industry are exposed to the same market risks, and each firm has its own capital structure, with different hurdle rates, the industry WACC and beta values will be used in this dissertation to standardize all calculations.

Conflicting support for using EVA as a measurement model emerges from the financial literature review undertaken. Abate *et al.* (2004:71) concluded that EVA: "...provides securities analysts and portfolio managers with a robust framework for identifying good companies that have good stocks. EVA also provides insight into the critical role of risk adjustment in stock selection and portfolio risk control."

Clinton and Chen (1998:40), however, failed to demonstrate a significant relationship between EVA and shareholder' returns and share prices. This view was supported by research done by De Villiers and Auret (1998:54), illustrating a higher correlation between share prices and EPS rather than EVA and share prices.

Since EVA is subject to accounting manipulation and asset age, its application as a valuation tool across the different companies in the Platinum Sector, is limited.

2.4.1.2 Market Value Added (MVA)

Opposed to EVA, which is based on historical returns, MVA focuses on the ability of current invested capital to create shareholder value, in the form of the current market value. Traditionally MVA measures the addition of 'value' by focusing on the difference between the Book Value (Invested Capital) and the Market Value of an asset (Fernandez, 2002:265). This can be expressed as:

$$\begin{aligned}\text{Market Value of Company} &= \text{No. of Shares} * \text{Price per share} + \text{Value of debt} \\ \text{Book Value of Company} &= \text{Total common equity} + \text{Value of debt}\end{aligned}\quad (2.16)$$

MVA is used as a criterion for expected future performances, and can be expressed as follows (De Wet, 2011:1):

$$MVA = PV (\text{Future EVAs}) \quad (2.17)$$

$$V = MVA + IC \quad (2.18)$$

Where:

V = Value of company as a whole,

EVAs = Economic Value Added in future years

IC = invested capital; and

PV = present value.

When defining MVA as the present value of all future EVAS, it becomes clear that MVA and EVA as performance measurements are directly related.

2.4.1.3 Expectations-Based Management (EBM)

Fundamentally, shareholders expect to be compensated for the investment risk taken. In the EBM approach, the hurdle rate is set as the rate required by the market, and not WACC. Value creation is, therefore, benchmarked to expectations. Shareholders perceive the creation of value when actual returns exceed expected returns, in contrast

to the EVA principle of actual returns exceeding the cost of capital. Discount Cash Flow Analysis is the modus operandi of EBM.

EBM is defined by Copeland and Dolgoff (2005:292) as follows:

$$\begin{aligned} \text{EBM} &= \text{Actual economic profit} - \text{Expected economic profit} \\ &= [A(\text{ROIC}) - E(\text{ROIC})](\text{IC}) - [A(\text{WACC}) - E(\text{WACC})](\text{IC}) + [\text{ROIC} - \text{WACC}][A(\text{IC}) - E(\text{IC})] \end{aligned} \quad (2.19)$$

Where:

A = Actual,

E = Expected,

ROIC = Return on Invested Capital,

IC = Invested Capital; and

WACC = Weighted Average Cost of Capital.

The tri-partite characteristic of this model, allows for three different pathways of creating value for the shareholder, namely:

- When the actual increase in ROIC exceeds expectations,
- When capital cost decreases more than anticipated, or
- Gains are more from investments than projected. (De Wet, 2010:2).

Since EBM is based on expectations, which are subjective in nature, its value as a model in the selection of shares for the platinum portfolio, is questionable.

2.4.1.4 Cash Value Added (CVA)

This value-based performance measure has been popularised by the Boston Consulting Group (BCG) (Young & O'Byrne, 2001:428), and focuses on cash flows, rather than

operating profit. This measuring instrument focuses on calculating excess cash over capital cost and is, thus, another variation of residual income. CVA differs from EVA by including accruals, depreciation and accumulated depreciation, and discounting the capital charge on the gross value of invested capital.

Operating Cash Flow (OCF) includes Earnings before Depreciation, Interest and Taxes (EBDIT) which are adjusted for non-cash charges, working capital movement and non-strategic investments. By subtracting Operating Cash Flow Demand (OCFD), which represents operating cash requirements, from OCF, CVA is obtained. This transaction can be expressed as:

$$CVA = OCF - OCFD \quad (2.20)$$

And:

$$OCF = OS \pm WCM - NSI \quad (2.21)$$

Where:

OCF = Operating Cash Flow,

OCFD = Operating Cash Flow Demand,

OS = Operating Surplus,

WCM = Working Capital Movement; and

NSI = Non Strategic Investments.

Advantages of CVA over EVA include:

- Different depreciation policies, which can significantly affect market valuations of companies, are ignored by CVA, since it focuses on EBDIT,
- Requires no accounting adjustments, and

- Based on cash flows, instead of operating profits. It therefore measures cash flows generated above or below investor's expectations.

Since CVA focuses on cash flows, it can be used at both company and divisional level.

Disadvantages of CVA when compared to EVA:

- Unreliable when having uneven cash flows (Martin & Petty, 2000:149),
- Depreciation and accruals which are eliminated by CVA, are important criteria in the valuation of companies, and
- Based on historical figures and not future expectations.

2.4.1.5 Cash Flow Return on Investment (CFROI)

This measurement tool focuses aptly on cash and inflation-adjusted values. It is applied by the Boston Consulting Group (Young & O'Byrne, 2001:428) in the corporate finance environment, and developed by HOLT Value Associates (Geenen *et al.*, 2009:1) in money management. Essentially, the CFROI compares inflation-adjusted investment to inflation-adjusted cash flow within an organisation (Net Cash Flows (NCF's)), eliminating the effect of accruals.

CFROI which is known as both as 'Internal Rate of Return (IRR)', and also as the 'Market Discount Rate', is determined by considering assets' longevity and residual values. This IRR is not exactly the same as the traditional IRR, since it is based on real rates of return and real cost of capital. De Wet (2011:3) explains the market discount rate as: "...the internal rate of return that equates the present value of the aggregated Net Cash Receipts (NCRs) of 1438 (US listed) firms forecasted in real terms to the aggregated current market values (debt plus equity). The estimated market discount rate is then adjusted for the financial leverage and size of individual companies."

$$NCR = (NI + DE + INT) - CE \quad (2.22)$$

Where:

NCR = Net Cash Receipts,

NI = Net Income,

DE = Depreciation Expense,

INT = Interest Income; and

CE = Capital Expenditures.

(Source: Copeland & Dolgoff, 2005:290)

By assessing the asset lifetime, the probable time span of cash flow generation by “tangible depreciating non-current assets” can be determined. Asset life equates to the quotient of adjusted gross plant and its depreciation (Erasmus, 2008:68).

CFROI is based on Discounted Cash Flow analysis, but is directed to determine the internal value of a company as a whole. Unfortunately, the absolute value of a CFROI does not independently imply value creation. It should be benchmarked against a firm-specific discount rate, such as the WACC, and historical annual values.

Since the CFROI is expressed as a percentage, comparisons between different firms are enhanced. The investor, who is focused on cash dividends, finds this an attractive indicator, based on cash flows.

CFROI has several disadvantages: its calculations are complex, requiring several accounting adjustments. It is also difficult to evaluate different projects, since it represents the average CFROI for the company as a whole. Furthermore, start-up companies often have a negative CFROI, due to large initial capital investments (Erasmus, 2008:74). Other arguments against reliance of CFROI include inflation-adjusted estimates, which expose the CFROI to subjectivity, as well as the interference of operating and financing decisions.

2.4.1.6 Option Pricing Model

IFRS2 (International Financial Reporting Standards 2) requires share-based payments to be valued using the Option Pricing Model (Ernst & Young, 2009:1). This company

also regards Lattice models, such as the binomial models, to be superior to the Black-Scholes-Merton formula (Ernst & Young, 2009:2) in stock valuation. The deployment of IFRS2 has the advantage of depicting a variety of possible future share prices, influencing the value of the option. Due to the complexity of lattice models, many analysts still use the Black-Scholes-Merton formula, as well as Monte Carlo simulations (Ernst & Young, 2009:10) in valuations. The fair value of any option represents the sum of the share's intrinsic and time values.

IFRS2 recommends that a minimum of six inputs are needed in option pricing, namely:

- Current price of the specific share.
- Exercise price of the option.
- Expected volatility of the price of the specific share.
- Expected dividends on the underlying share.
- Risk-free interest rate for the expected term of the option, and
- Expected term of the option.

Valuing share options may be an intricate exercise, requiring careful judgment.

2.4.1.7 Conclusions

Due to the fact that traditional financial accounting measures of performance have certain imperfections (such as the susceptibility to accounting distortions and managerial manipulation; the focus on historical values; plus the fact that they are single-period entities), other value based financial performance measures were developed, such as CFROI by Holt Value Associates (Geenen *et al.*, 2009:1) and EVA, trademarked by Stern Stewart & Co.. The inclusion of the cost of capital is thought to be instrumental in these alternative measures creating value for the investor.

EVA measures the return on invested capital against the weighted average cost of capital. Conflicting support for using EVA as a measurement model emerges from the financial literature reviewed. Since EVA is subject to accounting manipulation and asset age, its application as a valuation tool in the Platinum Sector is debatable.

MVA measures the addition of 'value' by focusing on the difference between the Book Value (invested capital) and the market value of an asset. MVA is EVA extrapolated to the future.

EBM is based on the perception of shareholders that value is created when actual returns exceed expected returns, rather than the cost of capital. Due to its subjective nature, it will be omitted as a valuation tool in this dissertation.

CVA is a cash flow measurement, based on historical data. It excludes depreciation, which can vary amongst companies, and can be applied at both company and divisional level. It is unreliable with uneven cash flows, which are to be expected in the emerging platinum companies.

CFROI is another cash flow measurement, based on Discounted Cash Flow analysis, but is directed to determine the internal value of a company as a whole. Unfortunately, the absolute value of a CFROI does not in itself imply value creation. It should be benchmarked against a firm-specific discount rate, such as the WACC, and historical annual values. This measuring instrument has several disadvantages: its calculations are complex, requiring several accounting adjustments. It is also difficult to evaluate different projects, since it represents the average CFROI for the company as a whole. Furthermore, start-up companies often have a negative CFROI, due to large initial capital investments, making it an unattractive valuation tool for this dissertation.

Option Valuation will not be incorporated into the empirical study.

2.4.2 Value Approach to Investing

Since the financial statements serve as the most important information source to all decision makers, the quest to find the link between the financial ratios of a company and

its security's performance, has been investigated extensively by the financial experts listed below. Several of these studies aimed to identify either the single financial ratio, or the cluster of financial ratios, which demonstrate the best correlation with financial returns (O'Connor,1973:341; Hochman, 1983:130; Kim & Lipka,1991:84). Salmi *et al.*, (1997:122) confirm a strong relationship between financial ratios and the risk and return on securities, but conclude that each year has its own set of highly correlated financial variables. Ahmad *et al.* (2009:190) claims that the best correlation can be found when the number of variables are limited to between three and seven.

Three investment models, applying respectively their own set of variables, caught the attention of many investors due to their impressive success records, as mentioned under heading 1.2, Chapter 1.

- The Graham-Buffett approach focuses on determining the intrinsic value of companies, based on historical data. The success of this method impresses even its fiercest critics. Warren Buffett is considered globally to be the ultimate investor. Researchers such as Campbell and Thompson (2007:14) illustrated that historical performance as predictor of future earnings is inferior to predictor variables. Although historical data cannot guarantee future returns, it can be utilized to detect a trend, upon which future projections can be made. Studies of Buffett's strategy in a South African context linked the following criteria to be most correlated with predictable investment returns: Book Value; Intrinsic Value; Margin of Safety; Profit Margin; and Number of Years to Pay Off Debt (Cilliers, 2003:109).
- Phil Town, author of *Rule #1*, (2007:63) developed his own strategy based on Graham's investment guidelines (Graham *et al.*, 1962). Town (2007:63) fine-tuned his approach in utilising five key indicators, to determine investment potential of a security. He calls them the "Big Five", namely Return on Investment Capital (ROIC); Sales growth rate, (which he adjusts to Gross Profit growth rate); Earnings per Share growth rate (EPS); Equity, or Book Value per Share (BVPS) growth rate; and Free Cash Flow (FCF) or (Cash) growth rate.

Town (2007:63) further demands that: “All of the Big Five should be equal to or greater than 10 percent per year for the last 10 years” and then proceeds to review also the five year and one year averages, and

- Dr. Steve Sjoggerud, President of *Investment U*, concluded on June 9, 2003:1, that the Benjamin Graham’s (Graham *et al.*, 1962) saga ‘burns down’ to the calculation of Graham’s Intrinsic Value Number, which can be derived from subtracting total debt from operating assets (in other words: Net operating assets). Investment is then only advised when the “Intrinsic Value Number” is equal to or less than seventy-five percent of the current market price.

Since overlapping of criteria exist between the different models, the following eight financial indicators are extracted to be applied in the empirical study on the Platinum Sector of the JSE which is delineated in this dissertation:

- Return on Invested Capital (ROIC),
- Growth of Sales,
- Growth of Book Value per Share,
- Earnings per share growth rate,
- Free Cash Flow growth rate,
- Intrinsic Value,
- Margin of safety, and
- Net operating Assets.

2.4.2.1 Return On Invested Capital (ROIC)

ROIC is a performance measurement. It assesses the efficiency of a company to generate profitable current investments, through the allocation of resources under its control. These investments, for example, may be fixed assets, projects, or investment in other companies. A critique of ROIC is its failure to reveal the source of value creation.

ROIC is defined as:

$$ROIC = \frac{NOPAT}{IC} \quad (2.23)$$

Where:

NOPAT = Net Operating Profit After Tax; and

IC = Invested capital (total operating capital) at the beginning of the year.

More accurately, it can be defined as :

$$ROIC = \frac{NOPAT}{TA - EC - NIBCL} \quad (2.24)$$

Where:

TA = Total Assets,

EC = Excess Cash; and

NIBCL = Non Interest Bearing Current Liabilities.

For a single period, NOPAT can be applied as:

NOPAT = Net operating Earnings before Interest and Amortization Changes, but after cash taxes.

NOPAT represents the pure operating profit in an unlevered firm, and is calculated by subtracting tax from Earnings Before Interest and Tax (EBIT).

Invested Capital includes not only working capital, but also the net property, plant and equipment, and the net value of other assets. Invested capital may be calculated by adding interest bearing debt to, or by subtracting non-interest bearing liabilities from total assets (Weaver & Weston, 2003:9). When calculating NOPAT it is important to remember that non-interest bearing debt often represents owners' equity in the form of loans, and thus require cautionary application.

ROIC is expressed as a percentage and, therefore, considered to be an easy comparative indicator between similar companies. Efficiency is established when ROIC surpasses WACC. Mauboussin (2008:1) noted, however, that empirical evidence points to ROIC demonstrating a central tendency towards a mean similar to WACC.

According to Mauboussin (2008:5) ROIC is not a reliable indicator of growth, due to it being focused on current investments. It is in fact a lagging indicator, and is perceived to be directly correlated with returns. This notion is, however, deceptive: managers may exhibit harvesting behaviour by focusing on short-term profitable projects, in order to increase ROIC. Growth opportunities and, therefore, long-term value creation, may be neglected, although it should be remembered that growth by itself is not synonymous with value creation

ROIC has the following serious flaws because it is, primarily, an accounting- based measure:

- It is subject to managerial manipulation (the different accounting methods applied to calculate the nominator and denominator may lead to different outcomes),
- It is subject to established accounting conventions and also to changes in these conventions (GAAP and International Accounting Systems differ), and
- It is sensitive to inflation and exchange rates (invested capital may be derived from either multi-national or global stakeholders).

2.4.2.2 Sales Growth

Not only do sales occupy the top line of the income statements, but it is also the fundamental basis of all markets, including stock markets. Sales Growth is subject to Demand-Supply forces, which take into account the opportunity costs, the scarcity principle, substitution possibility, expected future prices and available resources. Elasticity of demand and supply are determined by the sensitivity of buyers and sellers to price and available quantity. All sales revert eventually to market equilibrium, when “...the price of a product adjusts so that the quantity that consumers will purchase at that price is identical to the quantity that suppliers will sell, “ (Carbaugh, 2008:40).

Sales, or revenues, are recorded according to the revenue principle, namely when revenue is earned (Libby *et al.*, 2009:284). Sales growth can be defined as: “... the

increase in sales over a specific period of time, often but not necessarily annually...” (InvestorWords.com, 2011:1).

Matsumoto *et al.* (1995:47) studied human behaviour in selecting financial ratios when analysing companies. They found that expert analysts ranked growth rates as the most important metric relevant to a firm. Profitability ratios were second in line, followed by EPS measures and leverage ratios.

In 1987, Varaiya *et al.* (1987:487-497) analyzed 400 of the Standard & Poor’s 500 companies, and concluded that the difference between the return of equity and the weighted average cost of capital, as well as sales growth, were indicative of higher firm value.

Contrary to the common notion that sales growth is synonymous to higher returns, Lau *et al.* (2002:207) reported a negative relationship between company size and stock returns as well as between weighted average annual sales growth and stock returns. These findings were echoed in another study (Ramezani *et al.*, 2002:65). A U-shape relationship was found between performance and sales growth. The positive relationship between these two metrics could only be sustained up to the third quartile, after which it catapulted.

2.4.2.3 Book Value per Share

This financial measure is useful to investors when assessing undervaluation of a company. However, Book Value per Share (BVPS) fails to give an indication of future value creation, since it is similar to the balance sheet, and thus provides a ‘snapshot’ of the current situation of a company (Investopedia.com, 2011:1).

BVPS can be defined as:

$$BVPS = \frac{\text{Common Stock Equity}}{\text{Number of shares of common stock outstanding}} \quad (2.25)$$

Book Value (BV) represents the total value of assets available to shareholders in the event of the liquidation of a company. BV normally equals Net Asset Value, or Net Operating Assets, which are similar to Total Equity Value. Except when a company is

experiencing financial distress, the Book Value is usually less than the market value of the company. When the Book Value exceeds the market value, the stock may be undervalued, posing an investment opportunity. The other end of the scale is also true: it may also signify stagnation and a warning signal to investors.

Studies undertaken by Collins *et al.* (1997:40); Barth *et al.* (1998:33); and Burgstahler and Dichev (1998:190) all demonstrate that earnings and Book Value are significant indicators when explaining share prices and their fluctuations.

BVPS is applied as the denominator in the Market-to-Book (M/B) Ratio. This performance metric compares the Market Value per Share to its Book Value per Share.

Market capitalization relies on market sentiment and therefore contains subjectivity. Companies that are expected to excel in performance, typically have higher Market to Book (M/B) ratios that signal the anticipation of higher returns.

The M/B ratio can be computed as follows:

$$\frac{M}{B} = \frac{\text{Market value per share of common stock}}{\text{Book value per share of common stock outstanding}} \quad (2.26)$$

Disadvantages of BVPS:

- Assets are recorded using historical Book Values. This may grossly obscure their real values in current time, and
- Some arguments hold that Intellectual property (IP) does not have a Book Value. This is applicable especially to the soaring information technology industry. Cortiyo *et al.* (2006:13) demonstrated that accounting measures, such as BVPS, are less reliable as measuring instruments in technology intensive industries.
- Although it is true that IP's Book Value is debatable, the effect of IP is expressed in the operating profit of the company, thereby indirectly influencing the market value of the company's shares.

2.4.2.4 Earnings per Share (EPS) and Price/Earnings (P/E) Ratio

EPS's profitability ratio is a very popular indicator of a company's perceived successful financial performance. It is a handy metric to use to compare companies in the same industry, and is defined as:

$$\text{Earnings per share} = \frac{\text{Earnings available for common stockholders}}{\text{Number of shares of common stock outstanding}} \quad (2.27)$$

The EPS ratio implies the monetary earnings of each share. Some confusion may arise due to different accounting policies describing 'earnings'. The International Accounting Standard 33, of 16 September 2009, smoothed out definitions regarding this ratio. This financial standard mandates that: "Basic earnings per share shall be calculated by dividing profit or loss attributable to ordinary equity holders of the parent entity (the numerator) by the weighted average number of ordinary shares outstanding (the denominator) during the period."

Care should be taken to distinguish this ratio from the *Diluted earnings per share ratio*. The latter ratio additionally takes into account a company's dilutive securities, such as the exercising of stock options and warrants, as well as converted bonds and preferred shares.

The P/E Ratio is the quotient of the stock price and earnings per share:

$$\frac{P}{E} = \frac{\text{Stock Price per Share}}{\text{Earnings per Share}} \quad (2.28)$$

The P/E ratio is also known as a relative valuation model and has the advantage that it is not affected by the dividend strategy of a company. However a disadvantage of the P/E ratio is its sensitivity to the capital structure and tax rate applicable to the company in which it is measured (Weitzel *et al.*, 2003:7). The denominator is also subject to accounting manipulation, assumptions and interpretations.

P/E ratios reflect the price investors are willing to pay for each monetary unit of reported earnings. Riskier stocks usually have lower P/E ratios, and companies associated with

strong growth potential, exhibit higher P/E ratios. However, high P/E ratios may also signal overvaluation (Brigham & Houston, 2009:290).

Contradictory evidence emerges from the financial literature review regarding the predictive power of accounting measures, such as the P/E ratio, with regard to the stock market return volatility. Aras & Yilmaz (2008:1-19), Ang & Bekaert (2007:651), and Koutmos (2010:31) all found a strong correlation, between these factors, but Lewellen (2004:230) concluded that a weak relationship exists between P/E ratio and asset pricing forecasts exists. Even Klarman (2009:19) warns that a low P/E ratio may reflect the market-discount factor already applied to stocks that are anticipated to fall.

As demonstrated by Goedhart *et al.* (July 2010:17) the P/E ratio was found to be overvalued by analysts by almost fifty percent, during the past twenty five years. This overt optimism was especially active during slow-down phases of the economy. Gilani (2010: 2) warns that economic growth has changed since the recession of November 2008, leading to “new-normal” economies. The market multiple, an indicator of volatility of the Standard & Poor 500 index, was 19.49 during the period 2000 – 2008. The multiple jumped to 80.86 on 24 November 2008, but slower growth is anticipated during the post-recession period and, thus, the new market multiple for the “new-normal” economies is calculated to be between 10.3 and 13. As Koutmos (2010:25) demonstrates, lower P/E ratios are associated with higher volatility and, hence, higher future expected returns. Emerging markets are, however, in a class of their own with rapid growth predicted for the so-called “non-new-normal” economies, hence a different P/E multiple should be applicable to these economies, namely 15.

2.4.2.5 Free Cash Flow Valuation Model

The FCF approach focuses on forecasted future earnings, based on the assumption that the status quo of the company, regarding its investment policies and capital structure will be sustained. This notion leaves little or no room for management flexibility. Finding the appropriate discount rate may also be problematic. In practice, companies tend to apply the overall company discount rate to all projects, ignoring the unique risks associated with a specific project. Furthermore, general economic

conditions are pre-empted to stay the same. These assumptions render themselves thus to subjectivity and errors.

FCF requires positive earnings and leaves the growth rate unaltered after withdrawal of all free cash. The reality is, however, that many companies have cycles of non-positive earnings, making FCF valuation obsolete (Kamstra, 2003:50).

FCF can be calculated as follows:

$$FCF = NOPAT - \Delta NOWC - \Delta FA \quad (2.29)$$

Where:

$$NOPAT = EBIT(1 - T) \quad (2.30)$$

Where:

NOPAT = Net operating profit after tax,

Δ = change,

NOWC = Net operating working capital,

FA = Fixed assets,

EBIT = Earnings before interest and tax; and

T = tax.

Notwithstanding the above mentioned flaws, the DCF valuation method has become standard practice in most companies, and similar to other growth models, it is regarded as invaluable to most investors.

Penman *et al.* (2003a:3) disagree with the merits of the DCF valuation method. They distrust free cash flow as an investment criterion, due to the fact that it is subject to management's strategies such as increasing Free Cash Flow by liquidating assets. Penman *et al.* (2003a:3) claim that investments, which create value, cause Free Cash

Flow to decline. Asset reduction or investment liquidation on the other hand, increases Free Cash Flow, but, at the time erode the asset value.

Regardless of the above criticisms, FCF, as was the case with the DCF model, has been extensively used by financial analysts in the period 2000 – 2007 (Ullah *et al.*, 2010:32), thus illustrating its popularity.

2.4.2.6 Intrinsic Value

The concept of Intrinsic Value was first introduced by Graham and Dodd in 1934. In 1962 these authors, together with Cottle (Graham *et al.*, 1962:28), concluded that a stock's future earnings power resembles the Intrinsic Value of that stock. They determined intrinsic value by analyzing historical data patterns. Contrary to the notion that the past is unreliable as a predictor of the future, investors such as Graham, Dodd, Buffett and Town (whose ideas have been analysed earlier in this dissertation) proved otherwise.

The product of the earnings' power and a capitalisation factor (accounting for volume, price and cost) represents the intrinsic value of a stock (Gentry & Reilly, 2009:6). The value of a stock can be expressed as:

$$V_f = V_s + V_d \quad (2.32)$$

Where:

V_f = Estimated market value of a firm,

V_s = Estimated market value of stock; and

V_d = Estimated market value of interest-bearing debt.

In an unlevered firm, V_f will be equal to V_s , and can be determined by using the Dividend Growth Model or Free Cash Flow approaches.

The value of equity (V_s) equals the factor of price and number of shares outstanding in its most simplistic form. It can also be determined by using the discounted free cash to equity approach (Gentry & Reilly, 2007: 8).

The value of debt (V_d) equals both the long-term debt, as well as short-term interest bearing liabilities on the balance sheet.

2.4.2.7 Margin of Safety

Warren Buffett's tutor, Benjamin Graham, first introduced the concept of Margin of Safety (Klarman, 2009:7). Both these investor gurus preach buying stocks below Intrinsic Value, and, thus, minimizing risk in order to protect capital. Graham avoids popular and growth stocks, which are usually either fully priced or overvalued. Klarman (2009:7) notes that "valuation is an imprecise art, the future is unpredictable and investors are human and do make mistakes", mandating a margin of safety.

Wolinsky (2010:1) urges the investor not only to focus on discounted intrinsic values, but to also take into account other factors pointing to relative "safe" investing.

Considerations mentioned are:

- a) Choose companies with "healthy" balance sheets – in particular favourable ratio analysis, such as return on assets, leverage ratios, return on equity, debt to equity ratios and fixed assets;
- b) Capitalize on economic downturns – Klarman (2009:70) notices that Margin of Safety policy excels especially in bearish markets as a safety net; and
- c) Favour conservative forecasts and intrinsic value calculations. This advice aligns with the Graham-Buffett approach which recommends avoiding being too bullish in forecasts.

The Efficient Market Hypothesis (EMH) holds that share prices reflect all known information. This claim implies that share prices are similar to intrinsic value. The Margin of Safety concept is, in reality, a rejection of this hypothesis. Klarman (2009:71) states that the success of the Margin of Safety approach lies in the frequent mis-pricing of assets, although prices are neither random, nor ignorant of information.

2.4.2.8 Net Operating Assets

Net Operating Assets (NOA) are defined as:

$$\text{NOA} = \text{OA} - \text{OL} \quad (2.33)$$

Where:

NOA = Net operating assets (equated to net operating working capital);

OA = Operating assets; and

OL = Operating liabilities.

(Source: Zhang, 2005:16)

In practice NOA can be regarded as synonymous to net operating working capital. Industry comparison is an integral part of stock valuation, since companies in the same industry face similar problems, such as supply-demand forces, exchange rates and regulatory influences. Zhang (2005:95) illustrates that NOA is a strong inverse indicator of future stock returns both cross-industrial and within-industrial.

Zhang (2005:17) points out that NOA may elicit opportunistic accounting practices, for example over-application of absorption costing systems, or intensive debtors' control. As a result of these practices, Zhang (2005:17) concludes that large inventories may signal inferiority against rivals, and that large closing inventories may be a sign of demand shifts. Likewise, when net operating assets increase amidst the transition to higher financing liabilities, the possibility of liquidity problems may surface.

Accrual accounting leads to double entry bookkeeping practices, therefore, caution should be exercised when interpreting balance sheets. This factor has led to the suggestion by Penman (2003a:30) that the balance sheet should be restructured into operating and financing sides. The change in NOA is subsequently viewed as the difference between operating income and free cash flow (Penman, 2003b:91).

Zhang (2005:16) argues that due to time and attention constraints, together with information overload, investors err in focusing on limited information, which in turn leads to bloating of balance sheet misperceptions. Consequently, (Zhang, 2005:16) argues that NOA is superior to "flow operating accruals or the change in net operating assets [as a means] to identify mispriced stocks".

Hirshleifer *et al.*, (2004:35) regard high NOA as an indicator for investor overoptimism in share prices due to attentional and informational myopia.

Based upon the above information the conclusion can be drawn that high NOA shares are overvalued, with possible future correction.

2.4.2.9 Conclusions

Section 2.4 of this chapter focused on the eight criteria that will be used in the empirical study delineated in Chapter Four.

- Although ROIC is criticized as being subject to managerial manipulation and is only an indicator of current value creation, it is still regarded as an invaluable investment criterion. ROIC provides insight in the effective allocation of resources to profitable investments and is, therefore, a performance measurement.
- Growth indicators are highly ranked amongst expert analysts, especially sales growth and return on equity growth. Caution should be exercised when attempting to equalize sales growth and earnings, since some researchers found negative correlations. The company's growth stage and external factors, such as the global economy, also impact heavily on sales growth.
- The Book Value of a company represents its liquidation value. It is compared to the market value of a company. High Market to Book ratios imply performance excellence. A dilemma is posed when the Book Value exceeds the Market Value. It may either signal undervaluation and an investment opportunity, or stagnation and threatening liquidation, and
- The relative valuation models of EPS and P/E ratios are very popular financial indicators amongst investors. Caution should be exercised when reviewing analysts' forecasts, since researchers have demonstrated significant overvaluation during the past quarter of a century. The global recession of

November 2008 also changed the 'rules of the game', and different P/E ratios are suggested for established and emerging markets, due to changes in growth potential and recovery.

The Free Cash Flow Valuation Model became instrumental in most analysts' armamentarium. This form of scrutiny is especially handy as a valuation tool in companies not having dividend policies. However, due to its sensitivity to managerial manipulation, Free Cash Flow Analysis is not appreciated by everybody and accrual accounting is proposed to be of higher value when looking from an investor's perspective.

- The concept of intrinsic value was popularized by Benjamin Graham (Graham *et al.*, 1962). Future earnings potential is regarded as being embedded in the intrinsic value of a company. Determining the Intrinsic Value of a stock or company forms the basis of their investment practices.
- Warren Buffett (Hagstrom, 1997:96) believes in the safety net provided by the Margin of Safety, to protect capital. This type of investment practice also serves to preclude speculative behaviour, and
- Net Operating Assets are investigated due to its application in Sjuggerud's (2003) Intrinsic Value Number. Accrual accounting may however distort net operating assets, which are focused on cash flows. NOA is a strong inverse predictor of future earnings. The Intrinsic Value Number is represented as Net operating assets, but investment is advised when it equals less than two thirds of the current market capitalization, and share price is adjusted.

Chapter 3: Value Based Management and the Platinum Sector

3.1 Introduction

“The main ingredient in stardom is the rest of the team.” - Unknown

3.2 Value Based Management (VBM)

The writer of this dissertation believes that by creating an ownership culture, the shared doctrine and core values are echoed throughout a company, resulting in aligned-commitment to deliver stakeholder value.

Employees are often encouraged by sharing in the company profits through an employee stock ownership plan (ESOP), and are empowered by taking responsible decisions in their allocated sections. Teamwork is refined, transforming the “I” into a united “we”. Not only do workers contribute labour, but they also risk physical and mental health; and share likewise.

VBM obviously calls for a unique leadership style, based on moral values, a code of ethics and corporate governance. Dignity and respect for every worker are the building blocks of this expanded corporate ownership structure.

The Center for Economic and Social Justice (CESJ, 2010:190) envisions VBM as the balance between moral and material values. The core notion of VBM is shared ethical values in order to deliver maximum value to stakeholders. Workers are given recognition for their performance by an appropriate reward system.

Discounted future cash flows represent the value a company offers. When returns on invested capital exceed the cost of such capital, value is created. This value creation is achieved by focusing on all decisions taken within a company: not only major strategic decisions, but also judgements at daily operating levels (Koller, 1994:87). Managers are, therefore, enabled to capitalize on the key drivers of value. VBM is a continuous process and, the success of its implementation, depends on evaluating financial indicators, in the context of macro-economic developments. Active top management

involvement and corporate governance are vital elements of the successful implementation and practising of VBM (Weaver & Weston, 2003:17).

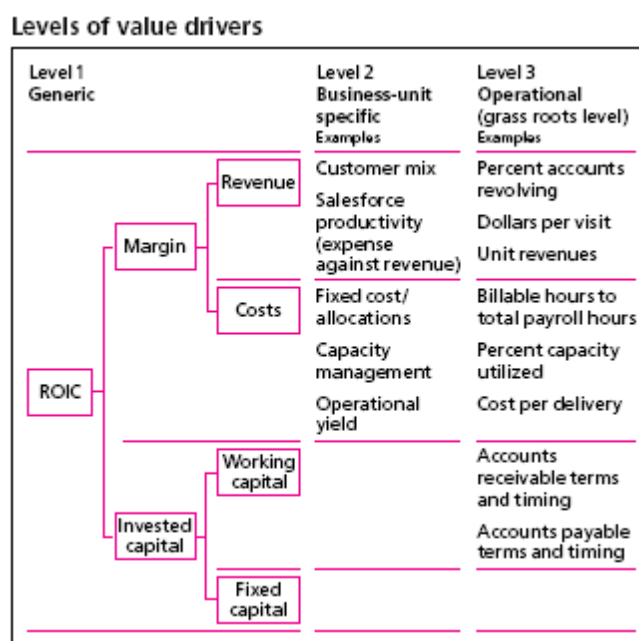


FIGURE 6: LEVELS OF VALUE DRIVERS

Source: The McKinsey Quarterly, 1994. Vol.3:91

3.2.1 VBM in the Platinum Industry

In this oligopolistic market, Anglo Platinum, Impala Platinum and Lonmin are responsible for 85% of platinum production in South Africa. Interesting differences exist between the companies, when evaluating value-based parameters.

When looking at compound growth in average share price over the period 1991 – 2006 (so chosen because Impala Platinum unbundled its shares in 2007), Lonmin outperformed the other two companies.

TABLE 1: COMPARISON OF SHARE PRICES

Company	Average share price 1991-2006	Compound growth in share price 1991 - 2006
Anglo Platinum	R196.70	15.13%
Impala Platinum	R257.83	18.41%
Lonmin	R69.39	20.33%

Source: McGregor BFA

When considering the performance of the three companies depicted in the above table, it should be kept in mind that Lonmin has only been a pure platinum producer since 2001, after shedding its coal, gold, and other mineral activities. Comparing the same three companies between 2001 and 2006, Impala's compound share price growth is 18.81%, followed by Lonmin with 16.19% and then Amplats with 12.54%.

Prinsloo (2007:64) researched EVA as a benchmark between the three companies and found that Amplats generated 45.6%, Implats 29.9% and Lonmin 17.4% of EVA in terms of invested capital during the period 2001 – 2006. All three companies had comparable growth in turnover.

The following table compares the two largest platinum producing companies:

TABLE 2: COMPARISON OF AMPLATS AND IMPLATS

Firm	Market Cap	P/E (hist)	P/Cash Flow	Interim 07 Net Income Increase	Reserves PGM (proved/probable/Total Resources)(in million ou)*	% Production Palladium (6 mo 07)	Net Cash Position
Anglo Platinum	\$35.7Bn	16.6	13.2	+47%	103.0/89.6/804	8%	\$400M
Impala Platinum	\$22.7Bn	20.7	15.2	+67%	10.6/33.7/219	9%	\$390M

Source: Kirk, R.: Stock Market Notes, Nov. 2007

3.2.2 VBM Application in the Platinum Industry: Anglo Platinum

Anglo Platinum is the world's largest platinum producer. Its nineteen concentrators, three smelters, one converter and one refinery complex for base and precious metals are actively operational on all the major platinum group metal (PGM) ore bodies. This includes platinum, palladium, rhodium, gold, ruthenium, nickel, iridium, copper and cobalt.

Van Wyk and Smith (2008:315) present the business model of VBM as a three step process (Appendices, Figure 30:127):

- The Fact Base serves as an information tool to identify key value drivers and to assess the current and future market attractiveness. By scrutinizing historical performances in the segments of key-customers, the market, and end-users, profitable value drivers can be identified and utilized. Contracts in the platinum industry usually are long-term, with little product differentiation. An attractive customer research programme will, therefore, add to gaining a sustainable competitive advantage. External factors, such as the price of the metals, the exchange rate, and inflation rates, are common to all industry players. The cost of operations also is similar to all companies, due to the refinery process. The real difference between companies is thus dependent on the efficiency of their operating activities, including human capital. Anglo Platinum Limited produced 5.2 million ounces of PGMs (of which 2.8 million ounces of platinum) in 2006 (Lumley & Raju, 2007:4).
- The Business Model Alternatives include the identification and selection of alternatives on both strategic and operational levels to maximise value. Since no algorithm exists in selecting the best alternatives, this often poses a very challenging stage, requiring insight and accurate forecasting of metal demands. Scenario analysis might aid in selecting and implementing the best alternatives – especially in a company such as Anglo Platinum with its diverse range of operations.

- The final phase not only focuses on implementation, but also on company-wide commitments to achieve a sustainable competitive advantage and maximise stakeholder value. This stage demands active involvement of top management. VBM individual and company commitments and performance measurements should be actively monitored in multi-period trials.

Cynthia Carroll, CEO of Anglo American, restated the company's commitment to safety first on the platinum mines, during the Annual General Meeting in April 2008. She imposed limitations on the progression of managers with a poor safety record. "The Good Citizenship" business principles were also endorsed at the meeting. The implementation of VBM methodology in all business units were initiated, with Anglo Coal as the first candidate (Anglo American AGM 150408). "The One Anglo" culture was believed to ignite maximum value creation companywide.

Pienaar (2009:61) concluded, however, in an empirical study conducted on employees' understanding of VBM at Anglo's Bleskop and Brakspruit shafts, as well as accountants at Rustenburg Platinum Mine, that little insight in VBM exists. An incentive based encouragement to adopt the principles of VBM was suggested.

3.3 The Thirteen Companies in the Platinum Sector of the JSE Limited

Three companies dominate this sector, namely Anglo Platinum Limited (Amplats), Impala Platinum (Implats), and Lonmin. These companies are so-called 'mine-to-metal' companies, with concentrators and refineries for both base and precious metals.

3.3.1 Anglo Platinum Limited (Amplats)

This platinum giant started with operations in 1946. It is the largest producer of the platinum group metals worldwide, with 40% of all newly mined platinum globally derived from the Amplats stall (Anglo Platinum, 2010a).

Its ticker symbol is AMSJ.J and it had a market capitalization of R168 402,41 million on 8 March 2011 and a beta of 1.62 in comparison with the CSI Close of the JSE All Share

Index (ALSI). Its P/E ratio of 16,73 compares favourably against the industry ratio of 75,15.

Major restructuring of its operations took place in 2009. The previous Rustenburg section was divided to form five separate mine groups, namely: Bathopele, Khomanani, Thembelani, Khuseleka, and Siphumelele mines. Two mines were constituted from the former Amandelbult division, namely the Tumela and Dishaba mines. Amplats continues to manage operations of the Union, Mogalakwena and Twickenham Mines.

Anglo Platinum has several joint ventures. On 30 June 2009 the company sold and transferred control of 51% of Lebowa Platinum Mine to Anooraq Resources, as well as an additional 1% of the Ga-Phasha, Boikgantsho and Kwanda projects. Other joint ventures include alliances with ARM Mining Consortium Limited, which operates the Modikwa Platinum Mine; Royal Bafokeng Platinum which operate the Rasimone Platinum Mine and Styldrift properties; the Bakgatla-Ba-Kgafela community holding a 15% share in Union Mine; Eastern Platinum Limited (subsidiary of Lonmin Plc); as well as the Bapo-Ba-Mogale community and Mvelephanda Resources which jointly operates the Pandora Joint Venture; and Xstrata's Kagiso Platinum Partnership which operates the Motololo Mine. Aquarius Platinum mine, an Australian based company, operates the Aquarius Kroondal and Marikana mines, and has pooling- and sharing arrangements with Anglo Platinum.

The smelting and refining operations cater not only for Anglo Platinum's wholly owned operations, but also for its joint ventures and third parties.

Outside South Africa's borders, the company is active in Zimbabwe (Unki Platinum Mine), and is actively exploring in Brazil, while partnering explorations in China, Russia and Canada (Anglo Platinum, 2010).

When assessing operations: Anglo Platinum and its joint ventures produced 2,484 million ounces of platinum during 2010 - an increase of 1% from 2009. Productivity per employee increased 12% in 2010 compared to 2009, to the equivalent of 7,06m²/employee. Operating costs to produce one ounce of platinum increased by 4% in 2010, to R11,73.

Lower grade ore was produced in 2010, and tonnes milled decreased by 2%, due to the restructuring changes that took place in 2009.

A reduction of 15% of the operating employees took place in 2010, combined with a 61% reduction in the number of contracted employees. To further cut costs, two of Anglo Platinum's mines adopted an owner-equipment-maintenance programme, with other mines expected to follow suite in 2011.

Anglo Platinum faced a 4% increase in direct mining costs in 2010, as well as a 2% increase in milling costs for its wholly owned operations. R4 billion was spent on capital expenditures for own mines (R5,3 billion in 2009). Projects consumed R1,8 billion.

During 2010 production was hampered by several interruptions. Seven employees died, resulting in accident investigations and intensified safety programmes. Geological and geo-technical issues and re-organisation activities compelled production stoppages. Potholes were encountered on the UG2 Reef horizon at Khomanani No. 1 shaft, compelling detoured mining around these potholes. Union Mine implemented a revised mining method, which adversely affected production. The 15 East shaft of the Tumela Mine faced barrel and haulage failures at two different levels during 2010, resulting in lower production and tramming activities.

The outlook for 2011 is positive: the Unki Platinum Mine in Zimbabwe was commissioned during January 2011, as well as the re-opening of the No. 2 shaft at Khuseleka. Further production increases, due to efficiency improvements overall, are expected (Anglo Platinum, 2010b:1)

3.3.2 Impala Platinum Limited (Implats)

Impala is the world's second largest producer of platinum and platinum group metals. It has operational activities not only in the Igneous Bushveld Complex in North West, South Africa, but also in the Great Dyke in Zimbabwe. It produces approximately 25% of global platinum (Impala Platinum, 2010).

Impala's ticker symbol is IMPJ.J and it had a beta of 1.59 and market capitalization of R117,888.40 million on 8 March 2011. Its P/E ratio at that time was 20,63 in comparison with the industry's P/E ratio of 75,15.

Implats is operational at Impala Platinum Mines, to the north of Rustenburg, North West Province, and at Marula Mine, north-west of Burgersfort in the Limpopo province. It also has joint ventures with African Rainbow Mineral Limited (ARM), at the Two Rivers Mine which is located south-west of Burgersfort in the Mpumalanga province, as well as The Leeuwkop project situated west of Brits in the, North West Province. The Great Dyke igneous intrusion in the centre of Zimbabwe, hosts the Zimplats' Ngezi Mine, south west of Harare. The Mimosa Mine, east of Bulawayo, is a joint venture between Implats and Aquarius Platinum Limited. A 3,9 million dollar strategic alliance was signed on 1 January 2010 between Implats and HTX to explore the mid-continent rift area in Ontario, Canada.

Implats produced 1,74 million ounces of platinum in 2010, as well as 3.7 million ounces of PMGs. The group boasts of being one of lowest cost primary platinum producers worldwide.

Impala Platinum commenced operations on 3 June 1967 on leased property from the Royal Bafokeng Nation, exploring the Merensky Reef. Demand was primarily from the jewellery market in Japan in the late 1960's, and for use in catalytic converters in automobiles in the United States. As stated previously, the introduction of catalytic converters resulted from legislation passed in mid 1970s as a result of the Environmental Protection Agency. Both General Motors and Chrysler concluded long-term contracts with Impala Platinum in the 1970s.

The 1980s in South Africa faced political turbulence, accompanied by militant trade union actions, such as riots, go-slows, underground sit-ins, faction fighting and arson. Implats, together with other mining companies, faced restructuring of industrial relations with the National Union of Mineworkers (NUM) as the representative of the mine employees. This decade also introduced operating activities on the UG2 Reef.

During the 1990's Implats acquired interests in Eastern and Western Platinum, both belonging to Lonplats. Impala and Lonplats agreed to merge in 1995, but the European Union blocked this merger.

Mineral rights and royalties were negotiated with the Royal Bafokeng Nation and a settlement was reached in 1999. Black Economic Empowerment transactions during 2006 and 2007 necessitated renewed negotiations. A final agreement was reached with Royal Bafokeng Holding (Pty) Limited (RBH), which obligated Impala Platinum to pay the discount on future royalties to RBH, thereby terminating all future claims on royalties. RBH subscribed 75.1 million Impala shares, which amounted to a 13.4% share in Impala.

As part of a Value Based Management Programme, Impala underwrote an Employee Share Ownership Programme (ESOP), in 2007, giving 28 000 lower level employees the benefit of value appreciation of 3% of equity. BEE also obtained a 27% ownership in the Marula Mine.

Impala aims to produce 2.1 million ounces of platinum in 2014, following ramp-ups of both Marula and Zimplats mines (Impala Platinum, 2011:1).

3.3.3 Lonmin

Lonmin takes the bronze position as primary producer of platinum worldwide. It produced 694 000 ounces of platinum concentrate in 2009, and 706 000 ounces were sold by year end September 2010 (Lonmin Plc, 2010:3).

Mining operations are taking place in the Bushveld complex in South Africa. Marikana mining is responsible for 92% of annual production, aided by the Limpopo mine near Polokwane. Upper Group 2 (UG2) and Merensky Reefs are both mined. Lonmin has a joint venture with Pandora.

Lonmin has its own process division, being fully vertically integrated. The concentrators crush the ore and form a liquefied concentrate, which is converted by the smelting facilities into a metal-rich matte. In the Base Metal Refinery (BMR) base metals such as

copper and nickel are extracted from this matte, followed by the Precious Metal Refinery (PMR), responsible for the production of refined platinum group metals (Lonmin, 2011:1).

Lonmin is listed on the JSE as LON and on the London Stock Exchange as LMI. It has a market capitalization of R38 749,120 million (8 April 2011) and a beta of 1.475 against the JSE ALSI. Its P/E ratio is 41,23 compared to the Industry's P/E of 75.15 (Bloomberg, 2011).

The company was founded in 1909 as the London and Rhodesian Mining and Land Company Limited (Lonrho). During the second half of the twentieth century the company emerged as a conglomerate, when aggressively taking over other companies, such as the departmental store, Harrods of Knightsbridge. Lonrho took over Ashanti Gold Fields Corporation, a gold mining business, in Ghana in 1968. The acquisition of two newspapers on the British market during the 1980s further strengthened its diversification policy. The Sunday newspaper, *The Observer*, was bought in 1981 and the daily paper *Today* in 1986. Both papers were sold within the next seven years.

In 1998 the company unbundled its activities into Lonrho plc and Lonrho Africa Plc. The latter was renamed Lonmin in 1999 and has divested itself since from all non-core activities.

To Lonmin's surprise, in May 2009 Keysha Investments 220 (Pty) Limited applied for prospecting rights on associated minerals on a part of its property. Associated minerals are non-platinum group metals found in the ore body which are mined and processed in conjunction with the PGMs. The Directors of Lonmin contested this, arguing that it is illogical and absurd that prospecting rights be granted over an ore body already actively mined under the old order mining rights. It was assumed that the conversion to new order mining rights already granted to Lonmin, would be a continuation of these rights, since the conversion process was portrayed to leave title holders in the same position pre- and post-conversion. The Department of Minerals and Resources' restricting issue of 4 Aug. 2010 was abandoned shortly thereafter, and, under Section 102, Lonmin

retained its right to extract and sell all associated minerals. The issue of Keysha's prospecting rights is, however, still unresolved.

Incwala Resources (Pty) Limited is an incorporated company with the purpose of enabling Historically Disadvantaged South Africans (HDSA's). 23.56% ownership of Incwala resides in Lonmin Plc and the International Development Corporation respectively, while 52.88% is allocated to HDSAs. Incwala holds 18% of the equity of Eastern Platinum Limited and Western Platinum Limited – as per the: “(BEE) Black Economic Empowerment”- sub-heading of the “Operating Environment – Our Business” (Lonmin, 2011:1)

3.3.4 Northam Platinum Limited (Northam)

Northam Platinum Limited is an independent black owned and controlled integrated platinum group metal producer. Northam has two mining segments: the Zondereinde mine, near Thabazimbi which it wholly owns and operates, and the Booyendal mine, near Mashishing, which is still being developed, but is also wholly owned. It also holds a 7.5% interest in the Pandora joint venture, in partnership with Anglo Platinum, Lonmin and the Bapo Ba Mogale Community. Northam has three subsidiaries, namely Broad Brush Investments 2 (Pty) Limited, Khumama Platinum (Pty) Limited, and Micawber 278 (Pty) Limited.

The Zondereinde mine started production in 1993 and has produced 5 million ounces of platinum group metals since. This mine is the deepest platinum mine in the world, and has an estimated life span of 16 years. Hydropower technology is utilized for cooling and drilling, which encompasses compressed air and water, resulting in reduced electricity consumption (Northam, 2011:1).

Infra-structure development and the building of roads have already been started as part of the first phase of the Booyendal project.

Northam has a beta of 1.317 and a market capitalization of R15 775,290 million. Its P/E ratio is 31,44 – compared to the industry's 75,15 and its ticker symbol on the JSE Limited is NHM.J (Bloomberg, 2011).

3.3.5 Aquarius Platinum Limited

Aquarius Platinum Limited (Aquarius) is an Australian based company and a pure-play platinum producer. It is the fourth largest platinum producer worldwide.

Aquarius owns and operates the Kroondal Mine, in North West Province, since 1996 and is also operational on Marikana Mine, CTRP, and Mimosa Mine. Everest South is a mine south of Two Rivers developed by Aquarius and commissioned in December 2005. Aquarius acquired a 50% stake in the Mimosa mine in Zimbabwe at the Great Dyke in 2002. Production commenced at the Kroondal site in 1999. The corporate strategy is the development of smaller assets in multi-operational activities (Aquarius, 2010:1).

Aquarius is highly mechanized, employing a 'wide reef' concept, which reduces manpower needs considerably. It doesn't own a smelter. Instead, its ore is sent to Impala Platinum's refineries for processing. Impala is the largest shareholder of Aquarius. Aquarius also entered successfully into an agreement with Anglo Platinum in 2000, tripling the production demand from the Kroondal Mine over the next sixteen years.

In 2009 this company issued a new U.S.Dollar-denominated convertible bond with a 4% coupon rate, raising \$300 million, shedding the more expensive South African bonds. These debentures are to be redeemed in 2015. This provided Aquarius with funds to strengthen the balance sheet and for corporate purposes.

2009 was also marked by a slow recovery from the global crisis. Illegal strikes, and the temporarily suspension of activities at the Everest South Mine impacted negatively on production. This was partially offset by better production from the Mimosa Mine in Zimbabwe, as well as from the new mine, Blue Ridge, which became operational. Zimbabwean operations, however, are shadowed by the introduction of royalty fees and electricity disruptions during 2009. Increased union demands in South Africa are influencing profitability margins (Murray, 2010:2).

Aquarius is listed on the Australian (ASX:AQP.AX), London (LSE:AQP.L) and Johannesburg Stock Exchanges. Its ticker symbol on the JSE Limited is AQP.ZA and it has a market capitalization of R18,344.360 million. Its beta is 1.82.

3.3.6 Anooraq Resources Corporation (Anooraq)

The ticker symbol on the JSE Limited of this company is ARQ, but Anooraq is also listed on the American Stock Exchange and Toronto Venture Exchange. Anooraq made history by being the first Black Economic Empowerment company to achieve Stock Exchange listing.

The market capitalization on the JSE is R1 714.985 million and it has a beta of 1.112 against the ALSI of the JSE Limited (Bloomberg, 2011).

Anooraq had its origins in British Columbia, Canada, where it was incorporated on 19 April 1983. It has two solely owned subsidiaries in the Cayman Islands, namely N1C Resources and N2C Resources, as well as Plateau Resources (Pty) Limited in South Africa. The legal mineral rights of the company are vested in this subsidiary.

Anooraq is operational in the acquisition, exploration and development of prospective platinum group metals.

Exploration activities in Mexico during the period 1996 – 1999 preceded Anooraq's entry to the South African market in 1999. It operates and owns the Bokoni Platinum Mine on the eastern limb of the Bushveld since 2009, and has several controlling projects in the Bushveld complex of South Africa. Primary projects are the Ga-Phasha PGM project, the Boikganstho Joint Venture, and Kwanda projects (Appendices: Figure 34,132).

The Ga-Phasha project is a 50/50 joint venture with Rustenburg Platinum Mines, a subsidiary of Anglo Platinum, and was acquired by Anooraq in 2004. The project is located 45 km from Steelpoort in the Limpopo province. Both Anooraq and Anglo Platinum are optimistic over the future prospects of this project and feasibility studies are being conducted to expand activities, not only on the UG2 reef, but also on the Merensky reef.

The Boikgantsho project is a joint venture with Potgietersrus Platinum Limited, a subsidiary of Anglo Platinum. Drilling and explorations during 2004 were promising, and a feasibility study conducted in 2005 showed promising results for a 32 year lifespan mine. Several minerals and metals are to be explored and developed, namely platinum group metals, gold and nickel. A large-scale open pit deposit is visualized, with utilization of Anglo Platinum's milling, smelting and refining facilities at the nearby Lebowa and Twickenham mines.

The Kwanda project gives Anooraq 80% interest in explorations on twelve farms in the northern limb of the Bushveld complex. Rustenburg Platinum Mine will retain a 20% stake.

During 2001 – 2003 extensive near-surface PGM mineralization was found on the Rietfontein property of Anooraq. Plateau Resources and Ivanplats are arbitrating Anooraq's 50% agreement in this project (Anooraq, 2010).

3.3.7 Bauba Platinum Limited (Baubu)

This company is engaged in mineral mining and exploration. In 2006 the former Bauba A. Hlabirwa Mining Investments (Pty) Limited underwent a reverse listing, shedding a 60% interest to Bauba Platinum and 40% to the King of the BaPedi Nation and Hlabirwa Mining (Baubu, 2011).

Baubu has been listed on the JSE Limited as from 17 September 2010 with the ticker symbol of BAU. Baubu has a market capitalization of R226,273 million. It had a P/E of – 5.67 on 8 March 2011.

The Department of Mineral Resources (DMR) granted two mining rights and one prospecting right to Bauba Hlabirwa on 4 October 2006, over eight properties extending 50 km in length and 6 km in width. The mining rights are in the Richtersveld region, including Diamond Quartzite. During 2010 both Rustenburg Platinum and ARM Mining Consortium filed a review application against the DMR's refusal to grant prospecting rights to both these companies on farms forming a part of Bauba Hlabirwa's Southern Cluster. Bauba Platinum was not a party at the time of the granting of prospecting rights

and the Ba-Pedi nation had preferential rights. The mining rights' case is still pending in the High Court of South Africa.

Bauba also experienced problems with its vendors. On December 15, 2010, the company voluntarily suspended its trading due to unsettled issues with the vendors, but re-started trading two days later. Shares were however again voluntarily suspended from the JSE on 8 February 2011, simultaneously with the resignation of its CEO, Pine Pienaar. Shares became active again on 22 March 2011, after settlement of disputes with the vendors and the appointment on a new CEO (Ryan, 2011:1). This volatility, undoubtedly, impacts negatively on investors' confidence.

3.3.8 Jubilee Platinum Plc

This company's activities entail mining exploration and development, focusing on the platinum group metals, as well as nickel, copper and Ferro-alloys.

Its prime asset is the Tjate Platinum project, close to Anglo Platinum's Twickenham and Impala Platinum's Marula Mines on the eastern limb of the Bushveld complex. It holds a 63% beneficial interest in this project, expecting to produce about 65 million ounces of PGM's and gold net of geological losses. Jubilee owns 91% of Maude Mining & Exploration, which owns new order prospecting rights for PGM on the farms Bokfontein and Elandsdrift, to the west of Brits. It also has chrome rights on one portion of Elandsdrift.

Jubilee Platinum Plc has recently acquired Breamore Resources Plc and now a 70% interest in a brownfield smelter for ferro-alloys. Braemore Resources Plc originally held an exclusive license to the patented ConRoast technology, utilised in the smelting process of high chrome-bearing PGMs. It held worldwide rights from Mintek to year 2020 to use the ConRoast technology in processing pgm concentrates. This technology surpasses the older more inefficient technologies, which have limitations especially in terms of the chrome content, PGM recoveries and sulphur-dioxide emissions. Jubilee Platinum Plc holds environmental and precious metals licenses.

Internationally Jubilee reached an agreement with BHP-Billiton in Australia, to test and process nickel tailings from BHP's Leinster, Kambalda and Mt Keith operations. In a deferred joint venture with Impala Platinum Holdings, it is engaged in exploration activities in Madagascar (Jubilee, 2011).

Jubilee is listed on the JSE under the ticker symbol of JLB, and on the London Stock Exchange as JLP.

3.3.9 Platmin Limited

Platmin is listed primarily on the Toronto Stock Exchange (symbol PPN), and secondary on the JSE (ticker symbol PLN), as well as on the Alternative Market of the London Stock Exchange (symbol PPN). It is an independent, mid-tier company incorporated in Canada as a mineral exploration company. Its main shareholder is Pallinghurst Resources Limited, holding 16% of the company. At the end of 2009 it had a market capitalization of R4,5 billion. Its BEE partner, the Moepi Group of companies, owns a 27.61% stake in Boynton Investments, Platmin's South African operating subsidiary.

The group's first mine, the Pilanesberg Platinum Mine (PPM), has a world-class infrastructure, with concentrators and a Dense Media Separation (DSM) plant to treat ore. Production at the mine started in 2009, with a targeted production of 250 000 ounces of platinum group metals in 2012. PPM has an estimated life time of 16 years. Other projects include the Magazynskraal, Grootboom (73% interest), and Loskop Joint Venture (together with Lonmin), projects adjacent to Pilanesberg Platinum Mine; as well as the Mphahlele project (54% interest) on the eastern limb of the Igneous Bushveld complex.

Platmin successfully raised \$250 million capital by way of new equity and \$135 million on convertible debentures on May 13, 2010 (Platmin, 2010).

Technical problems during 2010 hampered activities, but the target for 2011 is 20 000 ounces. The possibility of consolidating PPM with neighbouring platinum properties, has been flagged by Pallinghurst (Kotze & Matthews, 2010:1).

3.3.10 Eastplats Limited

Eastplats Limited is listed on the Toronto Stock Exchange (ELR); the Alternative Market of the London Stock Exchange (ELR) and the JSE (EPS) and it has a market capitalization of R8.58 billion, with a P/E Ratio of 129,40 (Fin24.com, 2011).

Eastplats Limited is Canada's largest platinum producer, with the following assets: Crocodile River Mine (20m ounces pgms – 87.5% ownership); the Kennedy's Vale project (50m ounces pgms – 87.5% ownership); Spitzkop project (12,7 m ounces pgms – 93.4% ownership); and the Mareesburg project (1,5m ounces pgms – 75.5% ownership).

Eastplats was an unlevered company up to Feb.1, 2011 when it received approval for a \$100 million financing. The company concentrates on low cost, near surface projects. Platinum provides more than 50% of its earnings, but rhodium enjoys the rest of its focus. It has a production rate exceeding 130 000 ounces of platinum group metals annually. The Crocodile River Mine (CRM) smelter has a capacity of 180 000 tonnes per metal and has also chrome extraction facilities (Eastplats, 2011).

3.3.11 Village Main Reef Gold Mining Company

This company's ticker symbol on the JSE is VIL. It has a market capitalization of R5,59 million, a beta of 0.48 in comparison to the JSE's ALSI and a P/E ratio of -19,40 (Infomine, 2011).

Village Main Reef Gold Mining Company was founded in 1934. Since the acquisition of Lesego Platinum Mining Limited in March 2010 in a reverse merger transaction, its focus has been on the exploration and evaluation of platinum properties. The Lesego property, as well as the Eerste Regt property, is part of the Phosiri project. In October 2010 the company proposed the acquisition of 74% of Consolidated Murchison Mine (gold and antimony mine) (Village Main Reef Annual Report, 2010:2). Lesego is expected to produce 28 million ounces of PGM's annually. It is located 300km northeast of Johannesburg in the Limpopo province and will be exploring both the UG2 and

Merensky reefs in deep mining activities. The UG2 reef lies approximately 200 m deeper than the Merensky, reef (Village Main Reef, 2011).

3.3.12 Wesizwe Platinum Limited

This company has a market capitalization of R1,9 billion and is trading under the ticker symbol of WEZ on the JSE. It has a current ratio of 0,3 and a Return on Equity of 17,36%. The debt to equity ratio is 1.6 and a P/E ratio of -23.92.

Wesizwe Platinum Limited is an exploration and development company, and through its subsidiaries Bakubung Minerals and Africa Wide, mainly on platinum, but it is also exploring palladium, rhodium, and gold. Copper and nickel are by-products. Interests are held in Ledig 909 JQ, Frischgewaagd 96 JQ, and Zandriverspoort 210 JP, geographically located in the western limb of the Bushveld complex in North West, South Africa.

During 2010 Wesizwe Platinum Limited experienced cash constraints, but was able to secure a loan from China. Assets doubled from R1,3 billion to R2,6 billion, due to the acquisition of Rustenburg Platinum Mines Limited's (RPM) prospecting rights and 37% participation rights in the Western Bushveld Joint Venture (the Delta project). This also led to the consolidation of various reserves around Wesizwe's core project, the Frischgewaagd-Ledig mine (Wesizwe, 2010:3). RPM is now Wesizwe's largest shareholder, since the acquisition of this company was equity based (Wesizwe, 2011).

3.3.13 Royal Bafokeng Platinum Limited (RBPlat)

This company was listed on the JSE on 8 November 2010, under the ticker symbol of RBP.

RBPlat is an independent black-empowered mid-tier company with operations in the Bushveld complex, focused on platinum production. It enjoys a 67% joint ownership of the Bafokeng Rasimone Platinum Mine (BRPM), with Anglo Platinum's subsidiary, Rustenburg Platinum (RPM), owning the balance. RPM has, in turn, a 25% shareholding in RBPlats. Due to the Royal Bafokeng Nation's entrenched Broad Based

Black Economic Empowerment (BBBEE) credentials, RBPlat owns “new order” prospecting rights under the new South African Law.

BRPM is a 73 million ounce resource with annual production of 270 000 high grade ore which is operational at less than 500 metres depth. This Joint Venture has operational rights in the Boschkoppe and Styldrift mining areas, together with a section of the Frischgewaagd area. The Styldrift-Merensky project is expected to have its production ramp-up in 2015 (Royal Bafokeng, 2011).

Chapter 4 – Putting Theory to Practice

4.1 Introduction

“The proof of the pudding is in the eating” - English Proverb

4.2 Research background

The Platinum Sector of the JSE is an attractive investors' focus point but is, however, notorious for its volatility, because it is subject to intense commodity price fluctuations, as well as exchange rate influences.

As mentioned previously, demand for platinum declined considerably during the 2008 global recession. Fortunately for the Platinum Sector, environmental legislation in the United States and Europe, which requires the *emulsion of lead free gasses*, softened the impact of the recession. This recovery is echoed in the Annual Report of Anglo Platinum Limited of 31 Dec. 2010:21, stating that the “gross demand for platinum from the auto-catalyst sector rose by 44% in 2010, following a recovery in sales of automobiles.”

The jewellery industry in Japan and China has popularised platinum items, but demand declined globally by 20% in 2010, due to higher metal prices and the after-effect of the global recession (Anglo Platinum AR, 2010:23). Recovery in this area is anticipated in 2011.

Industrial demand increased in 2010 in all sectors, except the dental and petroleum industries. Demand surged especially for use in electronic devices, such as laptops and liquid crystal display (LCD) devices (Anglo Platinum AR, 2010:24).

Based on the information provided so far in Section 4.2, it appears as if platinum and platinum group metals have a bright future.

Thirteen companies are listed currently on the JSE in the Platinum Sector, but each differs in their prospects of creating value for the shareholder. However, through

analysis of this sector, by means of financial and economic indicators, portfolio selection can be streamlined to outperform the market.

4.3 Research methodology

Secondary numerical data, mainly derived from McGregor BFA's database, is used in this quantitative research study, supplemented by information obtained from the annual reports of the different companies.

The primary objective of this study is to develop a framework for the selection of shares in the Platinum Sector of the JSE that is value-based. The risk of selecting poor performing assets/shares from the Platinum Sector will, thus, be incrementally reduced. Shares that will contribute to value creation for the investor will be identifiable by means of the indicator selection framework developed.

Eight indicators have been arbitrarily selected due to their historical performance in portfolio selections by respected investors, such as Warren Buffett (Hagstrom, 1997:96) and Phil Town (Town, 2007:63), namely:

- Growth of Return on Invested Capital (ROIC)
- Growth of Turnover
- Growth of Book Value per Share
- Earnings per share growth rate
- Free Cash Flow growth rate
- Intrinsic Value
- Margin of safety
- Net Operating Assets

As a secondary objective, these indicators will be applied to the Platinum Sector of the JSE. An analysis of the results by means of statistical regression techniques will aid in formulating an investor's selection framework.

4.4 Population description

The population consists of all the companies listed in the Platinum Sector of the Johannesburg Stock Exchange Limited (JSE), on 1 January 2011. Thirteen companies represent this sector, (described in detail in Chapter Three), namely Anglo Platinum Limited; Impala Platinum Limited; Lonmin; Northam Platinum Limited; Aquarius Platinum Limited; Anooraq Resources Corporation; Bauba Platinum Limited; Jubilee Platinum Plc; Eastplats Limited; Wesizwe Platinum Limited; Royal Bafokeng Platinum Limited; Village Gold Reef Mining Company, and Platmin Limited.

4.5 Sample size

Twenty year data is only available for four companies, namely Anglo Platinum Limited, Impala Platinum Limited, Lonmin and Northam Platinum Limited. These four companies are also responsible for 85% of platinum production in South Africa.

Aquarius Platinum has six years of data, Wesizwe five years, followed by Anooraq and Jubilee with four years each.

Baub Platinum, Platmin, Village and Eastplats have less than four years of data sheets, Royal Bafokeng Platinum (RBPlat) only started operations in 2010 and has no financial data available. Village Gold Reef Mining was traditionally listed in the Gold Mining sector of the JSE, with recent relocation to the Platinum Sector, due to a change in its scope of activities and, thus, does not have enough data that is applicable to the Platinum Sector. Hence, both RBPlat and Village Gold Reef Mining are excluded from this analysis, resulting in a sample size of 11 companies.

- A non-probability sampling method is used in this survey study.

4.6 Data Collection

Data was collected from the following sources;

- Newspapers, such as *Business Day* and *Beeld*, thus listed the companies representing the Platinum Sector of the JSE on 1 January 2011.

- The database of McGregor BFA served as primary source of data, regarding the financials and share price performance of the companies, for the period 1991-2010. This was supplemented by information obtained from the annual reports of the different platinum mining companies, as well as Internet publications relevant to these companies.
- Statistics South Africa: 2011 supplied information on the yield rates of long-term government bonds, as well as exchange rates and interest rates applicable to this dissertation.

4.7 Data analysis

The information obtained from the database of McGregor and financial annual reports of the companies were organized on different spreadsheets in Microsoft Excel.

Each company was individually assessed on performance relative to the eight identified indicators, on an annual basis as from 1991 until 2010. Companies without data available in a specific period were only analysed for the years for which financial information were available. The eight indicators were evaluated against the average share price performance, where “average share price” is defined as the average share price for the last month before the date of the financial year end, of each company. Each company’s stand-alone risk was also evaluated by benchmarking its historical and expected returns against the average JSE All Share Index, and plotting the results on a Security Market Line graph.

An all-group assessment was made, with comparison of the eight indicators to the overall average share price on an annual basis. The results of this analysis were incorporated into the development of a regression model, which aimed to serve as a predictor tool in the choice of platinum shares.

Due to the constraints of limited data for the period observed, factor analysis could not be undertaken, and so the researcher decided to use each indicator as a variable on its own.

4.7.1 Statistical analysis

The quantitative analysis was conducted by means of the program “Statistica” (Statsoft Inc., 2011).

Data was extracted from BFA McGregor’s Database for each company over the period 1991 – 2010. Each variable, including average share price, was then plotted in a histogram to ascertain the normal distribution (Figure 7:77).

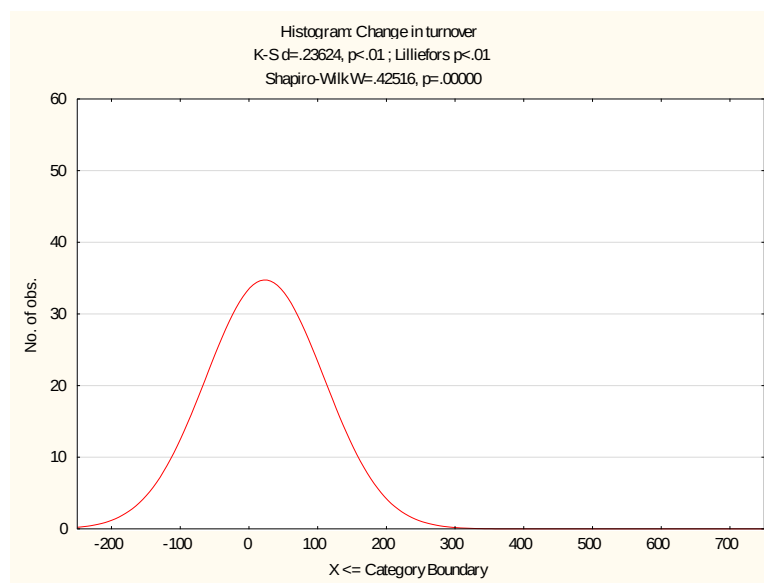


FIGURE 7: HISTOGRAM CHANGE IN TURNOVER

Source: Statistica, Statsoft: Inc.: 2011

The mean, median, minimum and maximum values, as the well as standard deviation for each variable are presented in a table (Table 3:82).

Scatter diagrams were drawn for each variable, plotted against average share price.

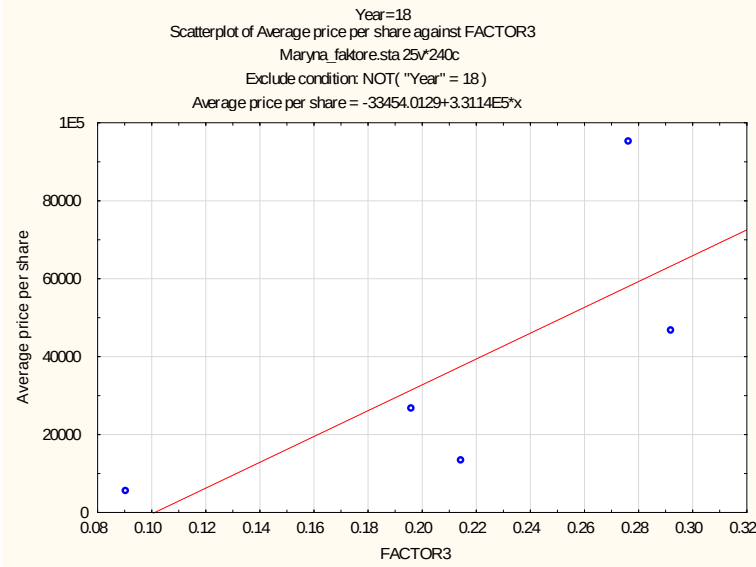


FIGURE 8: SCATTERPLOT OF EPS GROWTH VS AVERAGE PRICE PER SHARE

Source Statistica, Statsoft: Inc.: 2011

The Least-Squares Method was used to develop a simple linear regression prediction line for each variable.

The Simple Linear Regression Model:

$$Y_i = \beta_0 + \beta_1 x_i + \epsilon_i \quad (4.1)$$

Where:

Y_i = dependent variable,

β_0 = Y intercept for the population,

β_1 = slope for the population

x_i = independent variable; and

ϵ_i = random error in Y for observation i

Source: Levine *et al.* (2010:513)

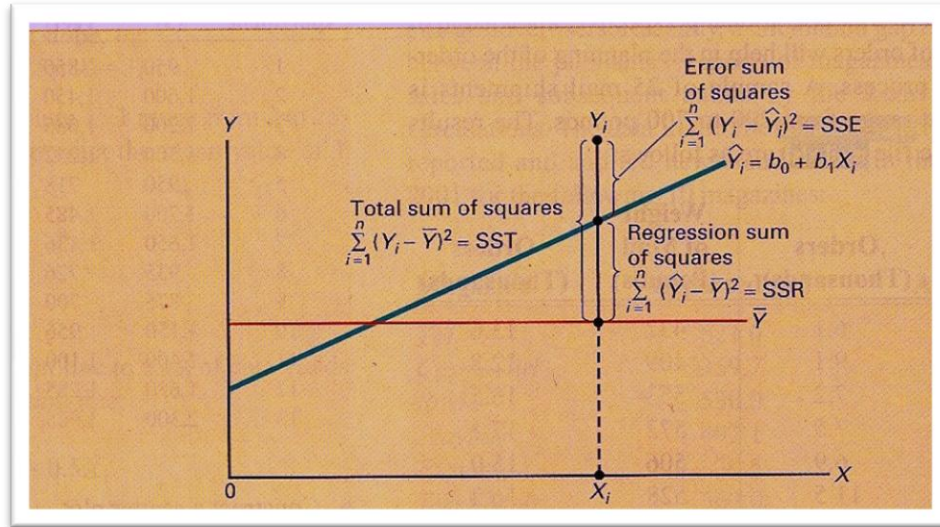


FIGURE 9: MEASURES OF VARIATION

Source: Levine *et al.* (2010:524)

The standard error of the estimate serves to measure the scatter around the prediction line, and is, therefore, similar to the standard deviation which measures variability around the mean.

The four assumptions of regression, namely:

- Linearity,
- Independence of errors,
- Normality of error; and
- Equal variance

were evaluated to confirm the appropriateness of the linear model.

The linearity assumption was tested by means of plotting the residuals (the difference between the observed (Y_i) and predicted ($\hat{Y}_i$)) against each independent variable. Since no relationship could be detected between them, it was concluded that the linear model was appropriate.

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

The assumption of normality of errors was demonstrated by the histograms showing normal distribution curves.

Equal variance assumption was tested by observing the scatter in a plot of residuals.

The next step involved calculating all the correlation coefficients (r) (Table 4:84) and r -square from each variable over the studied period (Table 5:86).

Only variables showing positive correlation above 0.3 (section 5.3.1:98) were incorporated in the development of a multiple regression model for each year. The formula for a multiple regression model is:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_n X_n + \epsilon_i \quad (4.2)$$

Where:

Y_i = dependent variable,

β_0 = Y intercept,

β_1 = slope of Y with variable X_1 , holding variables X_2 and X_3 constant,

β_2 = slope of Y with variable X_2 , holding variables X_1 and X_3 constant,

β_3 = slope of Y with variable X_3 , holding variables X_1 and X_2 constant,

β_n = slope of Y with variable X_n , holding variables X_1, X_2, X_3 constant,

X_1 = independent variable 1,

X_2 = independent variable 2;

X_3 = independent variable 3;

X_n = independent variable n ; and

ϵ_i = random error in Y for observation i

Source: Levine *et al.* (2010:573)

Confidence intervals for both the estimate of the mean response, as well as the prediction for an individual response, needed to be determined. Since the lack of sufficient data points was a serious obstacle, the researcher decided to accept 90% instead of 95% confidence level, ($p \leq 0.1000$). This relates to a 10% level of significance.

To evaluate the overall usefulness of the multiple regression model, the coefficient of multiple determination (r^2); the adjusted r^2 ; and the overall F test were also considered. The coefficient of multiple determinations represents the explanatory variation in the dependent variable. The adjusted r^2 is more correct, since it considers both the number of independent variables, as well as the sample size. The overall F test statistic reflects the dependent variable's association with the entire set of independent variables in the multiple regression model.

4.8 Limitations of the research

Since only four companies possessed data for the twenty year period observed, the results of the study might not necessarily be applicable to all the younger companies of the Platinum Sector, that are currently in a different life cycle. Even these four suitable companies, namely Angloplats, Implats, Lonmin, and Northam, experienced changes in their scope of operations throughout the twenty year period. For example, Lonmin has only been a pure platinum producer since 2001. However, it is important to keep in mind that these four companies are responsible for 85% of platinum production in South Africa. An assumption can, therefore, be made that the results obtained from the analysis of the data, are representative of the companies producing the majority of platinum in South Africa.

Most of the younger platinum mining companies are still in the exploration or early start-up phases. These companies represent potentially high-return-high-risk investments. It was, hence, important to include them in the analysis, especially to smooth out risk factors. This study was specifically conducted on South African companies and the results may not be applied universally to other countries, or to the market as a whole.

Chapter 5: Reporting

5.1 Introduction

“The best vision is insight” - Malcolm S. Forbes

5.2 Results of the Independent Variables

Before each variable is discussed individually, three tables are utilized to determine the significance of each variable annually, compared to the average share price of the Platinum Sector.

5.2.1 Descriptive Statistics

TABLE 3: DESCRIPTIVE STATISTICS PLATINUM SECTOR 1991 - 2010

Variable	Valid N	Mean	Median	Minimum	Maximum	Std. Dev.
Average price per Share	102	13084	4919	8	103917	20616
Growth in BVPS %	97	1	0	-8	51	6
Growth in ROIC %	96	4	0	-3	226	24
Growth in FCF	76	65	0	-202	5218	599
Growth in Turnover	75	23	12	-83	699	86
Growth in EPS Headline	63	2	1	0	8	2
Group Operating Assets	101	2205842	927000	657	19540000	3912583
Intrinsic Value	101	23651600	3875000	-2125000	258512500	49424793
Margin of Safety	101	15	1	-1	812	83

BVPS = Book Value per Share

ROIC = Return on Invested Capital

FCF = Free Cash Flow

EPS = Earnings per Share

N = Number of statistics

Std. Dev. = Standard Deviation

Source: Own Compilation

Table 3:82 is a summary of the descriptive statistics as averages for the Platinum Sector over the studied period. Percentages are given to illustrate the growth statistics of Book Value per Share, Return on Invested Capital, Free Cash Flow, Turnover, Earnings per Share and Margin of Safety.

The mean price per share of the Platinum Sector over the studied period was 13084 cents. The median value was 4919 cents. Since the mean is larger than the median, it can be deducted that the histogram is asymmetrical and right-skewed. The range varies from 8 cents to 103917 cents, with a standard deviation of 20616 cents, illustrating the significant volatility of the sector.

Growth in Book Value per Share (BVPS) had a range of -8% to 51%, with a standard deviation of 6%. This implies that this variable is less volatile, with a mean value of 1% and a median value of 0%.

Percentage Return on Invested Capital (ROIC) growth varied between -3 and 226, with a standard deviation of 24. This signifies moderate volatility. The mean value of 4 is larger than the median of 0, implying the graph is right-skewed.

Growth in Free Cash Flow (FCF) was very volatile, with a standard deviation of 599%, and a mean value of 65%. The range was between -202% and 5218%.

The mean growth in turnover over the same period for all companies was 23%. The standard deviation for turnover-growth was 86%, with minimum and maximum values ranging from -83% to 699%. The median value was 12%.

Headline Earnings per share (EPS) had a mean growth rate of 2%, ranging between 0% and 8%. The standard deviation of 2% implies minor volatility.

Group Operating Assets illustrated great variation, with a mean of 2205842 and a standard deviation of 3912583.

Intrinsic Value revealed significant volatility, with a large standard deviation. This variable probably demonstrates the difference between the established and the upcoming companies the most effectively.

The Margin of Safety had a range between -1% and 812%, with a mean of 15% and a median of 1%. The standard deviation of 83% reveals moderate volatility.

5.2.2 The Correlation Coefficients

TABLE 4: THE CORRELATION COEFFICIENTS OF THE 8 VARIABLES

years	TO-G	OA	EPS-G	IV	MOS	FCF-G	ROIC-G	BVPS-G
	r	r	r	r	r	r	r	r
1	1	-0.0428		0.74793	-0.84131			
2	-1	-0.2078		0.835943	-0.41255		0.77711	0.433935
3	1	0.0911		0.86931	-0.94197		0.262869	0.424146
4	1	0.1797		0.826257	-0.56427		-0.55946	0.592959
5	1	0.2005		0.845222	-0.73007		0.534322	-0.68855
6	-0.61262	0.2685		0.714913	-0.68615		0.180278	0.792717
7	-0.22869	0.2989		0.848646	-0.97714	-0.251	-0.73451	-0.14663
8	0.238956	0.8888		0.900722	-0.61514	-0.7514	0.303974	0.419404
9	0.209762	0.9648	-0.82565	0.879659	-0.14	-0.66159	-0.33136	0.660833
10	0.483011	0.8454	0.379473	0.66242	-0.22428	0.434281	0.121244	
11	0.19799	0.73	0.580345	0.86093	-0.27221	-0.43394	-0.84965	
12	0.797057	0.7639	0.526308	0.782432	-0.27092	0.68942	-0.44147	
13	-0.15969	0.5523	0.27313	0.797559	-0.31623	-0.63616	0.672012	
14	0.084853	0.4781	-0.43313	0.433935	-0.13416	0.521824	-0.38704	
15	0.095917	0.7573	0.235584	0.866141	-0.54964	-0.36797	0.980306	
16	-0.5387	0.7777	-0.78352	0.713512	-0.43081	-0.94953	-0.0469	0.156205
17	-0.64923	0.8049	-0.39192	0.879034	-0.38588	0.682862	-0.29034	
18	-0.33571	0.6854	0.186548	0.765898	-0.43081	0.248998	-0.1118	-0.15395
19	-0.34814	0.7266	0.935414	0.660076	-0.25826	0.01	-0.28355	-0.31193
20	0.222711	0.9814	0.994334	0.981784	-0.4322	0.26096	-0.2514	-0.59908
Total +	2	13	5	20	0	4	5	6
-	5	0	4	0	14	6	6	3
TO-G = TURNOVER-GROWTH; OA = OPERATING ASSETS; EPS-G = EARNINGS PER SHARE GROWTH; IV = INTRINSIC VALUE; MOS = MARGIN OF SAFETY; FCF-G = FREE CASH FLOW GROWTH; ROIC-G = RETURN ON INVESTED CAPITAL GROWTH; BVPS-G = BOOK VALUE PER SHARE GROWTH								

Source: Own Compilation

Table 4:84 contains the correlation coefficients of the different variables over the studied period (1991 – 2010) with the average share price. Correlation varies between -1 and +1. Positive correlation (above or equal to 0.3) was highlighted in green, whilst negative correlation (smaller or equal to -0.3) was highlighted in blue.

Turnover growth revealed both positive and negative correlation with the average share price. It is clear that year 12 had a 79.71% positive correlation with turnover-growth. Year 10 also revealed significant (above or equal to 30%) positive correlation (48.30%). Negative correlation was found in seven years.

Operating Assets (OA) had a significant positive correlation during years 8 – 20, but no significant negative correlation was demonstrated during the period studied. The strongest correlation was found in years 20 and 9, with respectively 0.9814 and 0.9648 positive correlation.

Earnings per Share (EPS) growth correlated positively five times with average share price during the period under observation, with years 19 and 20 demonstrating 0.9354 and 0.9943 respectively. Negative correlation was found in years 9, 14, 16 and 17.

Intrinsic Value is the only variable revealing positive correlation with the average share price over the entire period studied. The strongest correlation was found in year 20 (0.9818).

Margin of Safety had only significant negative correlation with average share price. This extended over 14 out of the 20 studied years. The most negative values were encountered in years 3 and 7. No positive correlation could be demonstrated.

Free Cash Flow (FCF) growth had a positive correlation in four years, but negative correlation was found in six years.

Return on Invested Capital (ROIC) growth could be positively correlated with average share price in five years, with year 15 demonstrating 0.9803 correlation. Six years had a significant negative correlation.

Book Value per Share (BVPS) growth could be correlated moderately over six of the 20 years, studied while negative correlation was found in only three years.

5.2.3 The r-square values

Being a square value, only positivity exists with this value.

Table 5:86 compares the r-square values of the different variables with the average share price of all companies listed in the Platinum Sector over the period 1991 - 2010. Only values above or equal to 0.3 (30%) were highlighted as being significant by the researcher.

Three years had significant r-square values for turnover-growth vs. average share price, namely years 6, 12, and 17. It is evident that the highest value was found in year 12, with 63.53% of the change in average share price explained by the variation in turnover-growth.

TABLE 5: R-SQUARE VALUES OF THE 8 VARIABLES VS. AVERAGE SHARE PRICE

	Turnover growth	Operating Assets	EPS growth	Intrinsic value	Margin of Safety	FCF growth	ROIC growth	BVPS growth
	r ²	r ²	r ²	r ²	r ²	r ²	r ²	r ²
All Groups								
Years								
1	1.0000	0.0018		0.5594	0.7078			
2	1.0000	0.0432		0.6988	0.1702		0.6039	0.1883
3	1.0000	0.0083		0.7557	0.8873		0.0691	0.1799
4	1.0000	0.0323		0.6827	0.3184		0.3130	0.3516
5	1.0000	0.0402		0.7144	0.5330		0.2855	0.4741
6	0.3753	0.0721		0.5111	0.4708		0.0325	0.6284
7	0.0523	0.0893		0.7202	0.9548	0.0630	0.5395	0.0215
8	0.0571	0.7900		0.8113	0.3784	0.5646	0.0924	0.1759
9	0.0440	0.9308	0.6817	0.7738	0.0196	0.4377	0.1098	0.4367
10	0.2333	0.7147	0.1440	0.4388	0.0503	0.1886	0.0147	
11	0.0392	0.5329	0.3368	0.7412	0.0741	0.1883	0.7219	
12	0.6353	0.5835	0.2770	0.6122	0.0734	0.4753	0.1949	
13	0.0255	0.3050	0.0746	0.6361	0.1000	0.4047	0.4516	
14	0.0072	0.2286	0.1876	0.1883	0.0180	0.2723	0.1498	
15	0.0092	0.5735	0.0555	0.7502	0.3021	0.1354	0.9610	
16	0.2902	0.6048	0.6139	0.5091	0.1856	0.9016	0.0022	0.0244
17	0.4215	0.6479	0.1536	0.7727	0.1489	0.4663	0.0843	
18	0.1127	0.4698	0.0348	0.5866	0.1856	0.0620	0.0125	0.0237
19	0.1212	0.5279	0.8750	0.4357	0.0667	0.0001	0.0804	0.0973
20	0.0496	0.9631	0.9887	0.9639	0.1868	0.0681	0.0632	0.3589
Total	3	12	5	19	8	6	6	5

Source: Own Compilation

The r-square values confirmed that *operating assets* as a variable could explain the average share price of the Platinum Sector being moderately to strong in the last 12 out of the 20 years.

Intrinsic Value had significant r-square values in 19 of the twenty years studied, with the highest value found in year 20 (96.39%).

Margin of Safety had eight years with significant r-square values, followed by FCF-growth and ROIC-growth with six years each.

EPS-growth and BVPS-growth demonstrated five years respectively of significant r-square values.

5.2.4 The individual variables

Each variable is discussed individually with, in the context of the different mining companies.

5.2.4.1 Turnover-Growth

Only six companies had data to analyze, namely Amplats, Implats, Lonmin, Northam, Aquarius Platinum and Eastplats.

Bauba has been listed on the JSE Limited as from 17 September 2010, after the former Bauba A. Hlabirwa Mining Investments (Pty) Limited underwent a reverse listing in 2006, shedding 60% interest to Bauba Platinum and 40% to the King of the BaPedi Nation and Hlabirwa Mining (Bauba, 2011).

Wesizwe is an exploration and development company, and did not have any turnover during the study period, since exploration dominated activities over the period studied.

Anooraq is operational in the acquisition, exploration and development of prospective platinum group metals, and also did not have data over the studied time frame.

Village Main Reef Gold Mining Company was founded in 1934. The company originally resided in the Gold Mine Sector of the JSE Limited. It is only since the acquisition of Lesego Platinum Mining Limited in March 2010 in a reverse merger transaction that its

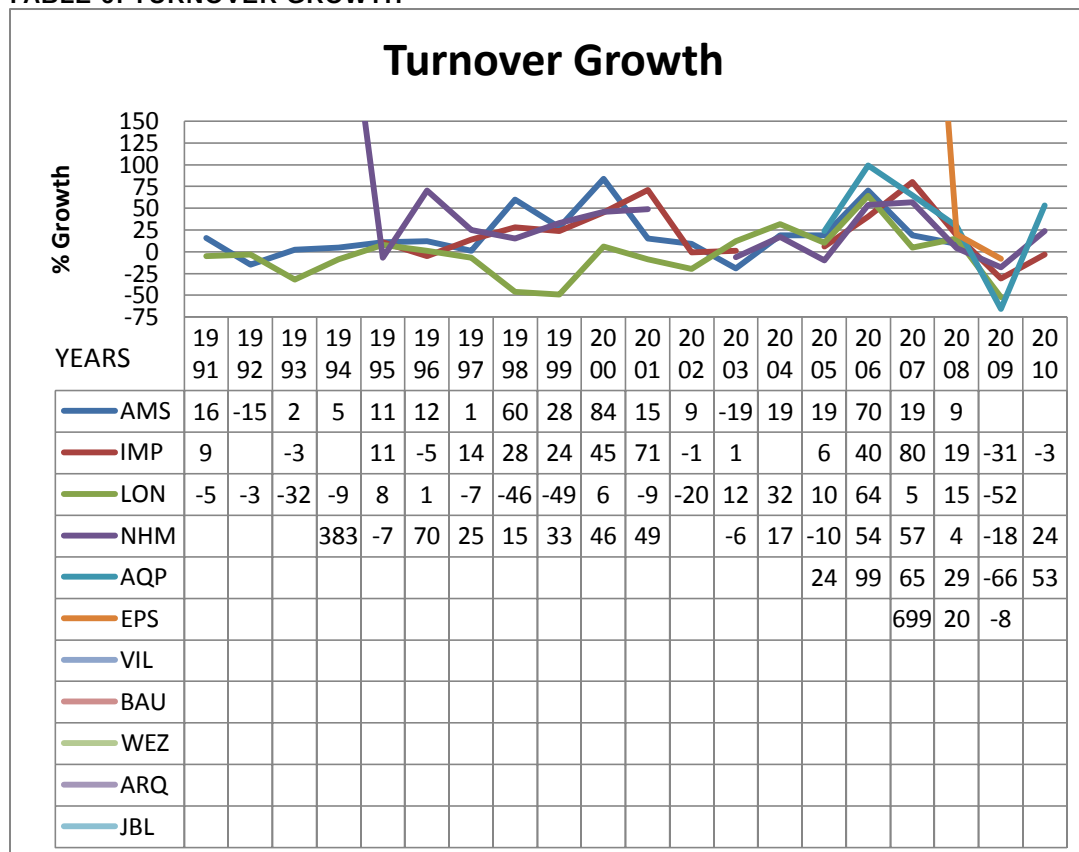
focus has been on the exploration and evaluation of platinum properties. The company is, therefore, excluded from this empirical study.

Platmin started with production in 2009 at its first mine, the Pilanesberg Platinum Mine, with a targeted production of 250 000 ounces of platinum group metals in 2012.

Jubilee Platinum Plc is actively exploring and developing, but not producing as yet.

When analyzing Turnover-Growth for the individual companies of the Platinum Sector over the past 20 years, it is evident that all the companies have similar trends in response to external stimuli (Table 3:82). The years 1998 and 2006 saw soaring performances in most companies, whilst 2008 – 2009 mirrored the global recession.

TABLE 6: TURNOVER GROWTH



AMS = AMPLATS

IMP = IMPLATS

LON = LONMIN

VIL = VILLAGE

BAU = BAUBA

NHM = NORTHAM

AQP = AQUARIUS

EPS = EASTPLATS

WEZ = WESIZWE

JBL = JUBILEE

ARQ = ANOORAQ

Source: Own Compilation

Table 6:88 illustrates Amplats' experience as a platinum producer clearly, with peak performances towards the end of the previous century. The effects of Broad Based Black Economic Empowerment were revealed in 2003, when shedding of mines took place, leading to a negative growth in turnover. Recovery soon took place, with positive growths in the following years. 2006 was a golden year, with 70% growth in turnover.

Unlike the other companies studied, Impala had its peak performance in 2007 with 80% increase in turnover. The company experienced negative growth in 2009, due to its final agreement with Royal Bafokeng Holding (Pty) Limited (RBH), obligating Impala Platinum to pay the discount of future royalties to RBH, thereby terminating all future claims on royalties.

Lonmin's poor turnover-growth in 1998 is due to the early restructuring of the company's activities, shedding all non-platinum operations. Lonmin has only become a pure platinum producer since 2001. The years 2003 – 2008 saw soaring performances, with an impressive 64% growth in turnover in 2006. The recession etched its mark on Lonmin productivity in 2009, extrapolated by internal problems with their ovens.

Aquarius Platinum is a typical example of a company in the growth stage of its life cycle, with rapid growth in turnover – especially evident in 2006, but revealing also a large standard deviation (volatility). This company had the deepest trough in 2009.

Eastplats started with production in 2007, after being involved in exploration in prior years.

Figure 10:90 illustrates the box-plots of the change in turnover of the various companies. The Box and Whiskers plot is a graphical illustration of the scatter of values, divided in four quartiles. The first quartile (Q1) illustrates the 25% smallest values depicted as a whisker, the second (Q2) and third quartiles (Q3) contain the box with 50% middle values (scattered around the mean), and the fourth quartile (Q4) hosts the 25% top values in another whisker. When the box-plot is symmetrical, the mean and median are equal, dividing the box in two symmetrical parts, with the length of both whiskers equal.

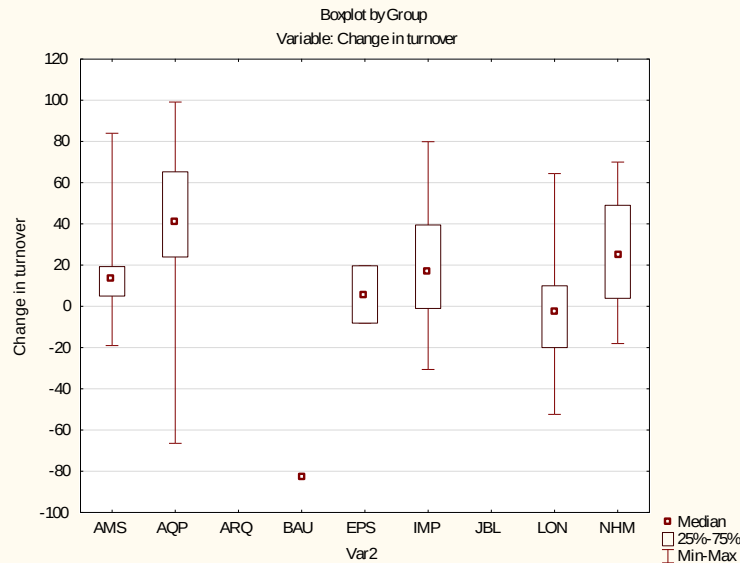


FIGURE 10: BOX & WHISKERS PLOT CHANGE IN TURNOVER

AMS = AMPLATS AQP = AQUARIUS ARQ = ANOORAQ BAU = BAUBA EPS = EASTPLATS
IMP = IMPLATS JBL = JUBILEE LON = LONMIN NHM = NORTHAM

Source: Statistica, Statsoft: Inc.: 2011

The Box and Whiskers plots of Amplats, Aquarius Platinum, Implats, and Lonmin are asymmetrical. The 25% of values in the fourth quartile distorts the curves of Amplats (AMS), Implats (IMP) and Lonmin (LON) to be right-skewed (the mean is distorted to the right). In these curves, 75% of the values are found between the beginning of the left whisker and the right edge of the box. Aquarius Platinum's plot is left-skewed, with 25% of values scattered along the long left whisker. Only Northam Platinum had a symmetrical distribution, implying that the mean and median values are equal.

5.2.4.2 Growth of Return on Invested Capital (ROIC)

As mentioned in the literature study section of this dissertation, ROIC is a performance measurement, assessing the efficiency of a company to generate profitable current investments, through the allocation of resources under its control.

ROIC is focused on current investments, but is in fact a lagging indicator. The perception that ROIC is directly correlated with return is deceivable because managers may exhibit harvesting behaviour, focusing on short-term profitable projects, in order to

increase ROIC. Growth opportunities, and, therefore, long-term value creation, may be neglected.

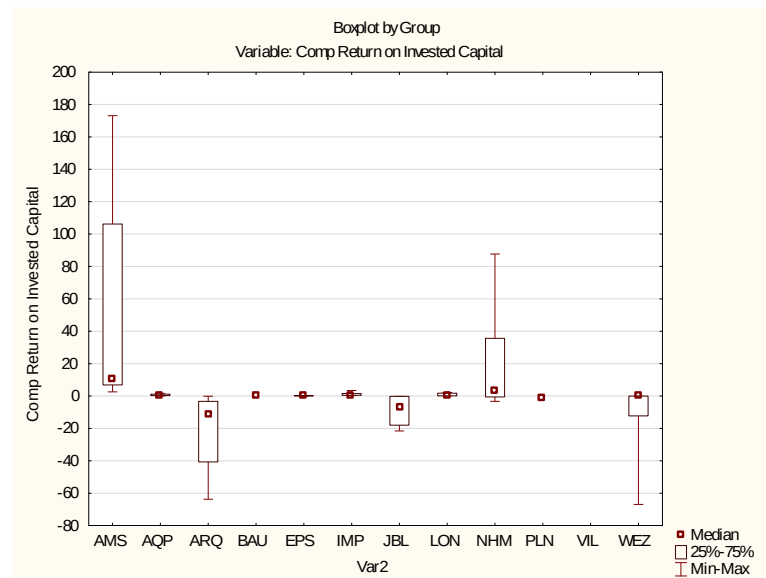


FIGURE 11: BOX & WHISKERS' PLOT GROWTH IN ROIC

AMS = AMPLATS AQP = AQUARIUS ARQ = ANOORAQ BAU = BAUBA VIL = VILLAGE
 EPS = EASTPLATS IMP = IMPLATS JBL = JUBILEE LON = LONMIN NHM = NORTHAM
 WEZ = WESIZWE PLN = PLATMIN

Source: Statistica, Statsoft: Inc.: 2011

The Box and Whiskers plot (Figure 11:91) gives additional information and indicate that Amplats and Northam had substantial positive growths in ROIC, signaling less capital tied in long-term projects. These two companies' box plots are right-skewed, with 75% of values concentrated from the beginning of the left whisker until the right edge of the box. The mean is distorted to the right of the median.

Anooraq, Jubilee and Wesizwe had negative growths in ROIC, implying expenditure on long-term projects, tying up capital.

5.2.4.3 Earnings per Share (EPS) Growth

The Earnings per Share ratio implies the monetary earnings by each share. Headline EPS-figures were used for this analysis.

The Box and Whiskers plots of the companies are all asymmetrical. Aquarius Platinum had the largest box containing the 50% middle values. Right-skewed asymmetry, with the median smaller than the mean, was obvious in the Box and Whiskers plots of Implats, Lonmin and Northam. Amplats had right-skewed asymmetry as well, but to a lesser degree (Figure 12:92).

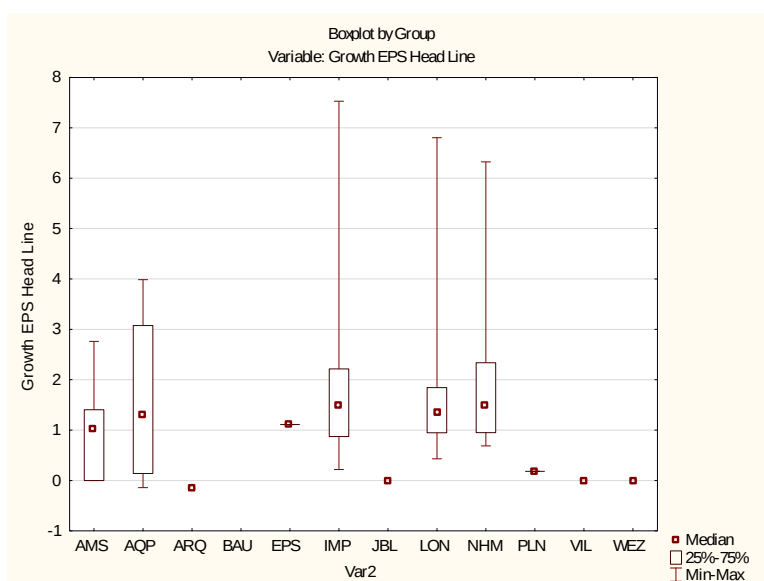


FIGURE 12: BOX & WHISKERS PLOT HEADLINE EPS GROWTH

AMS = AMPLATS AQP = AQUARIUS ARQ = ANOORAQ BAU = BAUBA VIL = VILLAGE
 EPS = EASTPLATS IMP = IMPLATS JBL = JUBILEE LON = LONMIN NHM = NORTHAM
 WEZ = WESIZWE PLN = PLATMIN

Source: Statistica, Statsoft: Inc.: 2011

5.2.4.4 Book Value per Share (BVPS) Growth

This variable probably reflects the life cycle of the companies the best.

Figure 13:93 illustrates the Box and Whiskers plot of Book Value per Share growth for the different companies over the period studied. Right-skewedness was evident in the box plots of Amplats and Implats, with 75% of all values clustered to the left. Anooraq had a left-sided asymmetry in the dispersion of values, with the mean smaller than the median. Only Lonmin's box plot was symmetrical, with the left and right whiskers being equal. The mean was also equal to the median in Lonmin's plot.

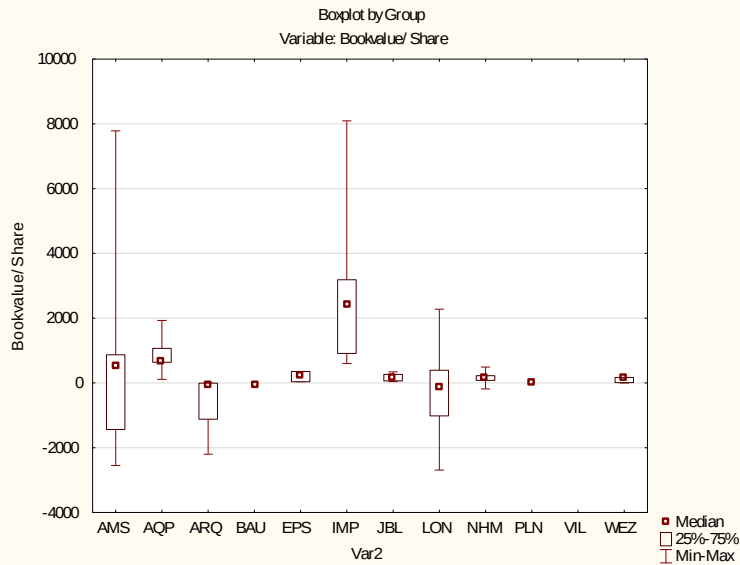


FIGURE 13: BOX & WHISKERS PLOT BVPS GROWTH

AMS = AMPLATS AQP = AQUARIUS ARQ = ANOORAQ BAU = BAUBA EPS = EASTPLATS
 IMP = IMPLATS JBL = JUBILEE LON = LONMIN NHM = NORTHAM VIL = VILLAGE PLN =
 PLATMIN WEZ = WESIZWE

Source: Statistica, Statsoft: Inc.: 2011

5.2.4.5 Growth in Free Cash Flow (FCF)

It is important to remember, that the definition for FCF is:

$$FCF = NOPAT - \Delta NOWC - \Delta FA \quad (2.7)$$

$$NOPAT = EBIT (1 - T) \quad (2.8)$$

Where:

NOPAT = Net Operating Profit after Tax,

NOWC = Net Operating Working Capital,

FA = Fixed Assets; and

EBIT = Earnings before Interest and Taxes.

Clustering of values to the left was evident in the Box and Whisker plots of both Implats and Amplats, and to a lesser degree in the box-plot of Northam. The negative free-cash-flow growth of Aquarius was also demonstrable in this plot (Figure 14: 94).

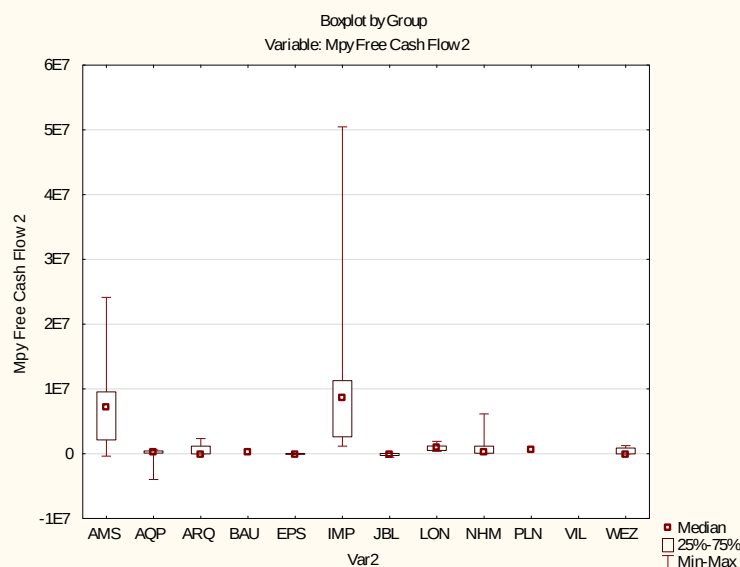


FIGURE 14: BOX & WHISKERS PLOT FCF GROWTH

AMS = AMPLATS AQP = AQUARIUS ARQ = ANOORAQ BAU = BAUBA EPS = EASTPLATS
IMP = IMPLATS JBL = JUBILEE LON = LONMIN NHM = NORTHAM VIL = VILLAGE PLN =
PLATMIN WEZ = WESIZWE

Source: Statistica, Statsoft: Inc.: 2011

5.2.4.6 Intrinsic Value

The concept of intrinsic value was first introduced by Graham and Dodd in 1934. Graham, Dodd and Cottle (1962:28) elaborated on this, concluding that a stock's future earnings power resembles the intrinsic value of that stock.

The Box and Whiskers plots (Figure 15:95) reveal the asymmetry in the distribution of values. Both Amplats and Implats have right-skewed distributions, with 75% of all values clustered to the left between the beginning of the left whisker and the right edge of the inter-quartile's box. The remaining 25% of values are dispersed along the long right whisker, causing the asymmetry in distribution. The mean has been distorted to the right in these box plots, being larger than the median.

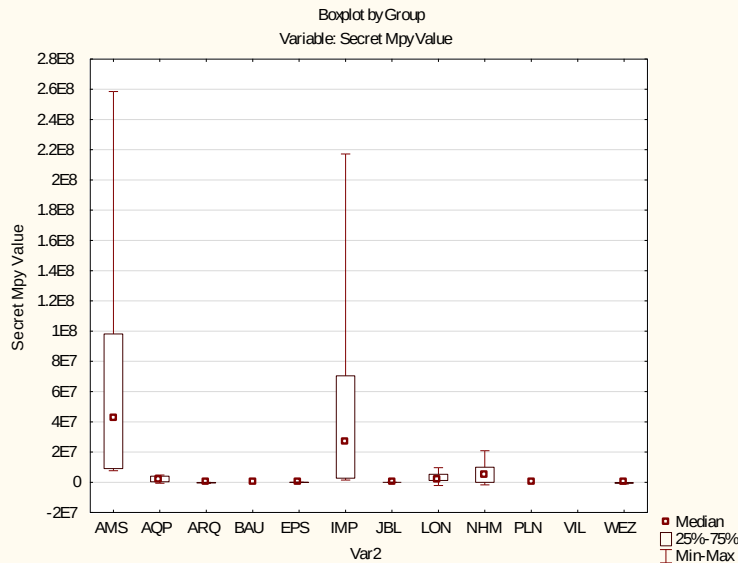


FIGURE 15: BOX & WHISKERS PLOT INTRINSIC VALUE

AMS = AMPLATS AQP = AQUARIUS ARQ = ANOORAQ BAU = BAUBA EPS = EASTPLATS
 IMP = IMPLATS JBL = JUBILEE LON = LONMIN NHM = NORTHAM VIL = VILLAGE PLN =
 PLATMIN WEZ = WESIZWE

Source: Statistica, Statsoft: Inc.: 2011

5.2.4.7 Margin of Safety

As mentioned in the literature study, the Margin of Safety concept was popularized by Graham and Buffett. This concept accounts for a safety net in purchasing shares at a discount value in order to minimize downside risk.

The Margin of Safety represents the difference between the share price and the intrinsic value of a share.

The Box and Whiskers plots (Figure 16:96) illustrate that the majority of dispersion of values is found in the inter-quartile range of these young companies. Anooraq, Eastplats, Jubilee and, to a lesser degree, Aquarius, have almost no whiskers on the sides, accentuating the central tendency in the scatter of values. Anooraq and Eastplats have symmetrical box plots, with the means equal to the medians. In contrast to them, the median values in the box plots of Aquarius and Jubilee are distorted to the left, causing asymmetry.

Amplats and Implats have very small Margins of Safety, again implying that their intrinsic values are closely resembled by their respective share prices.

Both Lonmin and Northam have long right whiskers; resulting in right-skewed graphs (the means are greater than the medians).

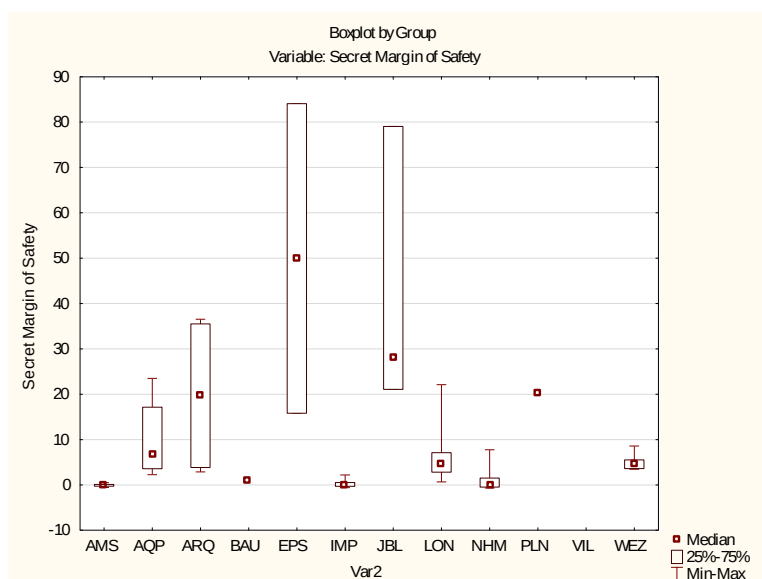


FIGURE 16: BOX & WHISKERS PLOT MARGIN OF SAFETY

AMS = AMPLATS AQP = AQUARIUS ARQ = ANOORAQ BAU = BAUBA EPS = EASTPLATS
 IMP = IMPLATS JBL = JUBILEE LON = LONMIN NHM = NORTHAM VIL = VILLAGE PLN =
 PLATMIN WEZ = WESIZWE

Source: Statistica, Statsoft: Inc.: 2011

5.2.4.8 Operating Assets

As mentioned in Chapter Two, the Operating Assets variable can be regarded as synonymous to net operating working capital in practice. Since companies in the same industry face similar problems, industry comparison is a handy benchmark tool. Zhang (2005:95) illustrates that NOA is a strong inverse indicator of future stock returns, both cross-industrial and within-industrial.

Zhang (2005:17) points out that Net Operating Assets (NOA) may elicit opportunistic accounting practices, for example over-application of absorption costing systems, or

intensive debtors' control. Zhang (2005:17) concludes that large inventories may signal inferiority against rivals, and that large closing inventories may be a sign of demand shifts. Likewise, when net operating assets increase amidst the transition to higher financing liabilities, the possibility of liquidity problems may surface.

The Box and Whiskers plot (Figure 17:97) confirms that the four largest platinum producers have the largest operating assets. Amplats and Implats dominate this area, being established companies, followed by Lonmin and Northam. Interestingly though, Implats has the largest left whisker (the 25% top values) of all companies in the graph.

Anooraq, Eastplats, Jubilee and Wesizwe are still more active in exploration, with capital constraints.

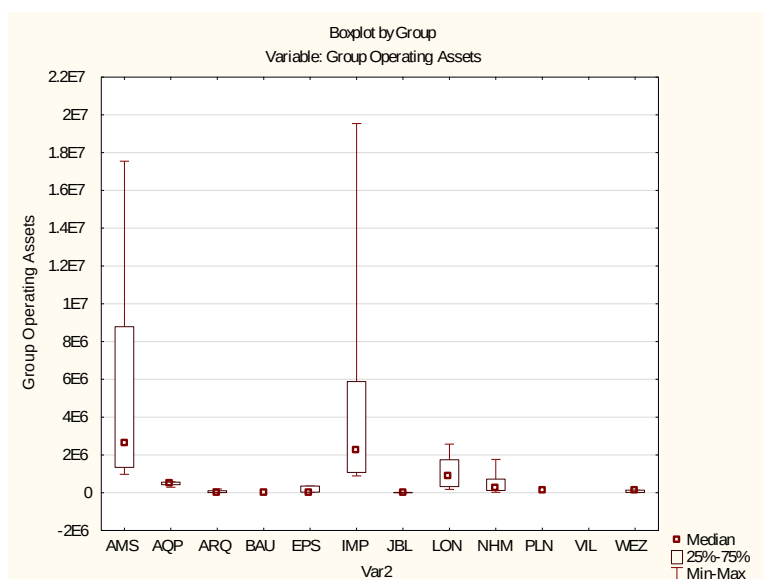


FIGURE 17: BOX & WHISKERS PLOT OPERATING ASSETS

AMS = AMPLATS AQP = AQUARIUS ARQ = ANOORAQ BAU = BAUBA EPS = EASTPLATS
 IMP = IMPLATS JBL = JUBILEE LON = LONMIN NHM = NORTHAM VIL = VILLAGE PLN =
 PLATMIN WEZ = WESIZWE

Source: Statistica, Statsoft: Inc.: 2011

5.3 Stepwise Multiple Regression

5.3.1 The selection of independent variables for the regression model for each year

Once the current empirical study, through the process of drawing histograms, had confirmed that the collective data of all companies together had a fairly normal distribution, scatter-plots were constructed to illustrate the relationship between the average share and the independent variables. Figure 18:98 is an example of such a scatter-plot diagram in which the change in turnover is depicted versus the average share price.

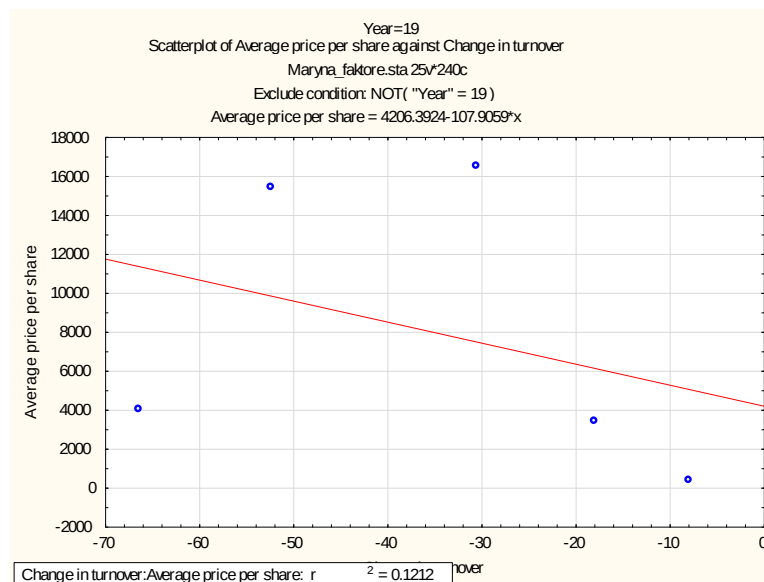


FIGURE 18: SCATTERPLOT OF AVERAGE SHARE PRICE VS. CHANGE IN TURNOVER YEAR 19

Source: Statistica, Statsoft: Inc.: 2011

Each scatter-diagram was then fitted with a trend-line. Figure 18:98 reveals a trend-line with a negative slope.

Correlation coefficients were, thereafter, determined for each variable for every successive year during the period 1991 – 2010. These correlation coefficients were then tabulated (Table 4:84). Only correlation coefficients with a nominal value above 0.3 were highlighted because correlations smaller than 0.3 were considered to be less significant.

Table 4:84 was investigated for consistency of associations over time, that is an association that is positive in some years and negative in other years is not something that could carry any weight in interpretation or prediction. Only two variables showed consistency, namely Margin of Safety and Intrinsic Value.

A criterion was set: only variables with correlation (positive or negative) equal to or larger than 0.3 and appearing equal or above ten times (50% of the years) during the studied period, were to be included in the model.

The variable 'Intrinsic Value' had positive correlation coefficients above 0.3 with average share price over the entire period, and was, hence, selected by the researcher to be included in the multiple regression model.

Two other variables, namely 'Operating Assets' and 'Margin of Safety' had correlation coefficients according to the above criterion in 13 and 14 years respectively, and were hence stepwise forward introduced to the initial regression model. Operating Assets had positive correlation and Margin of Safety negative correlation.

The five remaining variables (Turnover-growth, EPS-growth, FCF-growth, ROIC-growth and BVPS-growth) did not meet the above criterion and were excluded from the model.

5.3.2 Model-Building

The model building was initiated by using Intrinsic Value as the first variable.

In a forward regression method, Margin of Safety and Operating Assets were individually introduced to the model.

Operating Assets had negative correlation in the first two years, followed by positive correlation (Table 4:84). This inconsistency led to the researcher's decision to omit Operating Assets from the regression analysis.

The two remaining variables (Intrinsic Value and Margin of Safety) were used to develop the multiple regression models for each year (Table 7:100).

TABLE 7: ANNUAL MULTIPLE REGRESSION MODEL

Source: Own Compilation

Multiple regression model: $Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \dots$												
$\chi_1 = \text{Margin of Safety}$							$\chi_2 = \text{Intrinsic Value}$					
	Multiple regression equation annually	β_0	β_1	β_2	Mult.R	Mult. R ²	Adj. R ²	F	Deg. Fr. p	SSE	N	
Year 1	$Y_i = 4643.79 - 706.62X_1$	4643.79	-706.62		0	0.9001	0.8101	0.4304	2.1336 (2,1)	0.4357	2131.79	
Year 2	$Y_i = 1174.49 + 110.21X_1 + 0.001X_2$	1174.49	110.21	0.001	0.8444	0.713	0.1389	1.2419 (2,1)	0.5358	2561.29		
Year 3	$Y_i = 5211.27 - 1117.21X_1$	5211.27	-1117.21		0	0.9553	0.9126	0.7379	5.2227 (2,1)	0.2956	1512.35	
Year 4	$Y_i = 3554.94 - 370.108X_1 + 0.001X_2$	3554.94	-370.11	0.001	0.8756	0.7666	0.2999	1.6325 (2,1)	0.4831	2966.61		
Year 5	$Y_i = 4785.39 - 954.05X_1 + 0.001X_2$	4785.39	-954.05	0.001	0.9162	0.8395	0.5185	2.6152 (2,1)	0.4006	3509.40		
Year 6	$Y_i = 4137.40 - 166.09X_1$	4137.40	-166.09		0	0.8004	0.6406	-0.0781	0.8913 (2,1)	0.5995	4138.09	
Year 7	$Y_i = 5498.18 - 2457.74X_1$	5498.18	-2457.74		0	0.9978	0.9956	0.9869	113.86 (2,1)	0.0661	375.53	
Year 8	$Y_i = 1972.45 - 332.36X_1$	1972.45	-332.36		0	0.9171	0.841	0.523	2.6447 (2,1)	0.3987	2395.93	
Year 9	$Y_i = 2185.50 + 597.33X_1$	2185.50	597.33		0	0.8948	0.8006	0.4019	2.0079 (2,1)	0.4465	4185.54	
Year 10	$Y_i = 7076.82 - 81.49X_1$	7076.82	-81.49		0	0.6625	0.4389	-0.6832	0.312 (2,1)	0.749	13062.13	
Year 11	$Y_i = 5411.85 + 1504.27X_1$	5411.85	1504.27		0	0.8692	0.7555	0.2666	1.5454 (2,1)	0.4944	13705.77	
Year 12	$Y_i = 7161.61 + 1955.08X_1$	7161.61	1955.08		0	0.8016	0.6426	-0.0723	0.8988 (2,1)	0.5979	22633.19	
Year 13	$Y_i = 1813.94 + 1231.12X_1 + 0.001X_2$	1813.94	1231.12	0.001	0.8058	0.6493	-0.052	0.9258 (2,1)	0.5922	22284.65		
Year 14	$Y_i = 13096.03 + 951.86X_1$	13096.03	951.86		0	0.4327	0.1873	-1.4382	0.1152 (2,1)	0.9015	35201.29	
Year 15	$Y_i = 3882.84 + 78.88X_1$	3882.84	78.88		0	0.8662	0.7503	0.5838	4.5061 (2,3)	0.1248	13264.91	
Year 16	$Y_i = 19113.19 - 537.84X_1$	19113.19	-537.84		0	0.7351	0.5404	0.3106	2.3514 (2,4)	0.2113	30862.87	
Year 17	$Y_i = 10524.71 - 93.46X_1$	10524.71	-93.46		0	0.8767	0.7687	0.6761	8.3063 (2,5)	0.0257	20148.79	
Year 18	$Y_i = 10685.76 - 278.21X_1$	10685.76	-278.21		0	0.7692	0.5917	0.4557	4.3483 (2,6)	0.068	23433.32	
Year 19	$Y_i = 3921.05 - 16.43X_1$	3921.05	-16.43		0	0.6564	0.4309	0.2032	1.8927 (2,5)	0.2444	6093.03	
Year 20	$Y_i = 1159.56 + 38.03X_1$	1159.56	38.03		0	0.9828	0.9659	0.9318	28.3048 (2,2)	0.0341	2005.86	

Table 7:100 is a summary of the statistics found. β_0 represents the y-intercept; β_1 is the slope of variable 1 (Margin of Safety - represented by the symbol χ_1); and β_2 is the slope of variable 2 (Intrinsic Value, represented by the symbol χ_2). Noteworthy is the fact that β_2 had a minimal value of equal or close to zero, which can be attributed to the difference in size and magnitude of the two variables (see Table 8:108).

Only four years had a 10% level of significance ($p < 0.1$), namely years 7, 17, 18 & 20.

It is clear that Margin of Safety was the main determinant of share price in Year 7, with an individual p-value of 0.07 (compared to the p-value of 0.20 of Intrinsic Value).

Intrinsic Value was the main determinant in years 17, 18 and 20 with p-values of 0.01, 0.05 and 0.02 respectively. The corresponding p-values of Margin of Safety during these years were 0.76, 0.79 and 0.76

5.3.3 Testing the Model

By using the regression model developed in Table 7:100, all companies with average share price data for four or more years were included in the testing of the model. These companies entailed Amplats, Implats, Lonmin, Northam, Aquarius, Anooraq, Jubilee, Eastplats and Wesizwe. Predicted share prices were compared to actual average share price of each company for every year (Appendices, Table 11:131).

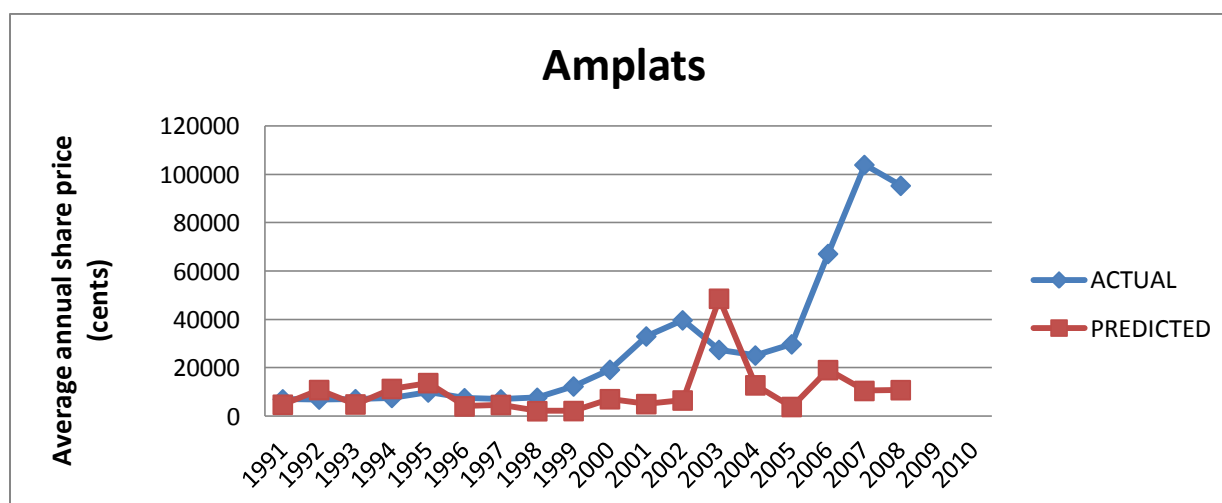


FIGURE 19: MODEL TESTING: ACTUAL VS. PREDICTED SHARE PRICES AMPLATS

Figure 19:101 illustrates the fit of the model for Amplats' share price over the studied period. Years 1991 – 1998 reveal an excellent fit, but divergence emerged during the last decade, but especially during the last five years of the period studied. Keep in mind those years 2008 – 2010 bore the brunt of the global recession.

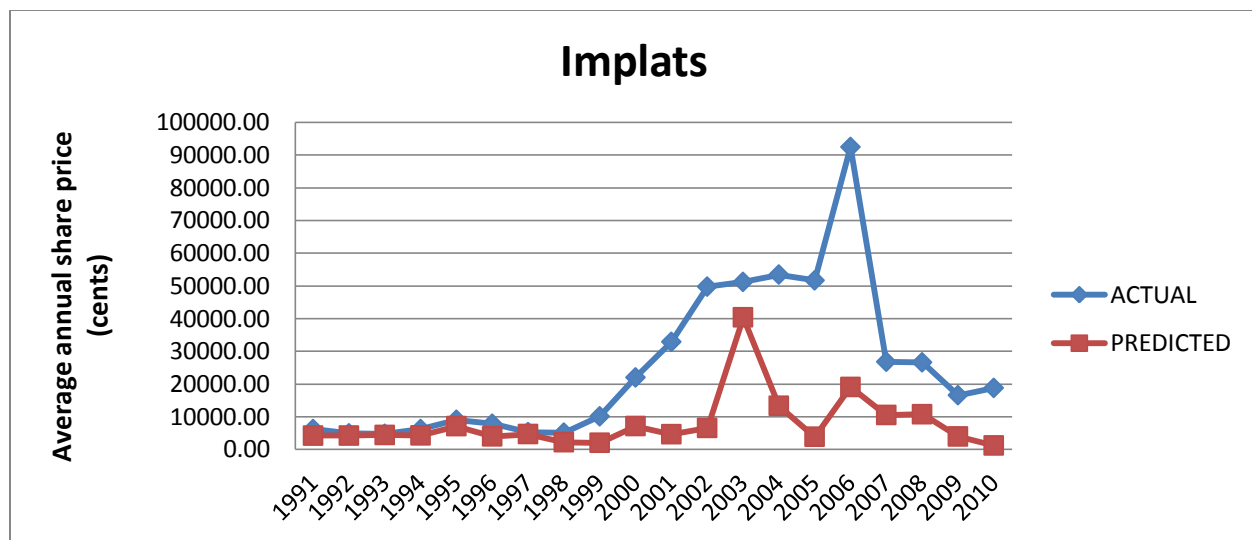


FIGURE 20: MODEL TESTING: ACTUAL VS. PREDICTED SHARE PRICES IMPLATS

Source: Own Compilation

Implats followed the same tight fit with the model as Amplats during years 1991 – 1998. However, moderate fit could be demonstrated during the next twelve years, with the exception of the period 2005 – 2006. These years signaled a surge in the share price of Implats – probably due to bullish market sentiment during those years (Figure 20:102).

Lonmin's graph is exciting (Figure 21:103). A very tight fit could be demonstrated over the first thirteen years of the study period. Years 2006 – 2008 were marked by divergence of the graphs of actual versus predicted share prices. Bullish prices ruled during these years, but the global recession of 2008 resulted in a correction of these values closer to market equilibrium.

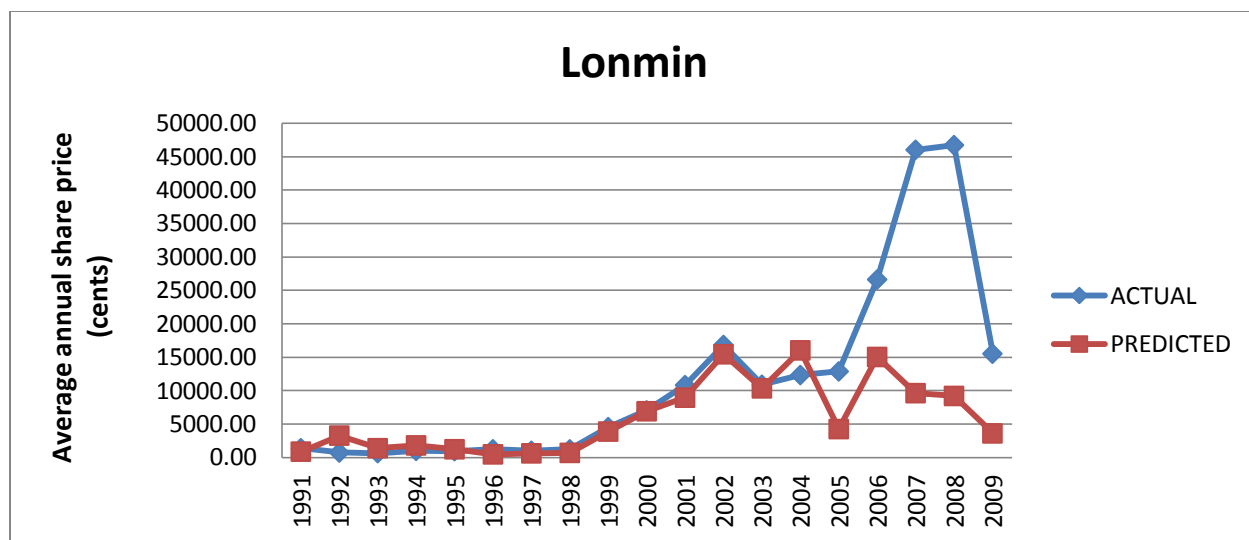


FIGURE 21: MODEL TESTING: ACTUAL VS. PREDICTED SHARE PRICES LONMIN

Source: Own Compilation

Northam is the last of the four major platinum producing companies with twenty year data.

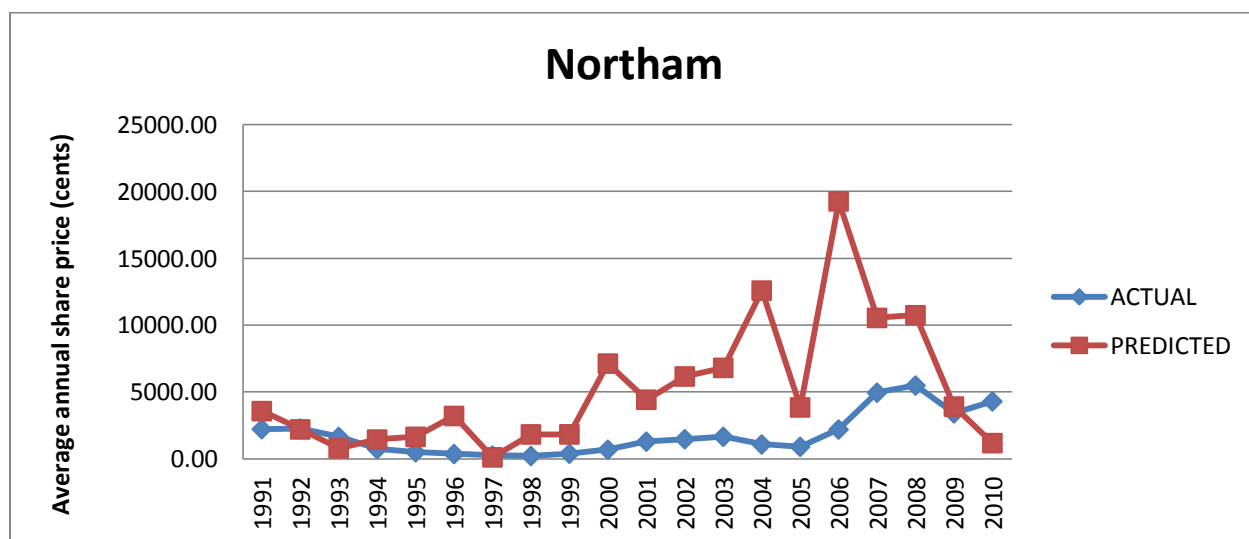


FIGURE 22: MODEL TESTING: ACTUAL VS. PREDICTED SHARE PRICES NORTHAM

Source: Own Compilation

Since 1994 predicted prices exceeded actual prices (except in 2010), and a tight fit could only be demonstrated in years 1992 – 1994, in 1997 and in 2009. The largest

difference between predicted and actual share prices was found in 2006 (Figure 22:103).

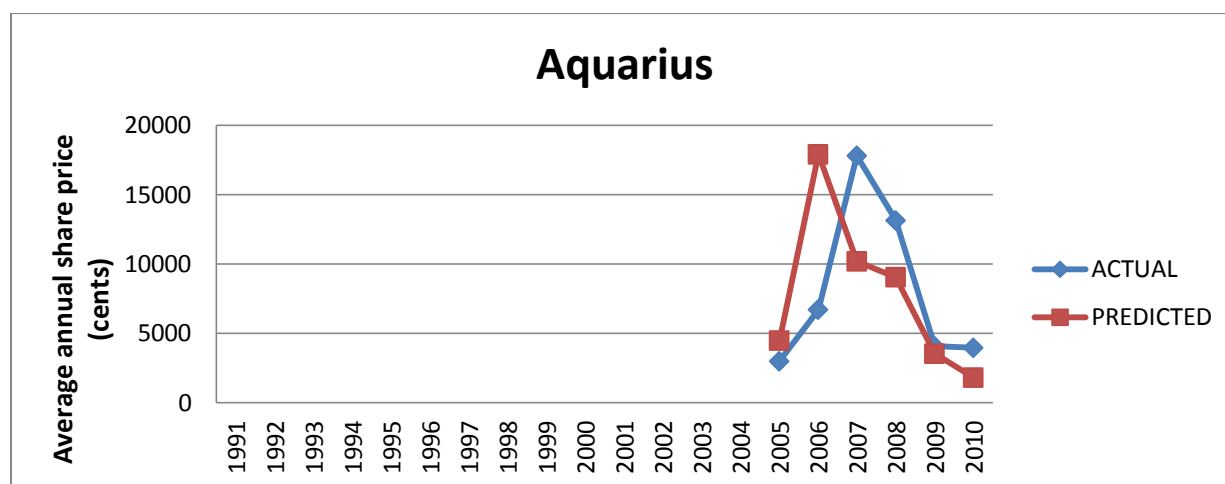


FIGURE 23: MODEL TESTING: ACTUAL VS. PREDICTED SHARE PRICES AQUARIUS

Source: Own Compilation

Aquarius Platinum only had data from 2005 – 2010. The graphs of actual and predicted share prices had a close resemblance and moderate fit over the study period (Figure 23:104). Actual prices lagged behind predicted values. This data implies that the model can be used as a predictor tool in this company.

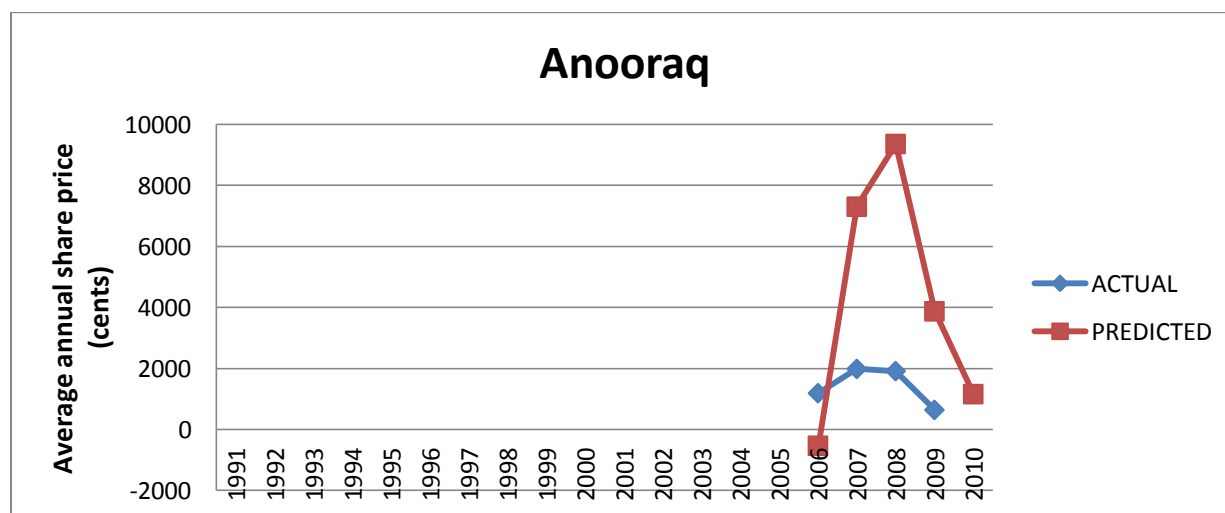


FIGURE 24: MODEL TESTING: ACTUAL VS. PREDICTED SHARE PRICES ANOORAQ

Source: Own Compilation

Anooraq possessed data over the period 2006 – 2010. Predicted prices were much higher than actual prices as from 2007 and no reliable relationship between the two graphs could be demonstrated (Figure 24:104).

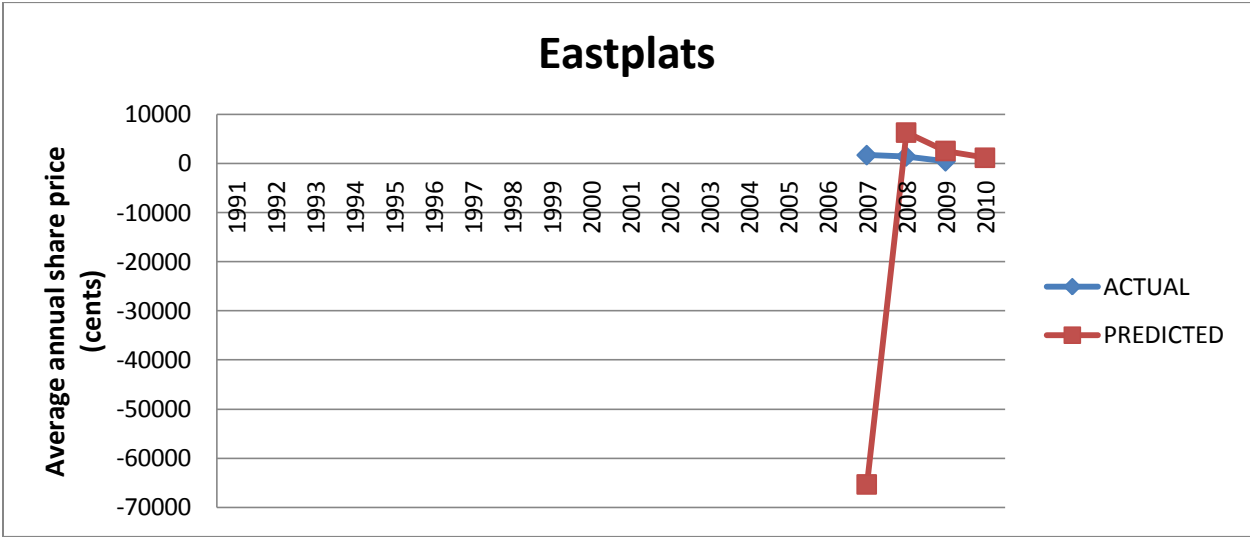


FIGURE 25: MODEL TESTING: ACTUAL VS. PREDICTED SHARE PRICES EASTPLATS

Source: Own Compilation

Although Eastplats had only four years of data, a good fit of the model could be demonstrated during the period 2008 – 2009 (Figure 25:105). A longer studied period is necessary in order to determine the reliability of the model fit.

Jubilee also had only four years of data (Figure 26:106). Only 2009 showed convergence of the predicted and actual values. Before the model is dismissed as unreliable in this company, a longer period study is necessary. Jubilee is an emerging company, and production was only possible in a limited number of years.

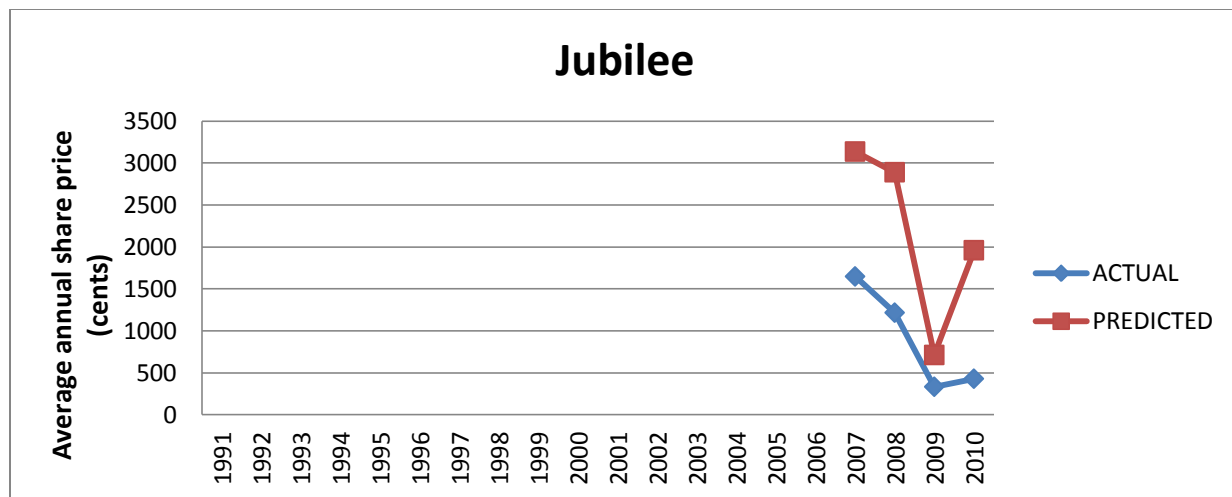


FIGURE 26: MODEL TESTING: ACTUAL VS. PREDICTED SHARE PRICES JUBILEE

Source: Own Compilation

The last company possessing enough data to be used in comparison was Wesizwe, with data over the six year period 2005 – 2010 (Figure 27:106).

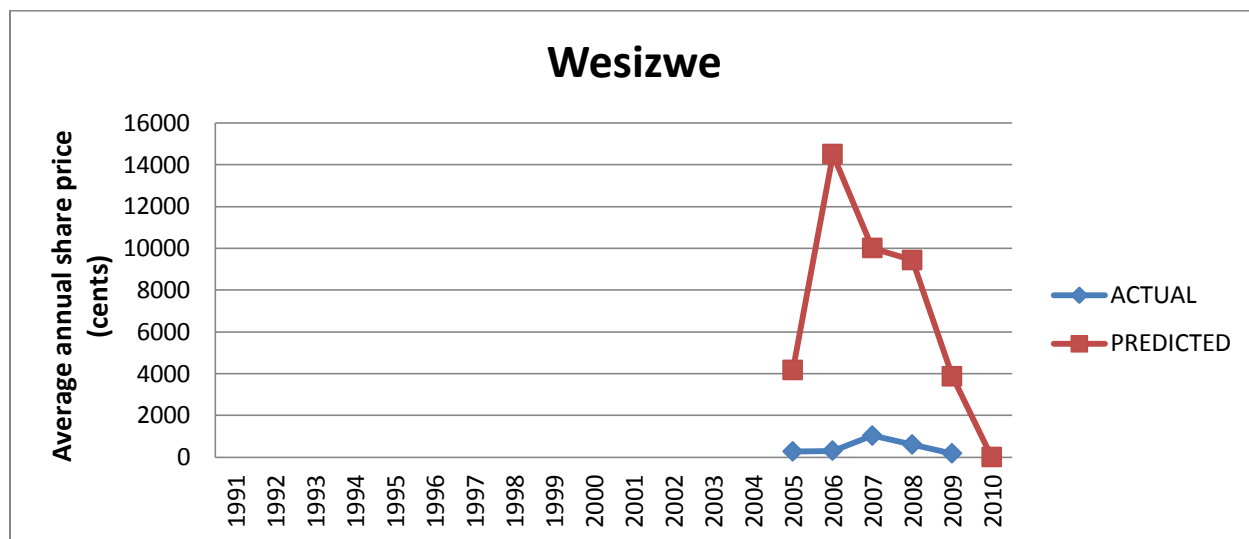


FIGURE 27: MODEL TESTING: ACTUAL VS. PREDICTED SHARE PRICES WESIZWE

Source: Own Compilation

No similarity could be found between the actual and predicted values in existing data for Wesizwe. The researcher concluded that the regression model developed cannot be justified to predict share prices.

5.4 Evaluating Individual Platinum Share's Investment Potential

5.4.1 Introduction

Since only four companies had twenty year data, the researcher decided to review the period 2005 – 2009 in order to include some of the emerging companies which possess data for this period. Six companies were identified with five year financial data, namely Amplats, Implats, Northam, Lonmin, Aquarius and Wesizwe.

The five year S.A. Government Bond rate of 8.25% (Fig.1:7) was used for this evaluation, and the stand-alone risk of each company was benchmarked against the Average JSE All Share Index (ALSI) for the same period.

5.4.2 Individual Company's Performance vs. the Selected Variables

Table 8:108 provides a summary of the performances of the six companies versus the eight identified variables, plus the average share price over the period 2005 – 2009.

Amplats had the highest average share price, namely R721.22, followed by Implats with R387.92.

The emerging companies Aquarius Platinum and Wesizwe had the highest Sales growth, namely 34.05%, which is to be expected of the growing phase in their life cycles. Amplats had the highest growth in turnover when reviewing the four stable companies, namely 19.25%.

TABLE 8: COMPARISON OF HISTORICAL PERFORMANCE ALL COMPANIES (2005 – 2009)

Variable	AMS	IMP	Lonmin	Northam	AQP	WEZ
Ave. SP	72122	38792	29549	3544	8111	8111
Std. Dev	19091	29093	16202	1739	6016	6164
CV	0.26	0.75	0.55	0.49	0.74	0.76
Sales-G	19.25	18.33	8.33	18.33	34.05	34.05
Std. Dev	31.50	31.85	41.53	31.85	56.23	55.75
CV	1.64	1.74	4.99	1.74	1.65	1.64
ROIC-G	-0.88	-0.14	-0.17	-0.14	0.60	-0.66
Std. Dev	14.40	0.56	0.52	0.56	0.96	0.51
CV	-16.33	-3.87	-3.11	-3.87	1.60	-0.77
FCF-G	18.95	1.26	0.18	1.26	-7.99	-11.68
Std. Dev	77.71	2.09	0.87	2.09	19.08	26.59
CV	4.10	1.66	4.76	1.66	-2.39	-2.28
EPS-G	66.14	1.91	1.53	1.91	1.61	27.51
Std. Dev	109.84	0.73	0.67	2.25	1.87	27.82
CV	1.66	0.38	0.44	1.18	1.16	1.01
BVPS-G	18.24	0.23	-0.13	0.23	1.72	1.71
Std. Dev	20.51	0.48	0.66	0.48	3.83	9.28
CV	1.12	2.12	-4.98	2.12	2.23	5.42
Oper. As	6214.05	1058934.83	723800.00	1058934.83	466513.83	75800.40
Std. Dev	3683.86	464240.57	279346.92	298229.01	109198.26	62231.65
CV	0.59	0.44	0.39	0.28	0.23	0.82
Intr. Val	224223250	12383685	4872500	12383685	1984031	-520603
Std. Dev	8474017.64	6120779.78	4453671.24	8978035.08	2146247.27	354933.72
CV	0.04	0.49	0.91	0.72	1.08	-0.68
MOS	0.54	-0.05	9.34	-0.05	9.98	5.13
Std. Dev	0.64	0.40	6.01	0.40	8.46	2.09
CV	1.20	-7.95	0.64	-7.95	0.85	0.41
AMS = AMPLATS IMP = IMPLATS Lonmin = LONMIN Northam = NORTHAM AQP = AQUARIUS WEZ = WESIZWE Ave. SP = Average share price Sales-G = Sales-growth Intr. Val = Intrinsic Value EPS-G = Earnings per share growth BVPS-G = Book Value per Share growth MOS = Margin of Safety ROIC-G = Return on Invested Capital Growth						

Source: Own Compilation

The period under review faced the global recession in 2008/9 and this fact is reflected in the poor growth in ROIC of all companies. Only Aquarius managed to have a scanty positive growth of 0.6%.

Amplats had the highest Free Cash Flow growth (18.95%). The emerging companies Aquarius and Wesizwe both had negative growths, since their capital is tied up in future projects and investments.

Headline Earnings per Share grew the most in Amplats (66.14%), followed by Wesizwe with 27.51%.

Amplats took the crown again with Book Value per Share growth (18.24%), followed by Aquarius and Wesizwe with 1.7%

Implats and Northam had the same Operating Assets, but Amplats took the last position. This correlates with the high FCF-growth and BVPS-growth, implying that Amplats was not tied heavily in long-term projects during this period.

The Intrinsic Value is unique to every company.

Aquarius and Northam had the highest Margins of Safety, implying that the shares are trading at a price different to their intrinsic values and, therefore, pose as investment opportunities.

5.4.2.1 Amplats

Amplats had an average Share Price of R721.22 over the period studied, with a standard deviation of R190.91 and a coefficient of variation of 0.26. The company experienced an average sales growth of 19.25%. The negative ROIC-growth of -0.88 is disappointing, signalling lack of investment in long-term projects. This also reflects in the 18.95% growth in Free Cash Flow. Earnings per Share grew by 66.14% (again demonstrating limited long-term projects), but Book Value per Share increased by 18.24% on average. It can be deduced, therefore that Amplats's Fixed Assets were increased during the study period.

5.4.2.2 Implats

The average Share Price of Implats over the study period was R387.92. Sales Growth of 18.33% was maintained. Growth in ROIC was negative, namely -0.14%. Free Cash Flow increased by 1.26%, and Earnings per Share by 1.91%. It appears that Implats maintained the status quo. Even the modest increase in Book Value per Share by 0.23% signals survival attitude.

5.4.2.3 Lonmin

Lonmin disappointed with a sales growth of only 8.33% over the period studied – the worse performance of all the companies under scrutiny. Lonmin's share price was R295.49 on average. The company had negative growths in ROIC (-0.17%) and Book Value per Share (-0.13%). Free Cash Flow was just lifted from the ground. Despite these negative trends, it had a Margin of Safety of 9.34, implying an investment opportunity.

5.4.2.4 Northam Platinum

Northam Platinum had an average share price of R35.44 over the period studied, with a standard deviation of R17.39. It maintained an average 18.33% growth in turnover and a 1.91% growth in Earnings per Share. Northam's Free Cash Flow increased modestly with 1.26%, but ROIC growth declined marginally. This company is trading close to its Intrinsic Value, with a Margin of Safety of -0.05.

5.4.2.5 Aquarius Platinum

Of the two emerging platinum producing companies, Aquarius Platinum compares well with Wesizwe. Both had the same average share price, namely R81.11, as well as the same average growth in turnover, namely 34.05% on average over the study period. Even the Book Value per Share growth was very similar (1.72% vs. 1.71%). The similarities end here, however. Aquarius had a growth in ROIC of 0.60 and EPS growth of 1.61. Free Cash Flow growth declined to -0.79%, which is to be expected as a result of the company converting from exploration to production. Aquarius Margin of Safety was 9.98.

5.4.2.6 Wesizwe

Wesizwe was more heavily involved in long-term projects than Aquarius, with a Free Cash Flow growth of -11.68%, but despite this, the company impressed with its Earnings per Share increase of 27.51%. It had remarkably less Operating Assets than Aquarius Platinum, and had a negative Intrinsic Value. The situation calls for careful consideration before investing. The Margin of Safety of Wesizwe was 5.13.

5.5 Benchmarking the Companies

As mentioned in Chapter One, Section 1:2, the Capital Asset Pricing Model (CAPM) measures market risk, using a single parameter, called an asset's beta (β), to illustrate the vulnerability of an asset's returns (r), in comparison with the return of the industry or overall market. Beta takes into account both the time value of money in the form of a risk-free rate (r_f), such as government bonds, as well as the market risk premium (r_m), which is the difference between the returns of the market and the risk-free rate. It can be depicted by the following formula:

$$r = r_f + \beta (r_m - r_f) \quad (1.1)$$

The beta of the overall market is arbitrarily chosen to equal 1, and since government bonds are perceived to carry no default risk, the beta value is represented by 0. The risk-free rate is determined by calculating the average returns on government bonds over a specified period – in this case, the five year government bond yield of 8.25% was used. An asset's beta can be graphically plotted against the Security Market Line (SML), representing the line connecting the risk free rate of return and the overall market's return, (which in this study is the average All Share Index of the JSE).

Theoretically, a beta higher than one implies more risk than the overall market, but also possibly a rate of return higher than the market, whereas a beta smaller than one implies the opposite. The Platinum Sector of the JSE has an industry beta of 0.90.

To determine the beta of every company, the capital gains of each company in percentage is compared to the capital gains of the JSE Limited over the period 2006 – 2010 (Table 12:134). These results are plotted on a graph, a trend-line is added and the slope of the trend-line is determined by dividing the change in the y- axis ($y_2 - y_1$) by the change in the x- axis ($x_2 - x_1$) (Figure 28:112). This slope represents beta.

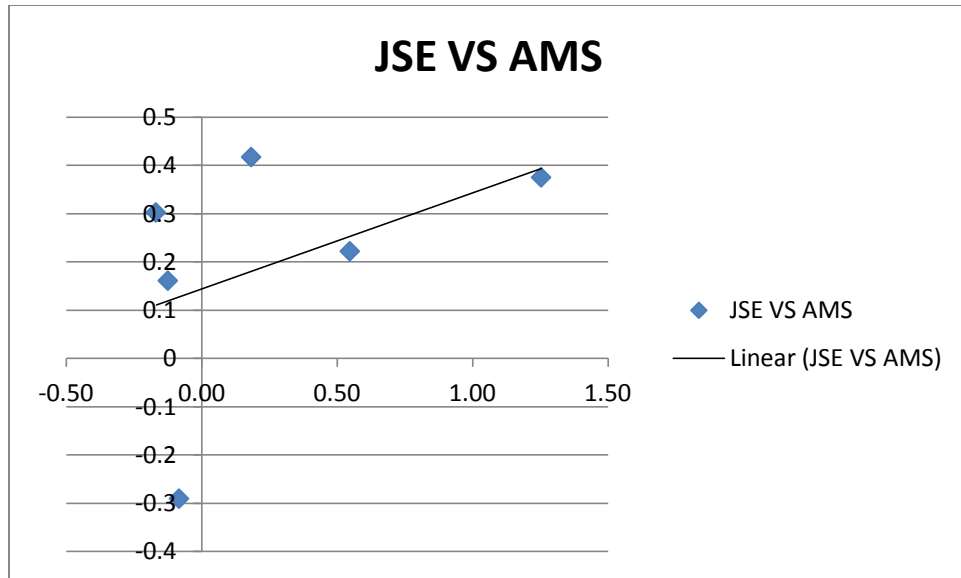


FIGURE 28: CAPITAL GAINS JSE VS CAPITAL GAINS AMPLATS: DETERMINING BETA

Source: Own Compilation

Beta can also be determined by calculating the quotient of the covariance of the returns of the asset with the market and the asset's (or portfolio's) return. Beta is usually determined over a 60 month period, but may be calculated over shorter or longer periods, leading to different values. In Section 3.3 the beta's of the different companies were quoted as derived by Bloomberg.com and the values vary from the calculated values in Table 9:113.

The SML graphs of the five remaining companies are depicted in the Appendices, Figures 36 – 39:133 – 135.

TABLE 9: DETERMINING THE BETA'S OF THE COMPANIES

Year	JSE CG	AMS CG	IMP CG	LON CG	NHM CG	AQP CG	WEZ CG
2010	0.16	-0.12	0.3	0.01	0.26	-0.03	-0.55
2009	0.30	-0.17	-0.38	-0.67	-0.38	-0.69	-0.62
2008	-0.29	-0.08	-0.62	0.02	0.11	-0.26	0.35
2007	0.22	0.55	0.29	0.73	1.25	1.65	2.23
2006	0.38	1.25	0.79	1.07	1.42	1.24	0.09
Average	0.20	0.29	0.04	0.23	0.53	0.38	0.29
	Cov	0.0651	0.0830	0.0455	0.0592	0.0803	-0.1932
	Var	0.0684	0.0684	0.0911	0.0683	0.0684	0.06835
	Beta	1.39	1.78	0.57	0.87	1.72	-0.41
JSE CG = JSE Capital Gains AMS CG = Amplats Capital Gains IMP CG = Implats Capital Gains LON CG = Lonmin Capital Gains NHM CG = Northam Capital Gains AQP CG = Aquarius Capital Gains WEZ CG = Wesizwe Capital Gains Cov = Covariance Var = Variance Beta = Beta							

Source:BFA Mc Gregor & Own Compilation

By using the formula:

$$r = r_f + \beta (r_m - r_f) \quad (1.1)$$

and substituting β with the beta's of the different companies in the equation, and using 8.25% as the risk-free (r_f) value, the expected return of the different companies can be determined (Table 10:115). The expected return of the overall market ($E(R_m)$) of 14.2% is derived as follows:

$$\begin{aligned}
 E(R_m) &= r^0 + IP + LP + MRP + DRP \quad (\%) \\
 &= 3.5 + 5.3 + 0.5 + 4 + 0.9 = 14.2\%
 \end{aligned}
 \quad (5.1)$$

Where:

$E(R_m)$ = Expected Return of the Market,

r^0 = real rate of return,

IP = Inflation premium,

LP = Liquidity premium,

MRP = Maturity risk premium; and

DRP = Default risk premium

The real rate of return of the market without inflation varies usually between 3 and 4%, hence the average of 3.5% used in equation 5.1.

Inflation in July 2011 was 5.3% officially, according to statssa.gov.za (2011).

McCulloch (1975:116) demonstrated that the liquidity premium is a reality, with a value exceeding zero. This premium represents the difference between a future interest rate and the market's anticipation of that rate. A value of 0.5% was chosen as a result of the global economic uncertainty still prevailing in 2011 after the recession of 2008/2009.

Luüs (2005:1) calculated the maturity risk premium based on the Gordon Dividend Model, to be between 3 and 5% in South Africa. An average of 4% has been applied in this dissertation. The market risk premium represents the difference between the risk free rate of a government bond and the expected return of the market, and is rounded off to 6% (expected return of the market = 14.2% minus risk-free bond rate of 8.25% equals 5.95%).

The Default Risk Premium was set as 0.9%, due to the post-recession economic stagnation and 25% official unemployment rate in South Africa (statssa.gov.za:2011). Grandes and Peter (2006:42) found in an empirical study that the default risk premium for ABSA bank was 0.96%; African Bank 0.92%; Standard Bank 0.89% and Investec Bank 0.78%. This was averaged at 0.88% and rounded to 0.9%.

TABLE 10: EXPECTED RETURN OF THE COMPANIES

$E(R_i) = R_f + \beta[E(R_m) - R_f]$								
	AMS	IMP	LON	NHM	AQP	WEZ	JSE	Bond
Beta	1.39	1.78	0.57	0.87	1.72	-0.41	1	0
R_f	8.25	8.25	8.25	8.25	8.25	8.25		
E(R_m)	14.2	14.2	14.2	14.2	14.2	14.2	14.2	
E(R_i)	16.59	18.93	11.67	13.47	18.57	5.79	14.2	8.25
AVG Historical Return	27	-3.39	23.77	41.65	38.38	28.66		

Source: Own Compilation

The Security Market Line is drawn to connect the risk-free return (8.25%) of government bonds with a beta of zero, with the 14.2% return of the market, which have a beta of 1. The different companies are successively plotted, by using their respective beta's as the x-values, and their expected returns as the y-values.

When plotting the different companies as described above, it can be determined whether the expected returns of the company are above, on, or below the Security Market Line. A company, whose returns are above the line, is undervalued by the market, and vice versa. Such a company would be bought eagerly by the market, forcing a decline in price until market equilibrium has been reached and the share trades on the Security Market Line.

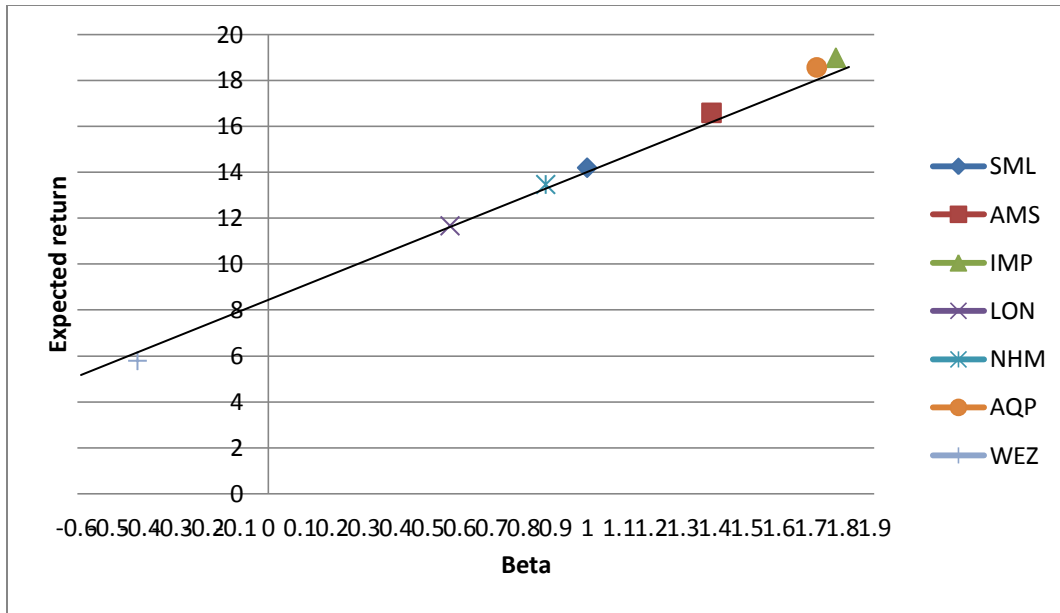


FIGURE 29: SECURITY MARKET LINE

SML = SECURITY MARKET LINE

AMS = ANGLO PLATINUM

IMP = IMPALA PLATINUM

LON = LONMIN

NHM = NORTHAM

AQP = AQUARIUS PLATINUM

WEZ = WESIZWE

Source: Own Compilation

Figure 29:116 illustrates clearly that Impala Platinum is underpriced and offers the best investment opportunity, followed by Aquarius Platinum. Amplats is also underpriced, but lie closer to the Security Market Line.

Northam is mildly overpriced, lying just below the SML. Lonmin is also moderately overpriced, but Wesizwe has a negative beta, moving in an opposite direction to the market, and is highly overpriced with expected returns of 5.79% versus the expected market returns of 14.2%.

Chapter 6: Conclusions and Recommendations

6.1 Introduction

“Nothing is a waste of time if you use the experience wisely” – Auguste Rudin

6.2 Conclusions

The Platinum Sector of the JSE is an attractive sector for the investor, offering ostensibly promising returns, despite being notorious for its volatility.

Demand for platinum is increasing due to a surge in environmental legislation worldwide, necessitating the use in catalytic automobile converters. Industrial demand is also increasing, especially in electronic devices such as laptops and liquid crystal displays. The jewellery requirements from Japan and China further support the demand for platinum.

The Igneous Bushveld Complex in North West, South Africa, is home to almost 87% of the world's platinum group metal reserves, with Russia contributing 8.3% from the Norlisk mine in Siberia, and the United States' Still Water Mining Company in Montana accounting for approximately 2.5%, being mainly a palladium producer. Geologists estimate that the Bushveld Complex will be able to fulfil demand globally for several decades, if not a century, due to the richness of deposits. Currently only approximately 5 million ounces are extracted annually from the Merensky and UG2 reefs, which host a concentration of 350 million ounces per one kilometer depth (Cawthorn, 2010:1).

It can, therefore, be concluded that the Platinum Sector of the JSE is apparently a shining star. May an investor thus randomly pick shares blindly from this sector and trust that it will result in high returns?

This study aimed to answer this question, as well as to smooth out volatility. By selecting eight variables, an empirical study was done to ascertain “safe” investing. The eight variables were:

- Sales Growth,
- Headline Earnings per Share Growth,
- Growth in Free Cash Flow,
- Growth in Book Value per Share,
- Growth in Return on Invested Capital,
- Intrinsic Value,
- Margin of Safety; and
- Net Operating Assets.

A regression framework was developed and tested against the sector annually. The framework correlated significantly with the average share prices in only four of the twenty years ($p < 0.1$).

It can be concluded that no overall reliable value-based investment selection framework could be developed for the Platinum Sector by using these eight variables. All companies revealed individual variations in model fit. Amplats, Implats and Lonmin had good fit during the first decade studied, but Aquarius Platinum was the only company that demonstrated a similar overall pattern between the actual and predicted graphs.

Each company's stand-alone risk was evaluated. It appears that Implats is the most underpriced and offers the best investment opportunity. Amplats and Aquarius are also underpriced, but Northam, and Lonmin are overpriced. Wesizwe moves opposite to the market, being a novice in production, but is highly overpriced.

The main constraint during the study was the lack of data for most of the emerging companies. Aquarius Platinum seems to be the most promising emerging company, based on its performance using the eight variables.

6.3 Recommendations

Since this sector seems to be very attractive for the investor, further studies are recommended using different variables. Lack of data for the emerging companies may however pose as a constraint in studies undertaken in the near future.

Separate studies should be done on stable and emerging companies, because these would probably be more reliable. Results from different economies are not equivalent and non-universal.

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Appendices

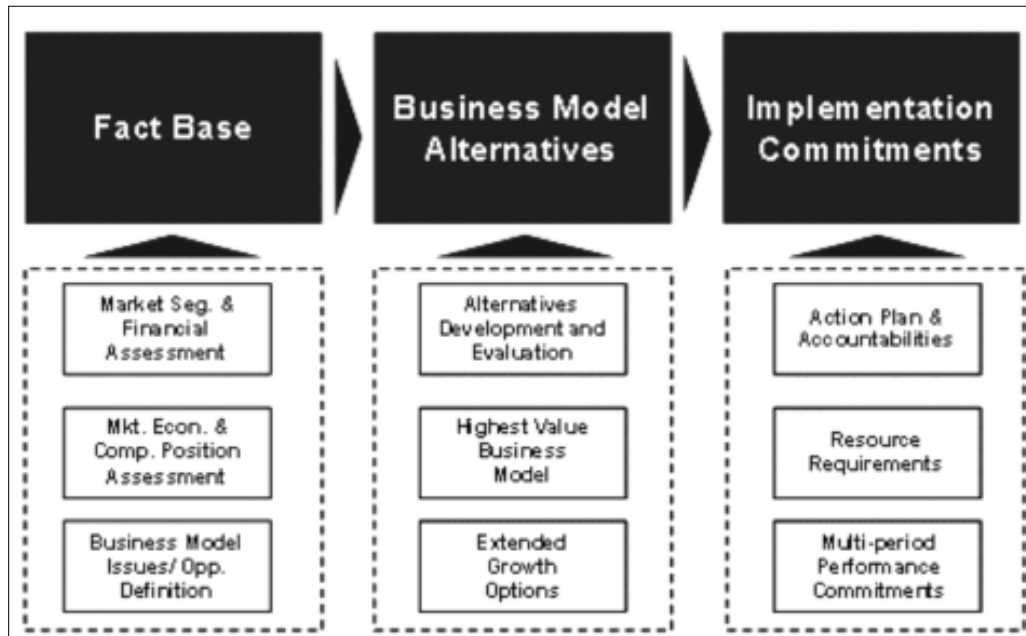


FIGURE 30:VBM: THREE FUNDAMENTAL STEPS

Source: Van Wyk & Smith: Third International Platinum Conference, 2008:316

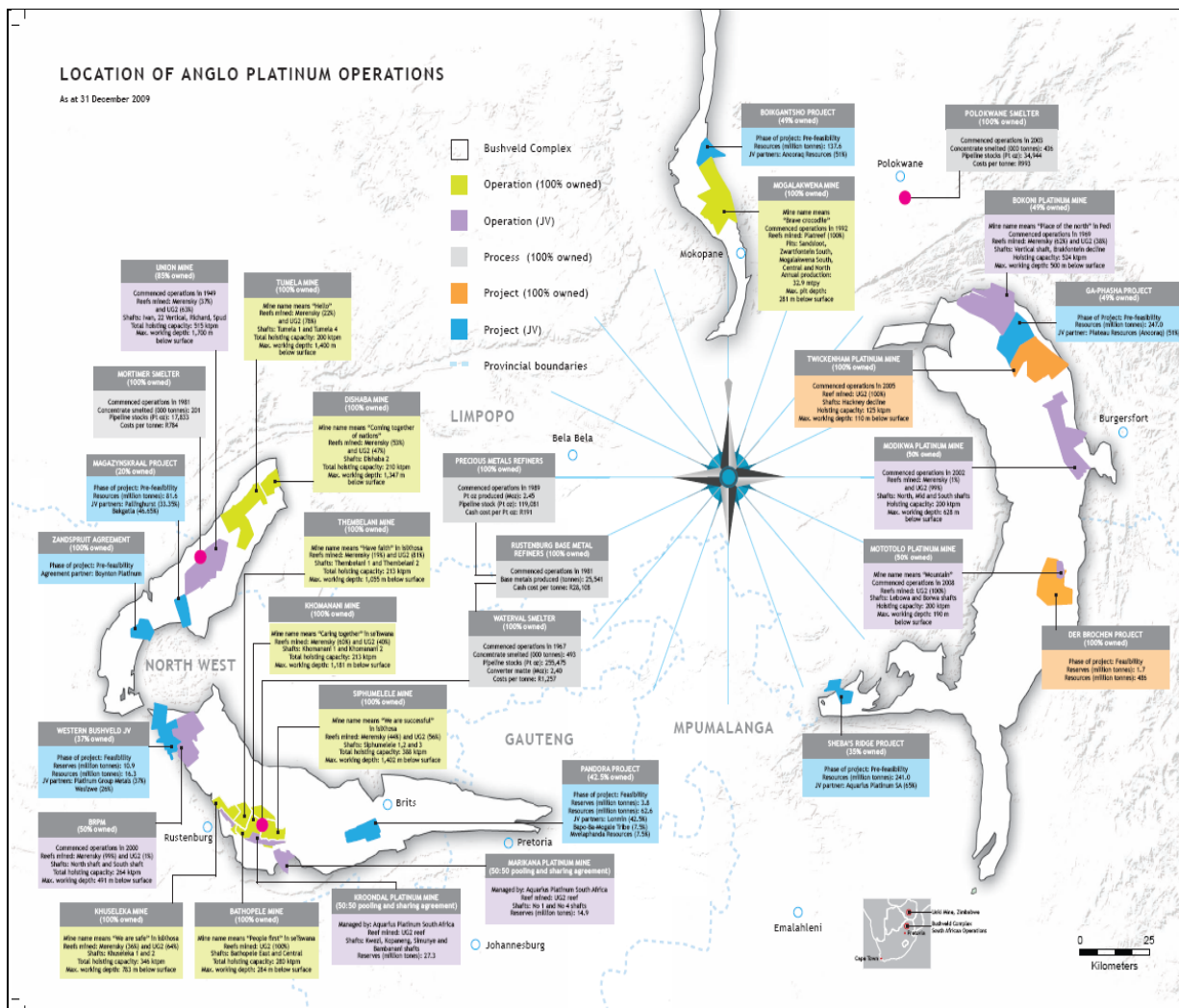


FIGURE 31: LOCATION OF ANGLO PLATINUM OPERATIONS

Source: Anglo Platinum, 2010.

http://www.angloplatinum.com/pdf/2010/anglo_platinum_location_map.pdf

[Accessed 10 April 2011]

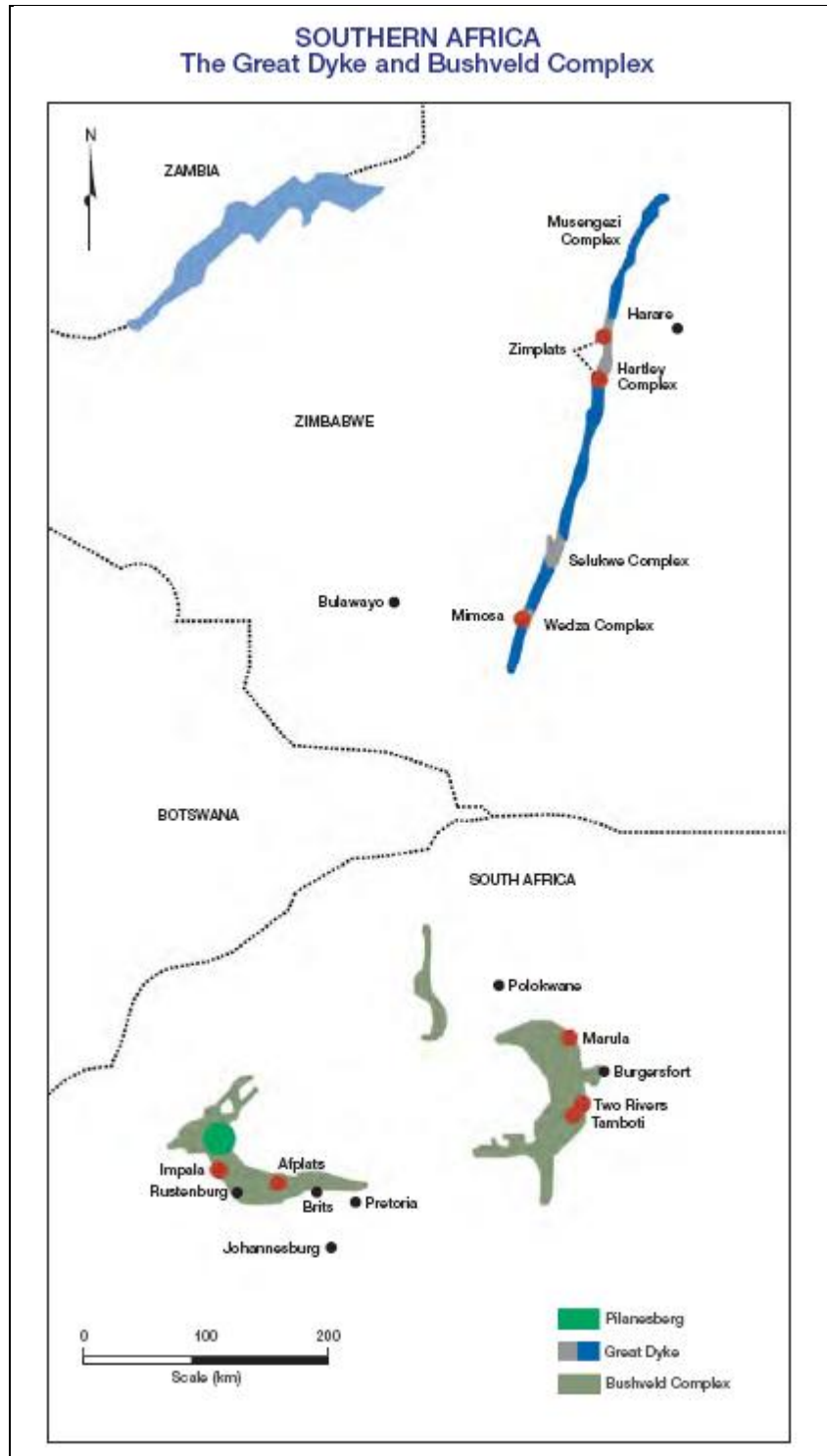


FIGURE 32: GEOLOGICAL OPERATIONAL ACTIVITIES OF IMPALA PLATINUM LIMITED

.Source: Implats – Mineral Resource and Mineral Reserve Statement 2010.

Anooraq | Mines and Projects Location

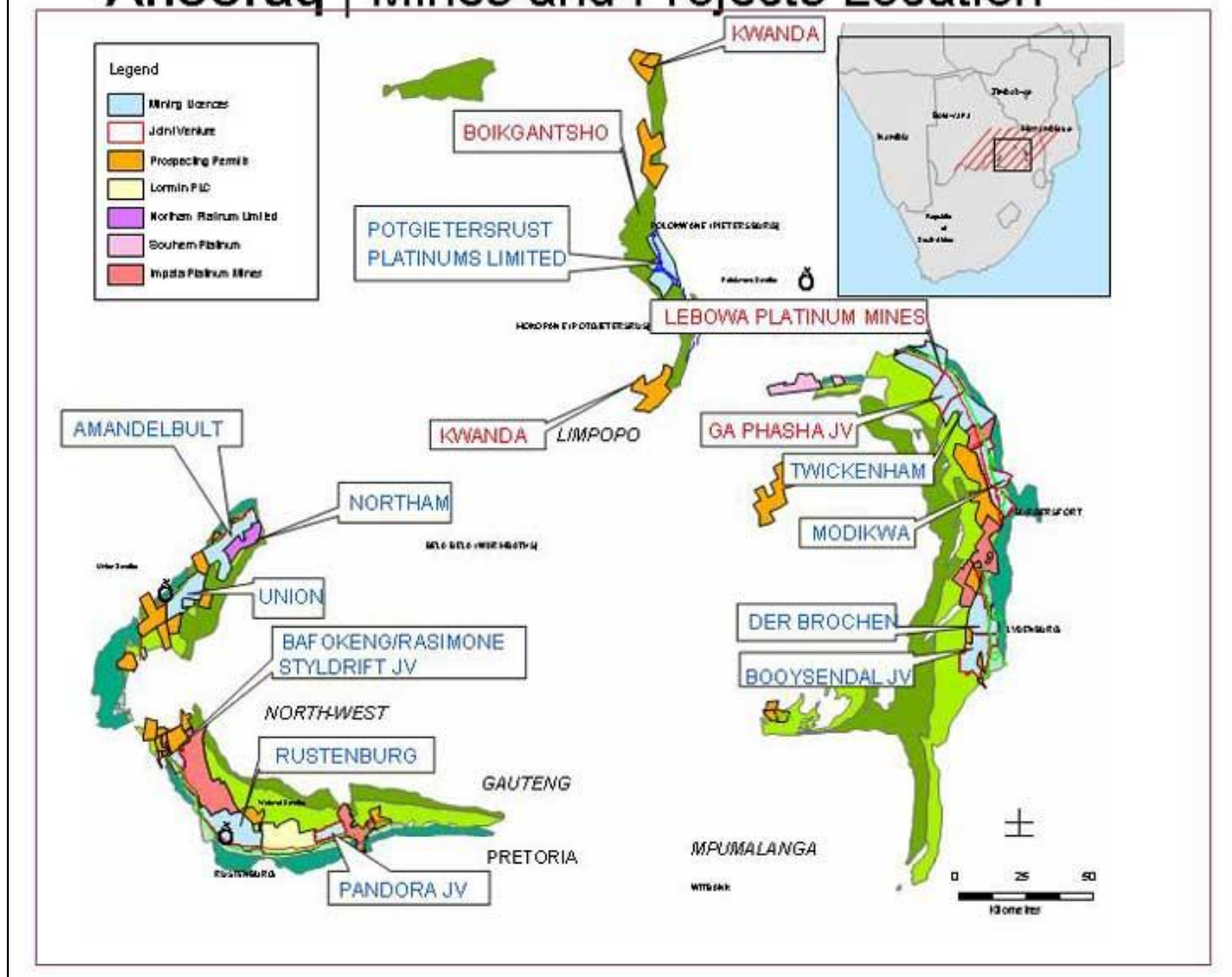


FIGURE 33: ANOORAQ MINES AND PROJECTS LOCATION

Source: www.anooragresources.co.za

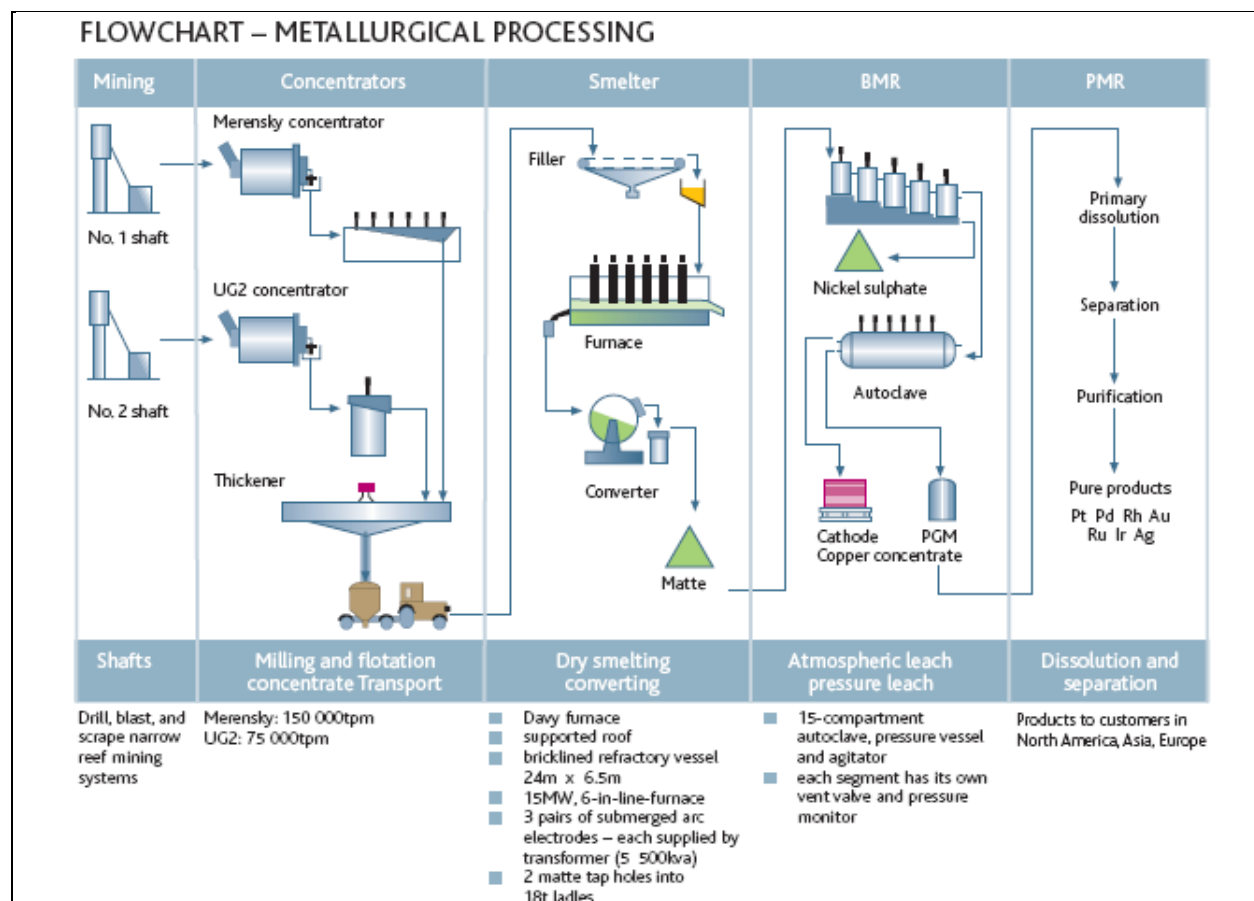


FIGURE 34: NORTHAM PLATINUM'S FLOWCHART FOR METALLURGICAL PROCESSING

Source: Northam Platinum Limited – Technical Overview.pdf

<http://www.northam.co.za> Accessed 14 April 2011.

TABLE 11: MODEL TESTING ALL COMPANIES

	AMPLATS		IMPLATS		LONMIN		NORTHAM		AQUARIUS		ANOORAQ		EASTPLATS		JUBILEE		WESIZWE	
	ACTUAL	PREDICTED	ACTUAL	PREDICTED	ACTUAL	PREDICTED	ACTUAL	PREDICTED	ACTUAL	PREDICTED	ACTUAL	PREDICTED	ACTUAL	PREDICTED	ACTUAL	PREDICTED	ACTUAL	PREDICTED
1991	7048	4808	6193	4186	1377	870	2229	3579										
1992	6956	10891	4883	4204	730	3274	2274	2211										
1993	7115	4931	4741	4383	646	1382	1648	791										
1994	7629	11348	6194	4258	982	1800	733	1449										
1995	9877	13760	9035	7087	941	1226	503	1654										
1996	7512	4119	7818	3958	1218	464	366	3216										
1997	7020	4714	5252	4665	997	616	246	120										
1998	7694	2139	5099	2174	1214	683	222	1835										
1999	12362	2204	10076	2001	4537	3871	390	1839										
2000	19244	7099	21964	7110	7036	6911	690	7133										
2001	33034	5075	32859	4617	10820	8946	1294	4427										
2002	39699	6575	49734	6539	16826	15433	1475	6170										
2003	27472	48615	51177	40363	10880	10339	1658	6811										
2004	25156	12836	53427	13304	12327	16021	1085	12591										
2005	29774	3886	51646	3844	12871	4246	910	3853	2988	75659							269	3883
2006	67132	19131	92434	19055	26619	15032	2200	19268	6707	-1164134	1190	-3588180					308	19113
2007	103917	10520	26758	10492	46022	9618	4954	10548	17801	-452476	1986	-1653157	1696	-175087	1649	-147983	1026	-143591
2008	95307	10848	26592	10727	46722	9200	5491	10747	13138	-1516965	1914	-3644437	1430	-521808	1217	-387155	601	-327896
2009			16548	3920	15513	3601	3406	3918	4071	-52050	641	-62978	435	-6613	333	-3227	178	-1551
2010			18771	1175			4300	1184	3958	164667		151663		1160	429	1160		

Source: Own compilation

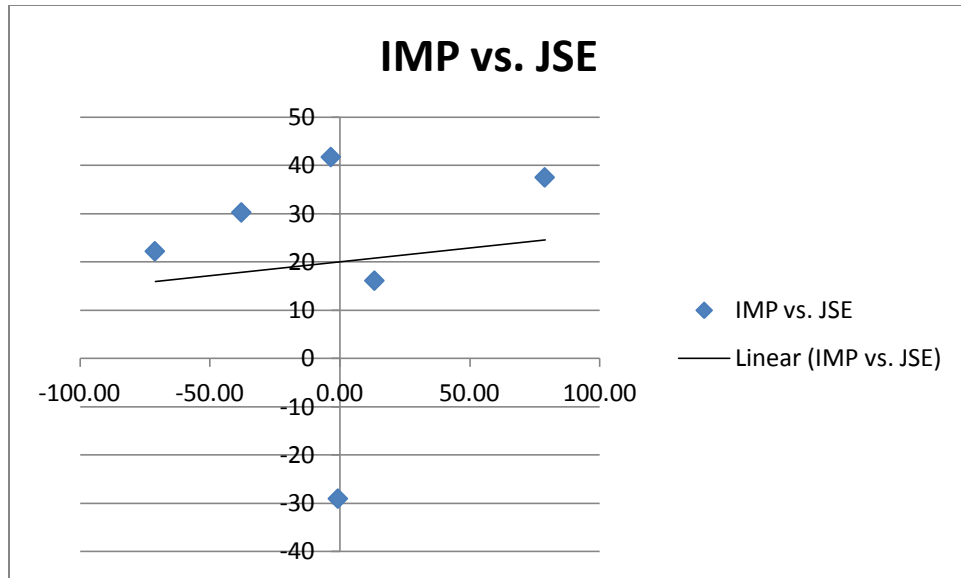


FIGURE 35: CAPITAL GAINS JSE VS IMPLATS: DETERMINING BETA

Source: Own compilation

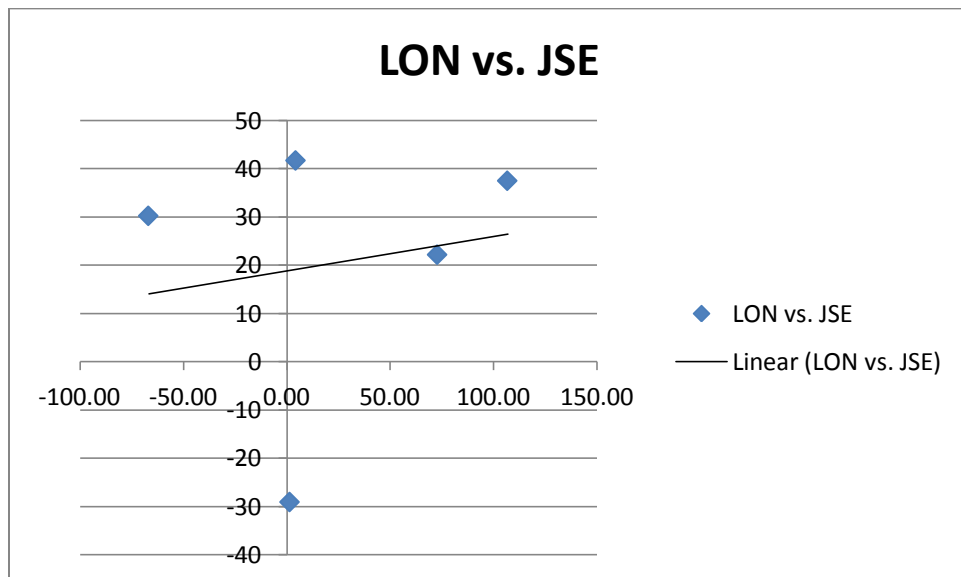


FIGURE 36: CAPITAL GAINS JSE VS. LONMIN: DETERMINING BETA

Source: Own compilation

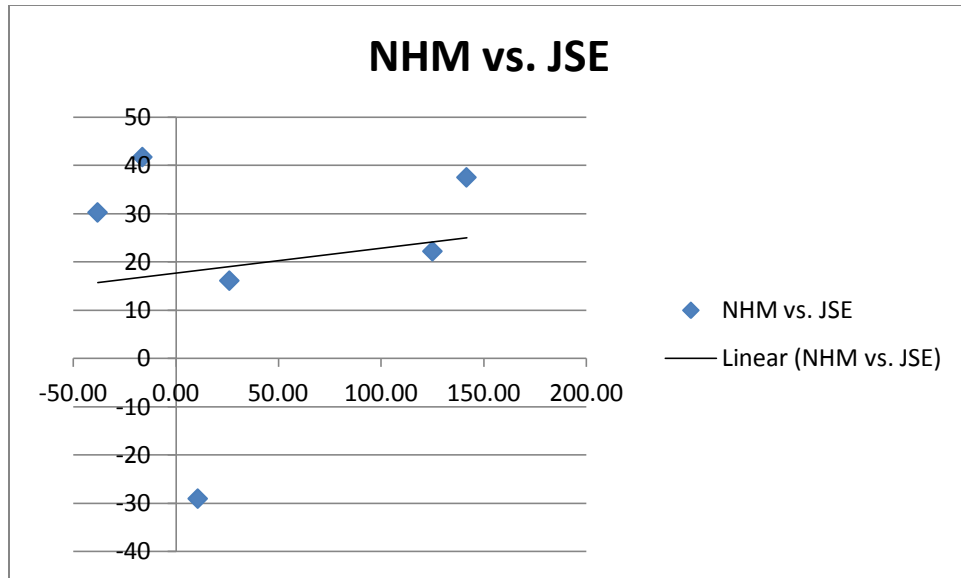


FIGURE 37: CAPITAL GAINS JSE VS. NORTHAM: DETERMINING BETA

Source: Own compilation

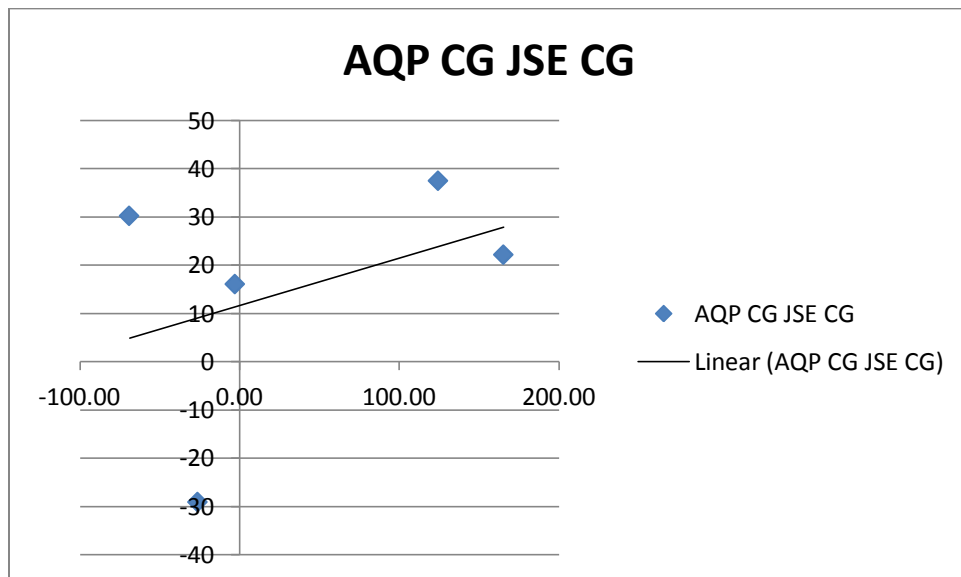


FIGURE 38: CAPITAL GAINS JSE VS. AQUARIUS PLATINUM: DETERMINING BETA

Source: Own compilation

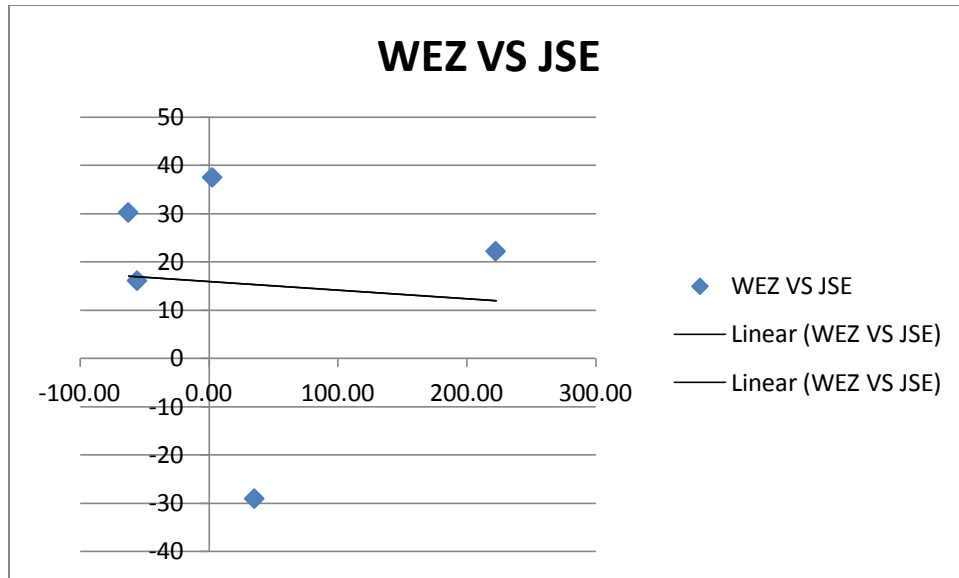


FIGURE 39:CAPITAL GAINS JSE VS. WESIZWE: DETERMINING BETA

Source: Own compilation

TABLE 12: JSE ALL SHARE INDEX & CAPITAL GAINS

JSE CLOSE					
Date	CRI AGV Close	Capital gains	CLOSE	Capital gains	
31-Dec-10	31745.57	16.12%	32118.89	16.09%	
31-Dec-09	27337.8	30.26%	27666.45	28.63%	
31-Dec-08	20987.64	-29.06%	21509.2	-25.72%	
31-Dec-07	29585.66	22.21%	28957.97	16.23%	
29-Dec-06	24209.27	37.53%	24915.2	37.68%	
30-Dec-05	17602.39	41.74%	18096.54	42.98%	
31-Dec-04	12418.54	24.19%	12656.86	21.85%	
31-Dec-03	9999.9	6.91%	10387.22	11.96%	
31-Dec-02	9353.6	-7.94%	9277.22	-11.28%	
31-Dec-01	10160.74	26.53%	10456.47	28.08%	
29-Dec-00	8030.24	0.71%	8164.29	-2.31%	
29-Dec-99	7973.6	63.23%	8357.19	66.62%	
31-Dec-98	4884.77	-9.82%	5015.72	-8.23%	
31-Dec-97	5416.93	-9.49%	5465.6	-8.84%	
31-Dec-96	5985.22		5995.82		
Average 1997-2010		15.22%		15.27%	

Source: Own compilation