A COMPARATIVE ANALYSIS OF ECONOMIC VALUE CREATED BY SOUTH AFRICAN MINING COMPANIES IN A GROWING PLATINUM INDUSTRY

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ABSTRACT

Global supply and demand for platinum benefited from favourable local and global economic environments over the past decade, and presented unique growth opportunities for platinum mining companies. Companies operating in a growing industry, such as platinum during the past decade, are expected to deliver superior returns, and to create economic value for shareholders. With markets becoming more globalized, deregulated, and liquid, investors move their capital to where they believe it will be most productively employed, and companies therefore need to demonstrate their ability to meet increasing shareholder demands for growth and economic value added.

Economic Value Added (EVA®), as a measure of company performance, has been widely adopted by companies and securities analysts globally but its use in South African platinum mining companies has been limited to date. In order to address this gap through this research, EVA® was calculated for the three primary South African platinum mining companies, Anglo Platinum, Implats, and Lonmin. EVA® for the respective companies was then compared to company growth rates, share price performance, and alternative, conventional performance metrics.

Through analysis it was found that, although the respective platinum mining companies experienced similar production and turnover growth rates during the review period, 2000 to 2006, Anglo Platinum was able to generate higher EVA® than Implats and Lonmin respectively. Share price has been found to correlate well with EVA® for both Anglo Platinum and Implats respectively, but this relationship was not statistically significant for Lonmin, and EPS was the only metric among the alternative performance metrics, EPS, P/E, ROA, and EBITDA, found to have a correlation with EVA® for Anglo Platinum and Implats respectively. The correlation between the other metrics and EVA® was found not to be statistically significant.

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DECLARATION

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science. University of Pretoria. It has not been submitted before for any degree or examination in any other University.

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

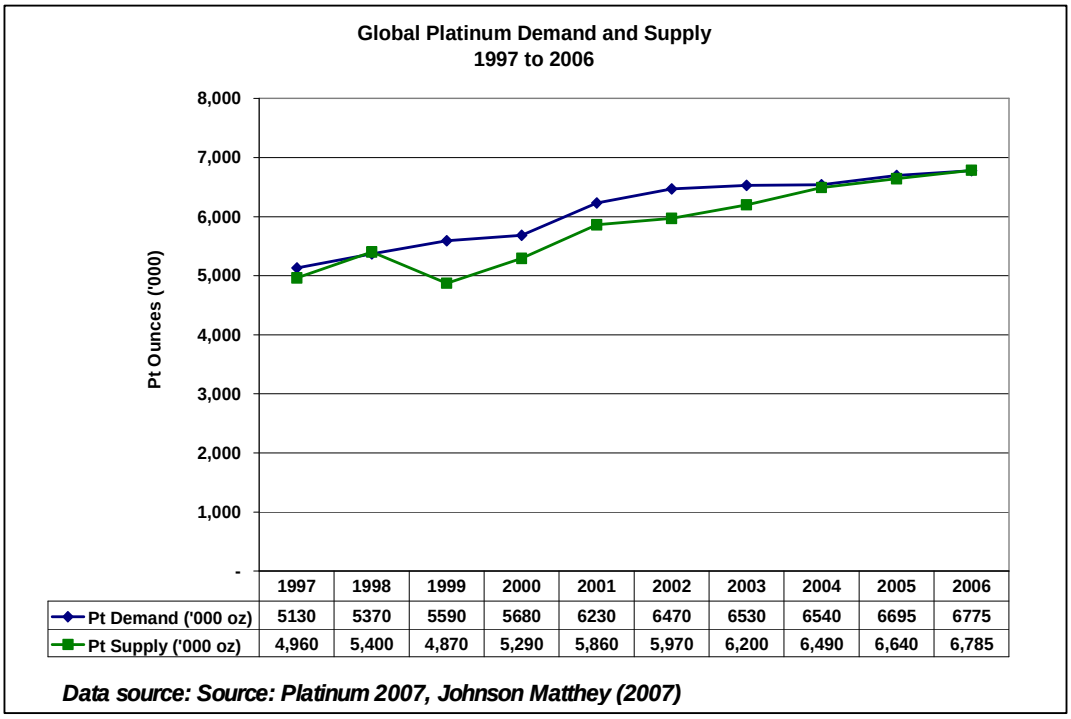
CHAPTER 1 - INTRODUCTION

1.1 Overview

Global platinum demand has increased steadily over the past ten years, rising from 5.13 million ounces in 1997 to 6.8 million ounces in 2006, primarily driven by growth in auto-catalyst applications as the largest consumer of platinum group metals.

Global platinum supply has also increased steadily over the same period, growing from 5.0 million ounces in 1997 to 6.8 million ounces in 2006. Although this 37% increase in supply was larger than the 32% demand growth over the same period, it was only during the last three years that the supply managed to catch up with demand as is illustrated in figure 1.

Figure 1: Global Platinum demand and supply from 1997 to 2006

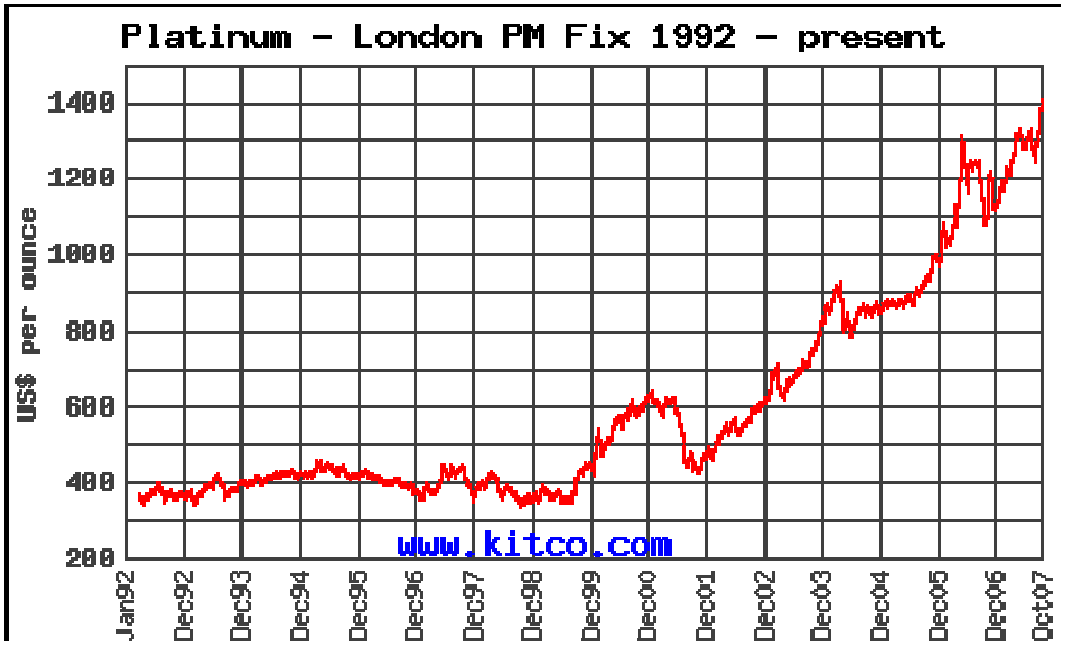


	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Pt Demand ('000 oz)	5130	5370	5590	5680	6230	6470	6530	6540	6695	6775
Pt Supply ('000 oz)	4,960	5,400	4,870	5,290	5,860	5,970	6,200	6,490	6,640	6,785

Data source: Source: Platinum 2007, Johnson Matthey (2007)

The continuing robust demand for platinum, combined with the supply that has just been able to keep up during the past ten years, resulted in the platinum metal price increasing steadily over the past ten years from approximately US$396 per ounce during 1997 to $1,143 per ounce at the end of 2006 as presented in figure 2. With both the demand and price trends continuing into 2007, the platinum price recently increased to over $1,400 per ounce during October 2007 (Kitco, 2007).

Figure 2: Historical Platinum metal prices from 1992 to 2007



Source: Kitco. 2007

South Africa is the largest producer of platinum group metals in the world, producing approximately 78% of global platinum, 36% of world palladium, and 84% of world rhodium supply (Johnson Matthey, 2007).

The three largest South African producers, Anglo Platinum, Impala Platinum and Lonmin, produce more than 85% of South Africa's supply, and the top five

producers, including Northam Platinum and Aquarius Platinum, account for more than 95% of the South African production.

Apart from some smaller producers entering the market almost all of the major producers have been expanding their operations over the past years in an attempt to meet the rising demand and to reduce the existing deficit (Johnson Matthey, 2006).

1.2 Motivation for Research

If the growing platinum market, the stronger platinum price, and the industry structure as discussed above are taken into account, it can be expected that South African platinum mining companies should be able to benefit from this situation and should be able to add / create significant value for shareholders.

However, comparison between the share price performance of selected companies as presented in table 1, and analyst reports on the respective platinum mining companies (Shepherd, 2006), suggests that different companies had varying degrees of success between 2001 and 2006.

Table 1: Share price performance for SA platinum mining companies

Company	Growth in share price (2001 – 2006)	Average annual growth in share price (2001 – 2006)
Anglo Platinum	100%	17%
Implats	164%	27%
Lonmin	262%	44%
Northam Platinum	105%	18%

Data source: McGregor BFA, 2007

Share price performance however, depends on the market, which is only the aggregate opinions of thousands of investors and analysts, who might be overlooking sources of future growth and revenues and is not necessarily an accurate indication of the true value of a company (Ballow, Burgman, and Molnar, 2004). Firer, Ross, Westerfield, and Jordan (2004) indicated that many investors react only on the share price performance and do not consider the economic value added by the company, which is one of the best known approaches to do performance evaluations.

While share price is an important parameter for companies to monitor and manage it is also important for companies to understand and monitor their true economic performance. Recent trends identify that non-financial considerations are playing an increasingly important role in the valuation of a company and its stock, specifically in terms of the perceived future potential (Ernst & Young, 2000).

One method to determine this true economic performance is Economic value added (EVA®) that is promoted as a measure of a company's real profitability. EVA proponents claim that it is the only measure that ties directly to a stock's intrinsic value (Worthington and West, 1999).

According to Taub (2003) EVA is a practical method of estimating the economic profit that is earned, as opposed to the accounting profit. This way of looking at financials enables companies to truly understand if they are profitable because they manage assets well or simply because they are owners of profitable assets.

Young and O'Byrne (2000) mentioned that investors will move their capital to where they believe it will be most productively employed, and they therefore don't just consider commercial performance, but also consider a company's competitiveness in capital markets.

1.3 Research Aim

When a company is operating in a growing industry, shareholders and stakeholders expect it to deliver superior returns and to create value.

The aim of this research is to calculate and compare the economic value added (EVA) for the respective South African platinum mining companies over the past ten years, and to determine if all the companies were able to add / create similar economic value in a growing industry.

The aim is also to determine if the share price performance of the respective companies over the past ten years is a true reflection of the economic value added by the respective mining companies over the same period.

CHAPTER 2 - LITERATURE REVIEW

The literature review starts off with an overview of the South African and global economic environments and also a review of the Platinum mining industry in order to gain a better understanding of the structure and specific trends over the past ten years.

The chapter concludes by discussing the academic literature relating to share holder expectations, available performance measures, and specifically focuses on economic value added as the preferred performance measure for economic performance and value added by companies for shareholders and stakeholders.

2.1 Global Economy

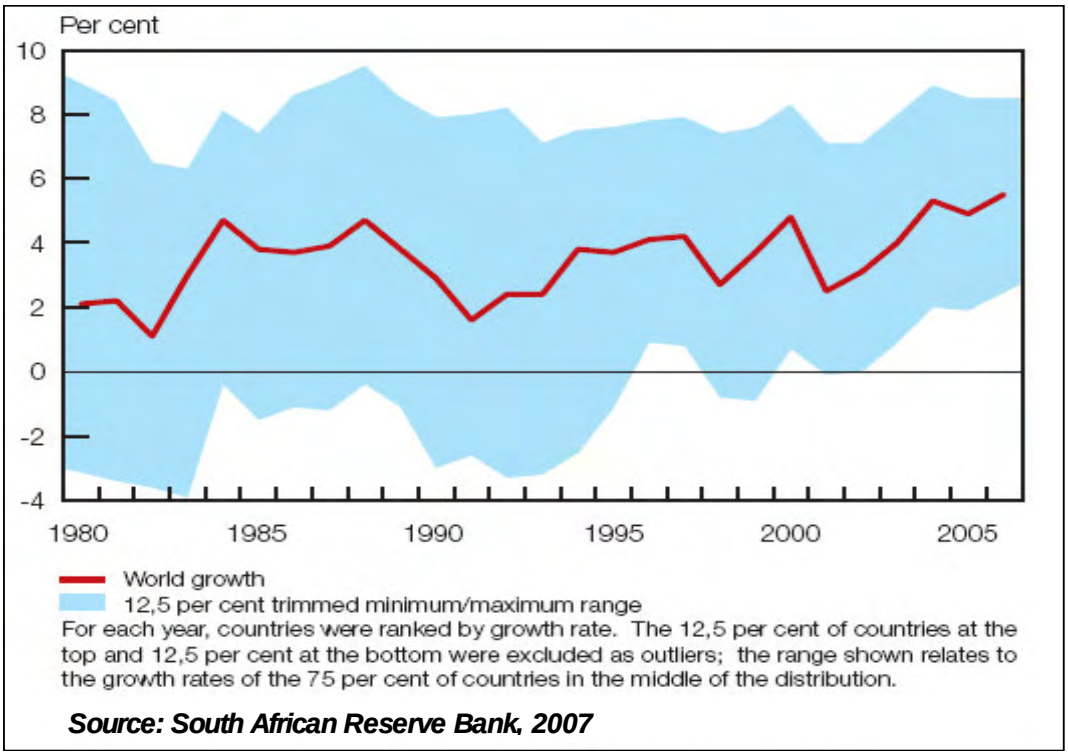
During the past decades and years a fundamental shift occurred in the world economy. We are moving from a world in which national economies were relatively self-contained entities, isolated from each other by barriers to cross-border trade and investment, to a world in which these barriers are declining, and national economies are merging into interdependent, integrated global economic systems (Hill, 2006).

For business, this process, referred to as globalization has produced many opportunities where firms can expand their revenues by selling around the world and reduce their costs by procuring from, or producing in nations where key inputs, including labour, are cheap (Hill, 2006). At the same time, globalization has also created new threats for businesses accustomed to dominating their domestic markets, as foreign companies are entering many formerly protected industries in developing countries, and increasing competition.

Due to the lowering of barriers to international trade, firms need to view the world, (rather than a single country), as their market, and as capital markets are becoming more globalized and deregulated, and markets are becoming more liquid, capital is attaining a degree of mobility as never before in history. Investors will therefore move their capital to where they believe it will be most productively employed. In the new world the investors therefore don't just consider commercial performance but also consider a company's competitiveness in global capital markets (Young and O'Byrne, 2000).

Fast economic growth means an expanding domestic market and living conditions, and is associated with a changing and dynamic business environment. Slow or zero growth in such an environment is perceived as stagnation and is not attractive to business and shareholders (McAleese, 2004).

Figure 3: World growth in real GDP



Source: South African Reserve Bank, 2007

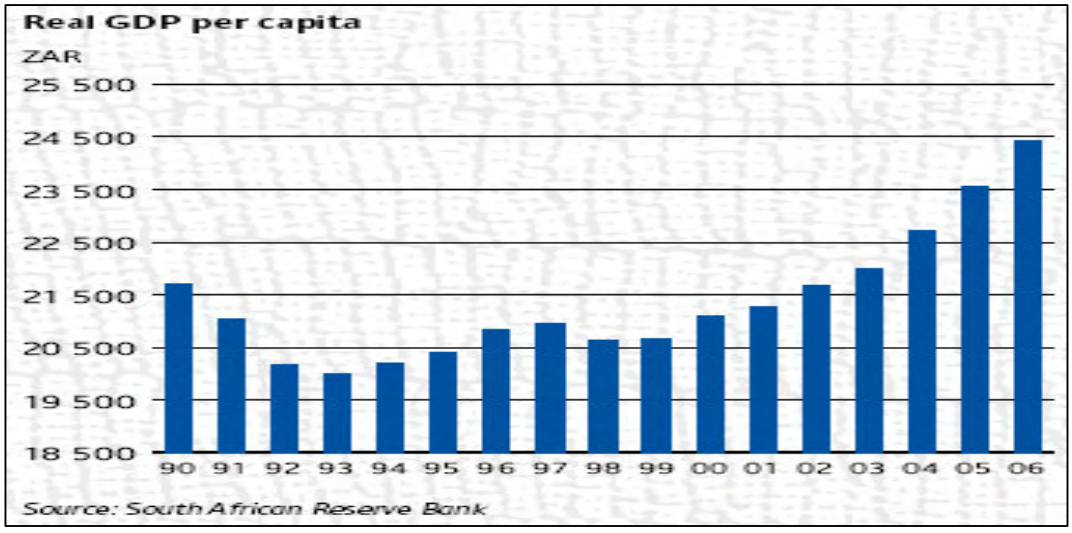
The global GDP growth rates have increased steadily over the recent years to reach the highest levels in 25 years during 2004 to 2006, peaking at 5.25% in 2006. Economists expect that the global economic setting will continue to be favourable and world markets will retain their momentum in 2007 (South African Reserve Bank, 2007).

2.2 South African Economy

Globalisation and the end of South Africa's international isolation, post-apartheid, resulted in trade liberalisation that enabled South African firms to access expanded international trade opportunities.

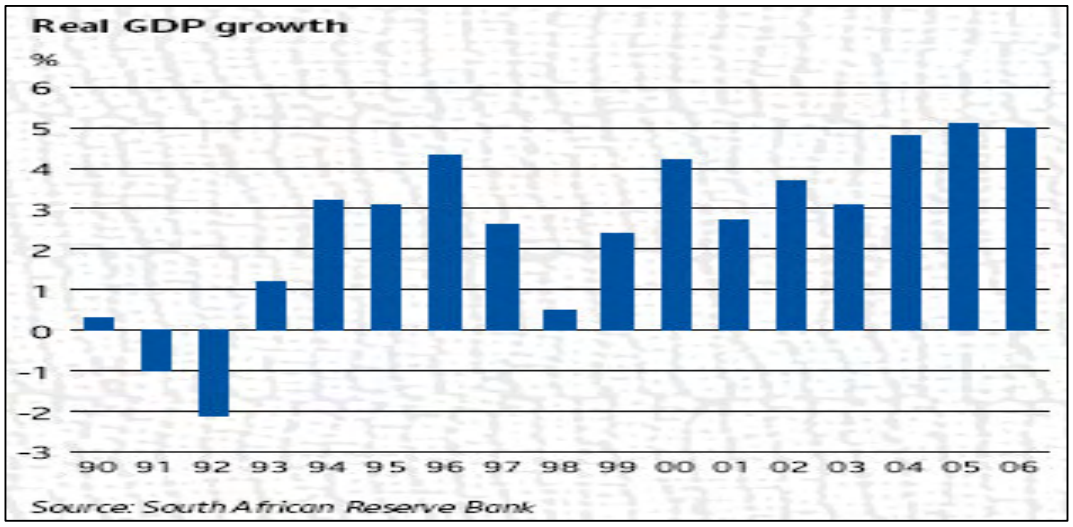
South Africa's economic growth has been impressive, rising from 3% in the first decade after 1994 to around 5% in 2006, replicating the global growth trajectory. The current economic upswing that started in September 1999, having persisted for approximately eight years now, is currently twice the length of the previous longest expansion phase of the business cycle (South African Reserve Bank, 2007).

Figure 4a: Historical South African Real GDP per capita



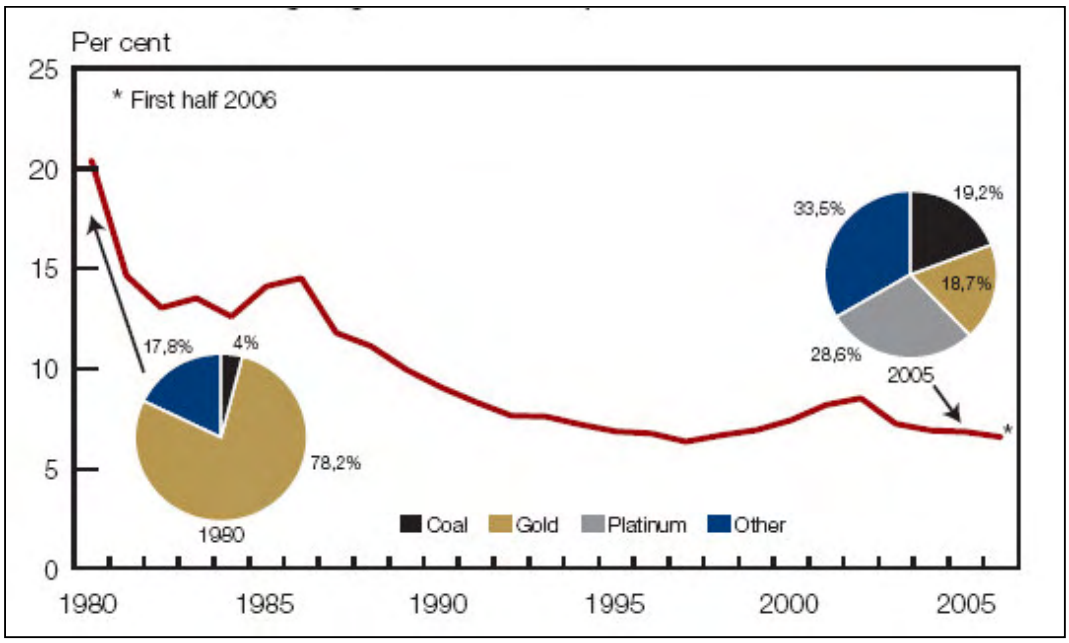
High commodity prices, sustained global growth, large capital inflows, and strong consumer demand contributed towards this growth increase. According to the SA government, the South African GDP growth rate must be at least 6% to have the desired impact on poverty alleviation and unemployment (Standard Bank, 2007). Real South African GDP per capita, and GDP growth rates are presented in figure 4a and 4b respectively.

Figure 4: Historical South African Real GDP growth rates



The South African economy became less dependent on commodities over the past quarter of a century as the services sector expanded in importance. Historically, the main economic growth driver was the primary sector (mining, quarrying, agriculture, fishing, and forestry), and gold in particular, as illustrated in figure 5, but this role has increasingly shifted towards the tertiary sector (wholesale and retail trade, tourism, transport, communications, and services).

Figure 5: Share of mining in SA GDP



Source: South African Reserve Bank, 2006

Although the mining sector's contribution to GDP declined from approximately 20% in 1980 to just less than 8% at the end of 2005, it is still a significant contributor to GDP. Figure 5 also illustrates the shift from gold to platinum as the most important mining product in terms of GDP contribution.

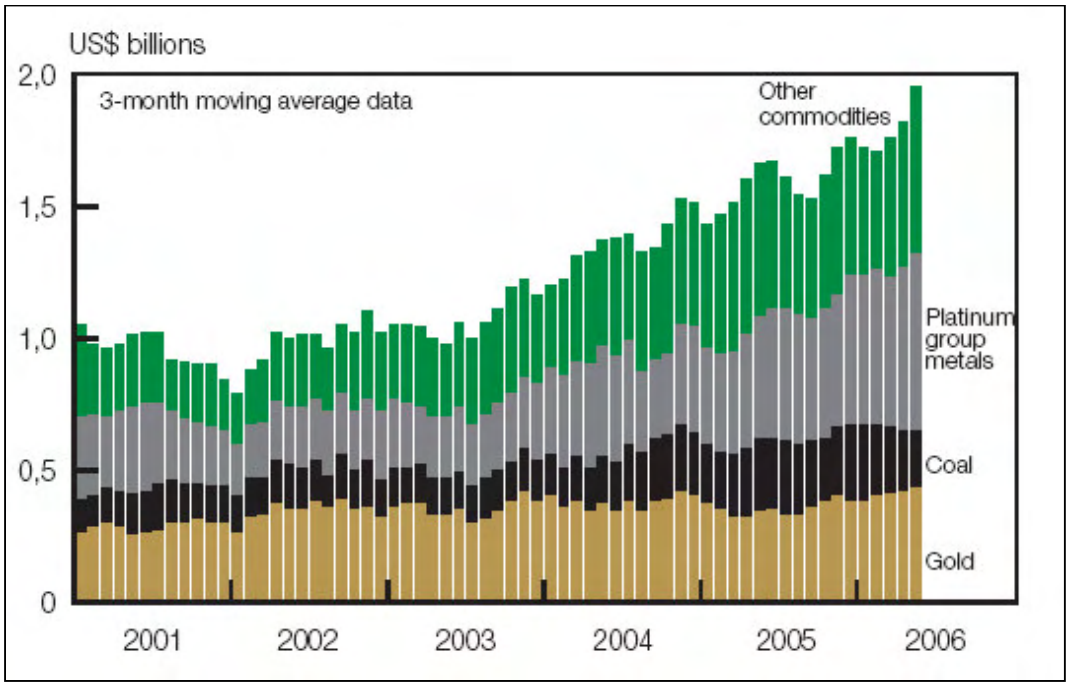
2.3 South African Mining Industry

South Africa's metal and mineral resources are of unique importance in the world, as the country occupies a dominant position in category after category, both in terms of reserves and production. The main resources are gold, uranium, chromium, antimony, coal, iron ore, manganese, nickel, phosphates, tin, gem diamonds, platinum, copper, vanadium, salt, and natural gas (Department of Minerals and Energy SA, 2006).

Historically gold used to play a dominant role in the mining sector, and an equally important role in the South African economy when South African gold mines produced up to 70% of the world's gold in the 1970's. South African gold

production declined during recent years to only 275 tons in 2006, just remaining the largest world producer with 11% of current world production.

Figure 6: South African commodity exports for period 2001 to 2006



Source: South African Reserve Bank, 2007

In contrast to gold, platinum group metals trended higher over the past number of years, its value having exceeded that of gold since 2001 as illustrated in figure 6 (South African Reserve Bank, 2007). The South African platinum mining industry today is therefore in a similar position as gold in the 1970's, where South Africa is dominating the world's supply, producing 77% of global platinum supply in 2006.

Besides platinum and gold, South Africa is also the largest exporter of several minerals, including vermiculite, vanadium, alumino-silicates, ferrochromium, ferromanganese, and manganese ore. A break-down of mineral sales is

presented in figure 7, and illustrate that platinum group metals currently make up approximately 33% of total mineral sales.

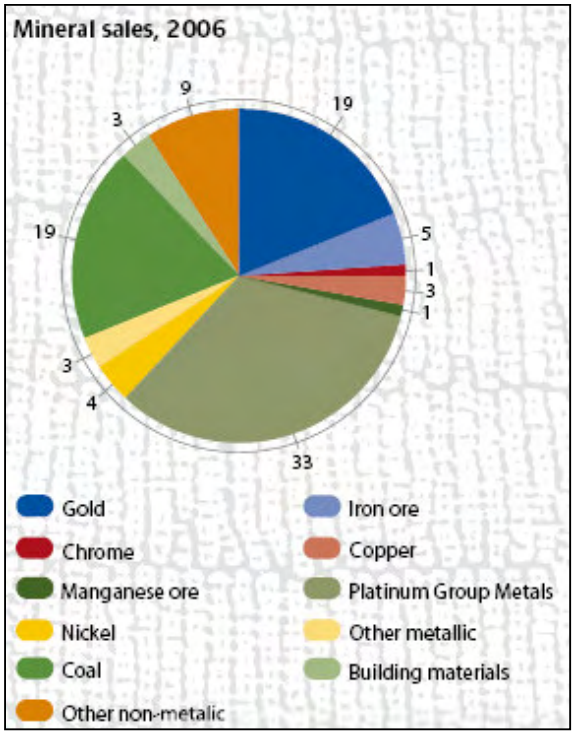


Figure 7: South African Mineral Sales for 2006

Source: Standard Bank, 2007

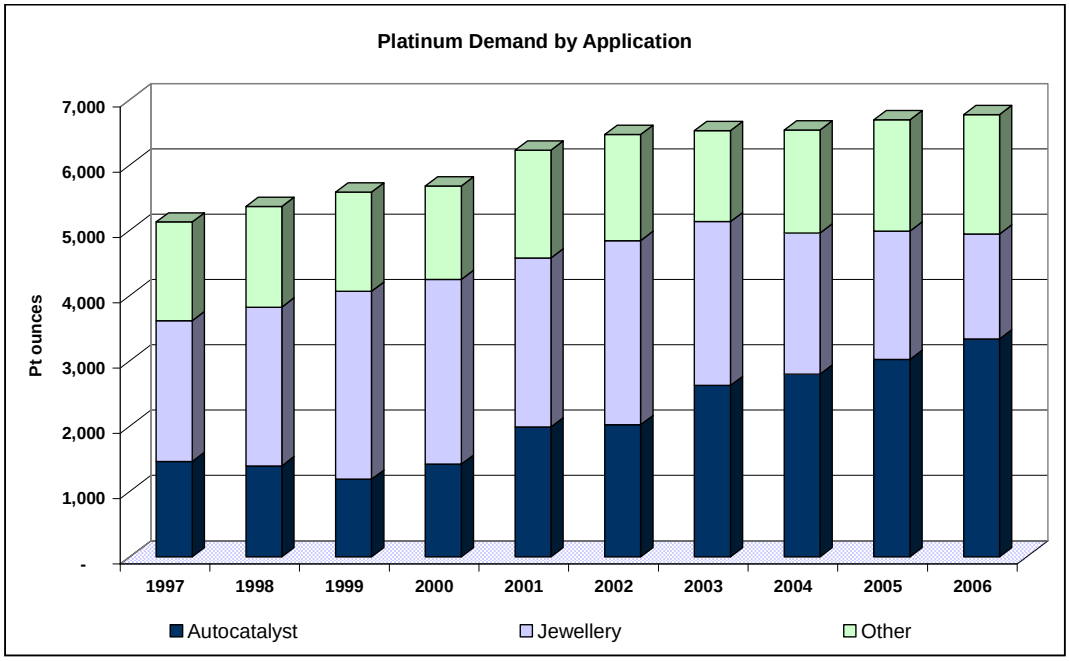
2.4 Platinum Mining Industry

Platinum supply is currently primarily geared toward industrial uses, auto-catalysts being the largest consumer, with the quantity supplied determined by the quantity demanded by industry. High metal prices during the past five years resulted in demand for jewellery declining from 2.8 million oz (43% of total demand) in 2002 to approximately 1.6 million oz (24% of total demand) during 2006 (Johnson Matthey, 2007).

Platinum demand by application for the past ten years, presented in figure 8, indicates that demand for auto-catalysts has increased steadily from 1.46 million oz in 1997 to 3.34 million oz in 2006, fuelled primarily by stricter vehicle

emission standards and legislation in Europe, North America, and Japan, which account for approximately 85% of global auto-catalyst demand. This stricter emissions standards combined with the continuing increase in market share of diesel engines in the automotive market is expected to push platinum demand for auto-catalysts even higher in the near future (Johnson Matthey, 2007).

Figure 8: Global Platinum demand by application



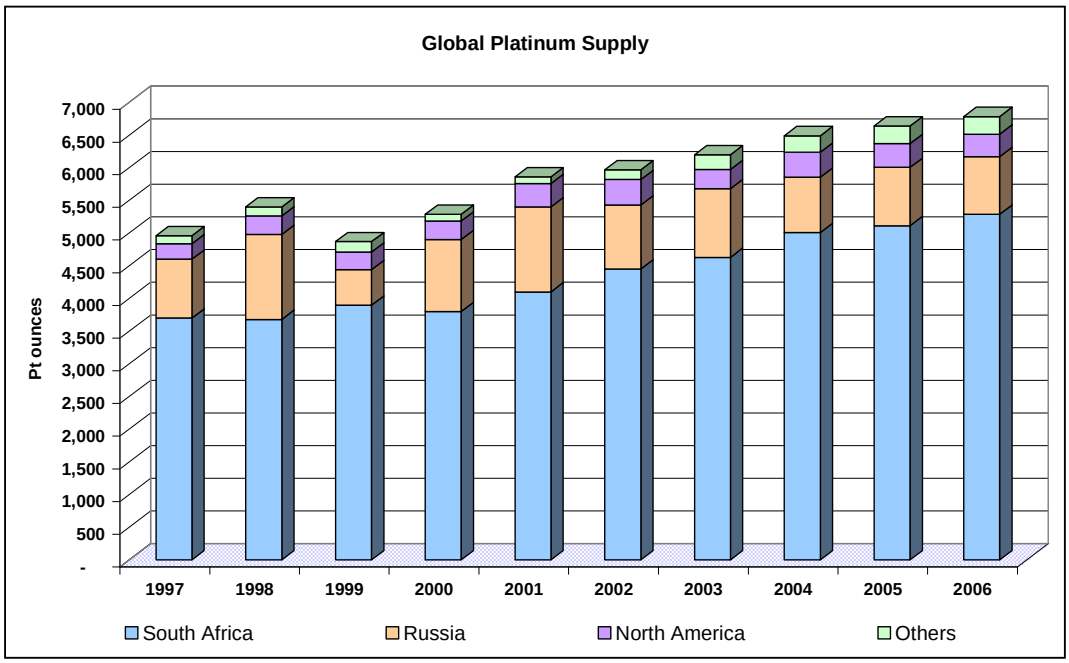
Data source: Johnson Matthey, 2007

Platinum is not held by central banks in the form of reserves, and therefore, the market for this metal is not directly sensitive to central bank actions. Therefore, due to demand being a function of the well-being of the economy, prices of platinum, in the long term, will rise if industrial activity increases, and fall if activity declines (Hillier, Draper, and Faff, 2006).

The primary platinum producing regions in the world are South Africa, Russia and North America, who produce 78%, 22%, and 6% of global supply respectively. The graphical representation of global platinum supply by region

displayed in figure 9 illustrates how South Africa's supply has increased just ahead of global supply over the past ten years, rising by an average of 4.3% per annum, from 3.7 million ounces in 1997 to 5.3 million ounces in 2006 (Johnson Matthey, 2007).

Figure 9: Global Platinum supply by region



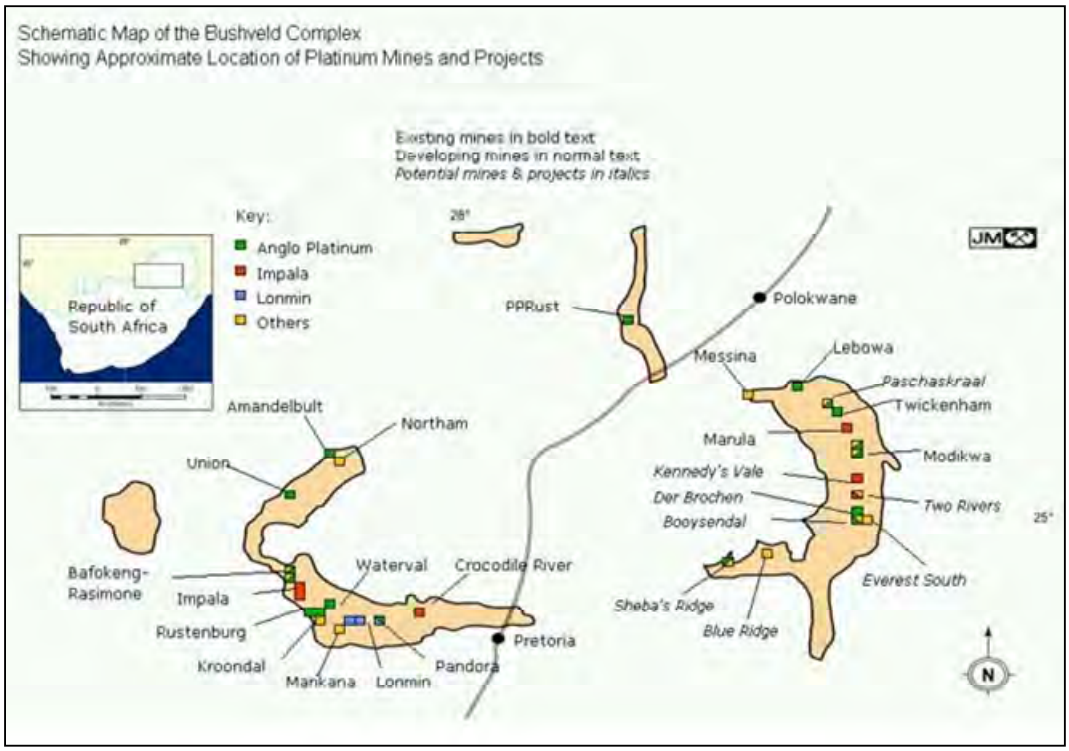
Data source: Johnson Matthey, 2007

South Africa's platinum mining industry is dominated by three large players, Anglo Platinum, Impala Platinum (Implats), and Lonmin, which make up just more than 85% of South African production. These companies mine the three platinum reefs contained in the Bushveld Igneous Complex (BIC), the largest platinum ore body in the world, namely the Merensky reef, UG2 Reef, and Platreef. According to the SAMREC Code, proven and probable reserves of platinum and palladium were estimated at 203.3 million troy ounces, (6,323 tonnes) and 116.1 million troy ounces (3,611 tonnes), respectively in 1999 (Cawthorn, 1999). In addition to these reserves, Cawthorn estimated inferred

resources at 939 million troy ounces (29,206 tonnes) of platinum and 711 million troy ounces (22,115 tonnes) of palladium.

The Bushveld Igneous Complex (BIC) can be compared to an enormous, irregularly-shaped saucer 370 kilometres across, with its centre buried deep underground but its rim exposed, as illustrated in figure 10. Figure 10 also indicates the locations of respective platinum mining operations in South Africa.

Figure 10: Schematic Map of South African Bushveld Complex



Source: Johnson Matthey, 2007

2.5 Company performance in a growing industry

Recognising the obligation to maximise shareholder value as one of the most basic and fundamental tenets of capitalism, companies must realize that for every dollar of profit that is reinvested in the business rather than distributed, they have to maximise value in order to produce a better return than that which

the investor might have achieved through an alternative investment at similar risk (Pettit, 2000).

When a company is operating in a growing industry, investors and other stakeholders expect it to deliver superior returns and to create economic value. Ability to fund growth and ability to create value are two of the fundamental questions that a growing business should focus on (Ward and Price, 2005).

Pettit (2000) mentions that companies face unprecedented demands for profitable, long-term growth under the pressure of rising market expectations implicit in any long bull-market. He points out that in most industries, and in the market as a whole, market capitalization is largely premised on profitable growth beyond the present value of all current operations.

Due to the nature of the mining industry, it takes years to increase capacity and production, and expansion programmes require intensive capital investment that is not always appreciated by investors. Mining companies therefore need to ensure that they can demonstrate profitable growth and the amount of value added.

2.6 Share price performance

The performance of a company's shares on the stock exchange depends on both its past earnings record and perceived future potential (Espag, 2003). Ernst & Young (2000) also reported that recent trends identified non-financial considerations as increasingly important in the valuation of a company and its stock, specifically in terms of the perceived future potential.

Ernst & Young (2000) further point out that shareholders are increasingly placing value on the value of intangible measures. They list the most important non-financial metrics as: strategy execution, management credibility, quality of strategy, innovativeness, ability to attract talented people, market share,

management experience, quality of executive compensation, quality of major processes, and research leadership.

Young and O'Byrne (2000) found that shareholder's wealth culture became increasingly predominant during the past few decades and investors will move their capital to where they believe it will be most productively employed. In today's globalized, liquid markets, investors don't just consider commercial performance but also consider a company's competitiveness in capital markets.

Scott (2001) also stressed that shareholders expect to gain a return for making their funds available to the business, and just as lenders expect that interest will be paid on their loans, shareholders expect to get a dividend on their equity.

Share price can therefore be affected by shareholders / investors' perception of growth and value added by a company and depend on their interpretation of the abovementioned elements, and companies need to manage performance metrics and their relationships with stakeholder accordingly.

In today's liquid markets, where supply of capital is limited, companies need to maximise its value and hence return to shareholders otherwise these investors will move their capital to more attractive opportunities. Managing for value has therefore become the mantra of today's executives, not only in the U.S., but also, increasingly, in other parts of the world (Pettit, 2000).

2.7 Methods of performance measurement

There are numerous measures available such as earnings, earnings per share, earnings growth, profit margin, return on equity, return on assets, cash flow, etc. but companies and managers need to consider these carefully as each of these has some limitation due to the way in which the costs of capital and debt are handled (Directorship, 2005).

Pettit (2000) has highlighted some pitfalls of traditional performance measurements. Firstly, profit and profit margin measures can lead to overinvestment because they overlook capital and the cost of capital. Any project with a positive return, but not necessarily the return shareholders expect, will improve a company's margins, unit cost, profit and productivity measures, but it may still destroy value. Secondly, unit cost, utilization, and income measures can promote overproduction, particularly towards the end of an accounting period, because it gives the illusion of lower unit cost. Although this practise appears to reduce costs, it could also raise the cost of invested capital. Thirdly, measures such as percentage margins and rates of return can lead companies to "starve the ***stars*** and feed the ***dogs***" (Pettit, 2000, p3) because they neglect the cost of capital. Fourthly, traditional financial measures are inherently biased against the new service economy where more service-orientated businesses are designed around razor-thin margins, but with low capital investment. Finally, traditional measures exclude the shareholders' investment in the business, and confuse accounting anomalies with the underlying economics of business, that could lead to wrong accounting-based decisions that might not make economic sense.

Jalbert and Landry (2003) discussed the balanced scorecards as an alternative performance measurement to EVA®, and although the balanced scorecard has the advantages of considering both financial and non-financial factors and providing detail of firm performance beyond that obtained from market - determined measures, it is unfortunately not a market – determined measure, and may not align perfectly with a shareholder wealth maximization goal.

McCormack and Vytheeswaran (1998) reported that many executives and Wall Street analysts favour free cash flow (cash flow from operations minus capital spending) as the preferred measure of performance for shareholders, but illustrate that while cash flow over the life of a project is a measure of its value, cash flow measured for any single historical period is a meaningless measure of performance. The investment of capital in attractive projects that could produce favourable future returns will result in lower free cash flow during the

current period that could be interpreted as a decline in shareholder wealth while it is actually increasing value.

Economic value added (EVA®) on the other hand is an accounting - based measure of operating performance that takes the difference between a company's after tax profit (NOPAT) and the cost of capital into account, and Stewart (1994), the father of EVA®, suggests that EVA stands well out from the crowd as the single best measure of wealth creation on a contemporaneous basis [and] is almost 50% better than its closest accounting – based competitor, including EPS, ROE and ROI, in explaining changes in shareholder wealth.

Another advantage of EVA over other measures like NPV is that it can be applied to the whole operating performance of a business, and it can be tracked easily over defined periods of trading, such as monthly or year to date (Scott, 2001)

2.8 Use of EVA® for performance evaluation

According to Taub (2003), EVA is a practical method of estimating the economic profit that is earned, as opposed to the accounting profit. This way of looking at financials enables companies to truly understand if they are profitable because they manage assets well or simply because they are owners of profitable assets. "EVA sets a required hurdle rate of return – the cost of capital – as a hurdle rate below which performance is unacceptable" (Pettit, 2000, p4).

EVA primarily serves three purposes, firstly, it is widely used as a performance measurement tool, secondly it is also used as a valuation tool and finally as a reporting tool (Mohanty, 2006). Since the 1980's, EVA has been widely accepted as a measure of corporate performance, and today the EVA – based compensation system is one of the most popular variable compensation systems being used in the corporate world (Mohanty, 2006).

Stewart (1991) expresses Economic Value Added (EVA) as:

$$EVA^{®} = [NOPAT – c^* \times Invested\ Capital]$$

and NOPAT is,

$$NOPAT = r \times capital$$

Where:

NOPAT	=	Net Operating Profits After Tax and before Interest
c*	=	cost of capital
Invested Capital	=	economic book value of the capital employed
r	=	rate of return on capital

or according to Ward and Price (2005),

$$NOPAT = EBIT – Tax$$

Where:

NOPAT	=	Net Operating Profits After Tax and before Interest
EBIT	=	Earnings Before Interest and Tax

Alternatively Pettit (2000) expressed Economic Value Added (EVA) as:

$$EVA^{®} = [Rate\ of\ Return - c^*] \times capital$$

Where:

Rate of Return	=	return on capital
c*	=	cost of capital
capital	=	economic book value of the capital committed to the business

Change in EVA over a specific period provides the corresponding trend in economic performance of a company during that period.

Griffith (2006), Pettit (2000) and Scott (2001) identified only a finite number of things decision-makers can do to deliver incremental economic value, namely, to reduce costs and improve net operating profit after tax relative to total assets, to manage assets better by removing assets that are not returning more than the capital charge (harvesting), investing in assets that will return more than the capital charge (growth), and to reduce the cost of capital.

Taub (2003) highlights two beliefs at the heart of EVA - firstly, the belief that the primary objective of management should be to maximise return to shareholders, and secondly, that a company should earn more than its cost of investment.

Fernandez (2001) reports that the number of companies using EVA-based performance measurement systems has increased from 25 in 1993 to 250 in 1996, and Mohanty (2006) reports that even today an increasing number of companies are reporting their annual EVA to investors.

Recently, there has been a widespread adoption of EVA® by securities analysts because of its focus on the firm's capacity for ongoing wealth creation rather than simply wealth distribution as per the dividend discount approach (Worthington and West, 1999).

According to Stewart (1992), positive EVA firms provide higher returns than shareholders can earn elsewhere, and thus deserve to sell for a premium-to-book value. EVA firms with a zero EVA just meet investor expectations, and should sell for book value, while negative EVA firms should sell at a discount-to-book value. This fundamental evaluation principle implies that the change in EVA over a period should, more accurately than any other measure, explain and correlate with the corresponding change in market value added

(McCormack and Vytheeswaran, 1998), and typically explains 60 to 85 percent of changes that affect the market value of a business (Scott, 2001).

In summary some of the advantages and disadvantages of EVA as a performance measure for companies are listed in table 2.

Table 2: Advantages and disadvantages of EVA

Advantages	***Disadvantages***
Explicitly considers the cost of capital.	Computations are complex and difficult.
Allows projects to be viewed independently.	Difficult to allocate EVA among divisions.
Capitalizes expenses that have multi-period benefits.	Is not market-determined.
Provides detail of corporate performance beyond that obtained from market-determined measures.	
Source: Jalbert and Landry, 2003	

2.9 Research in support of EVA®

"Much praise has been heaped on MVA and its related measure, economic value added (EVA), and many companies have reported great financial success after adopting these techniques." (Roush and Keef, 2002, p20).

According to Ehrbar (1998), firms that have installed EVA have outperformed their peers in many ways. They have realized higher levels of economic profit, a faster pace of asset dispositions (a sign of sharper capital management), quicker asset turns, more shares repurchased, and better stock market performance.

Worthington and West (2004) pointed out that although EVA figures are readily available and promoted in the UK, Australia, Canada, Brazil, Germany, Mexico, Turkey and France, no empirical studies have been conducted outside the U.S. and they commissioned a study on 110 Australian companies over the period 1992 to 1998 in order to examine whether EVA is more highly associated with stock returns than other commonly – used accounting – based measures. They found returns to be more closely associated with EVA than residual income, earnings and net cash flow, respectively, and also found GAAP – related adjustments associated with EVA to be significant in explaining stock returns.

O'Byrne (1997) launched a study to investigate the claims of some researchers who reported a poor statistical relationship between EVA and shareholder return or EVA and market value, and found that in his study EVA explained significantly more the variation in market value among companies than earnings, and changes in EVA and changes in capital explained significantly more of the variation in five - and ten – year changes in market value than changes in earnings.

McCormack and Vytheeswaran (1998) have reported that even without making company specific or industry specific adjustments for six oil refining companies, EVA provided a good explanation (31%) for changes in MVA, while Free Cash Flow, Earnings, ROE, RONA, and EBITDA were much less useful (0 to 13%).

Finegan (1991) found EVA to have an explanatory power of six times stronger than EPS in explaining the changes in MVA for his study of 450 U.S. companies on the Stern Stewart 1000 database.

Furguson, Rentzler & Yu (2005) used event study methodology to investigate whether firms adopt EVA due to poor stock performance (i.e. poor profitability) and whether adopting EVA leads to better stock performance (i.e. greater profitability). Although their study found insufficient evidence to conclude that poor stock performance leads to firms to adopt EVA or that adopting EVA improves stock performance, they indicated that firms adopting EVA appear to

have above average profitability relative to their peers both before and after the adoption of EVA, and that there was some evidence that EVA adopters experienced increased profitability relative to their peers following adoption.

Both O'Byrne (1997) and Worthington and West (2003) attempted to offer some explanations as to why there is divergence between the result of their studies (and others that found EVA to offer superior correlation to stock returns to other measures) and that of other researchers who found that EVA was not the superior measure for stock return. O'Byrne (1997) identified the biggest conceptual weakness in their research to be their failure to recognise that shareholder return depends on the difference between actual and expected performance, and pointed out that significant shortcomings in their methodology included their focus on shareholder return instead of excess shareholder return, their failure to use expected EVA improvement as a variable in explaining shareholder return, and their failure to recognise that investors put a much higher multiple on positive EVA than they do on negative EVA. Worthington and West (2003) explained that it is not always possible to decompose the specific GAAP adjustments in the publicly available data sets and this might account for some difference in incremental information content between studies, and secondly, differences in research design can be responsible for differences in results of different studies.

2.10 Criticisms of EVA®

While EVA has certainly attracted popular attention and a significant following, Kramer and Pushner (1997) found minimal evidence in the academic literature to support this reputation. They found that the empirical evidence regarding the strength of EVA as a measure of performance was limited, and that the existing evidence at the time did not consistently support the many claims made for EVA. Their own empirical analysis of the 1000 largest non-financial firms in the U.S. (as published by Stern Stewart & Co) also failed to provide evidence to support the contention that EVA is the best internal measure of corporate

success in adding value to shareholder investments, and found the market to be seemingly more focussed on “profit” rather than EVA. They explain that the market might be more focussed on “profit” than EVA due to the fact that they are almost constantly being fed news on earnings rather than EVA, and therefore it is not surprising that the market is not as responsive to EVA in the short-run.

Birchard (1994) and Nuelle (1996) pointed out that the calculation of EVA is sometimes too complex to calculate, that it mires a company into short - term thinking, and that it does not explain shareholder returns any better than other less complicated measures.

Kramer and Peters (2001) in another study investigated the relationship between capital intensity and EVA’s ability to serve as an effective proxy for market value added, and found EVA to be just as useful in the information economy as in traditional manufacturing businesses, but that it has been consistently outperformed by NOPAT that is a readily available financial performance measure. They further raised the concern that the marginal costs of using EVA in most of the industries studied just could not be justified by the marginal benefits of using EVA as a proxy of market value added.

Griffith (2006) performed an analysis on the Stern Stewart & Co. 2004 U.S. 1000 EVA / MVA Annual Rankings Database to assess whether EVA, MVA, and FGR performance should be used to forecast stock performance and to make investment decisions, and found them to be poor indicators of performance. He feels that MVA, EVA, and FGR should be used in a compensation system that would lead employees throughout the organization to maximize shareholders’ wealth rather than as a predictor of performance.

2.11 EVA® Adjustments

In order to convert all accounting earnings to economic earnings, and accounting book value to economic book value, certain adjustments are made to standard GAAP accounts. These adjustments assist to generate a NOPAT that is a more realistic reflection of the economics of the business, and to generate a capital figure that is a more accurate measure of the funds made available by shareholders and lenders (Scott, 2001).

Scott (2001) recommends that only a small number of adjustments should be made for simplicity's sake, and mentions that Stern Stewart typically finds companies to make between 10 and 15 adjustments.

Scott (2001) lists some of the most important questions that should be considered before an adjustment is made are:

- Will making the adjustment present a better picture of the economic reality?
- Will the adjustment assist to turn GAAP NOPAT into economic NOPAT?
- Is their enough data or detail available to make the change?
- Can the change be explained to employees and business owners?

Worthington and West (2003) found during an analysis of the respective components of EVA that the GAAP – related adjustments most closely associated with EVA were significant at the margin in explaining stock returns. They grouped modifications to companies' conventional accounts as adjustments to research and development, deferred taxes, intangibles, depreciation, provisions for warranties and bad debts, restructuring changes, and macro-economic conditions.

McCormack and Vytheeswaran (1998) have reported that even without making company specific or industry specific adjustments for six oil refining companies, EVA provided a good explanation (31%) for changes in MVA, but for

companies involved in exploration and production activities, standard EVA proved ineffective and some adjustments were necessary to improve explanatory power of EVA. They found that between five and fifteen adjustments are typically required to achieve the required accuracy. Based on their study, standard EVA only explained 8% of changes in market value added for oil and gas companies while the adjusted EVA explained up to 49% of those movements.

2.12 MVA as an alternative performance measure

While EVA is just a single - period measure of corporate performance, Market Value Added (MVA) is more forward looking. MVA is a market – generated number calculated by subtracting the capital invested in a firm (C) from the sum (V) of the total market value of the firm's equity and the book value of its debt (Kramer and Pushner, 1997), $MVA_t = V_t - C_t$.

Griffith (2006) describe MVA as a measure of the difference between "cash in" (what investors have contributed) and "cash out" (what they could get by selling at today's prices). If MVA is positive, it means that a company has increased the value of the capital entrusted to it, and thus created shareholder wealth and similarly if MVA is negative, then a company destroyed wealth. MVA is the present value of the stream of future EVA of a business and is also an indication of change in investor expectations for a specific company.

Stephen and Melvin (2002) acknowledge the suitability of MVA as a measure of shareholder wealth creation, but they have identified some difficulties associated with it. The fact that MVA is based on economic book value and that money tacitly tied up in internally generated goodwill is largely ignored, the fact that MVA does not distinguish between wealth created recently and wealth created in the distant past, and the fact that MVA is a price metric and suffering from the size effect, are seen as limitations to this measure. They did however find "standardised MVA", a measure derived from MVA by Ehrbar (1999) who

suggested improvements to MVA to address the concerns highlighted by Stephen and Melvin, to be a much enhanced measure but virtually the same as total shareholder return.

Roush and Keef (2002) however, raised quite a few concerns with MVA, such as that MVA is a hybrid statistic because it is made up of an ex-post measure (equity book value) and an ex-ante statistic (market value) and therefore it is not clear what it measures and might be of limited use as a predictor of the future. Further, they illustrated the problem caused by the size of companies with MVA, because, all other things being equal, it is well recognised that larger firms tend to produce larger profits.

Grant (1996) studied the relationship between MVA divided by capital and EVA for 983 companies and reported a high level of correlation between MVA and EVA for companies with a positive EVA, but only low level of correlation for companies with negative EVA's.

2.13 REVA as an alternative performance measure

According to Bacidore, Boquist, Milbourn and Thakor (1997) a more appropriate measure of capital used in a company for any period of time would be the market value of the company at the beginning of the period instead of the adjusted book value of net capital, which led them to use a refinement of the EVA measure, REVA. This measure is different from standard EVA because it assesses a capital charge for the period equal to the weighted – average capital cost times the market value of the company at the beginning of the period.

REVA has two advantages over EVA, firstly, if REVA is positive then additional shareholder value has been created (covering shareholders' opportunity cost of capital), and secondly, REVA might be estimated based on either total

operating cash flows to debt and equity or only on the flows to equity, which does not apply for EVA.

Bacidore et al. (1997) expressed Refined Economic Value Added (REVA) as:

$$REVA_t = NOPAT_t – [c^* \times MV_{t-1}]$$

Where: NOPAT = reported net operating profits after tax (including adjustments)

MV_{t-1} = total market value of the company's assets at beginning of period t.

Bacidore ***et al.*** performed an analysis on a random group of 600 companies from the Stern Stewart & Co. 1000 database for the period 1982 to 1992 and found that although EVA did well in terms of its correlation with shareholder value creation, it was statistically outperformed by REVA in this regard. They also found that realized returns of the top 25 REVA companies were higher than the realized returns of the top 25 EVA companies for the same period.

According to Bacidore ***et al.*** (1997) REVA is a more appropriate performance measure than EVA from a shareholders' point of view, and senior executives should be evaluated accordingly, whereas EVA could be used to compensate divisional managers and those who belong to lower levels in the organization.

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Furguson and Leistikow (1998) disagreed with Bacidore et al.'s findings and claimed that REVA is inconsistent with finance theory and with wealth maximization. They further stated that REVA is inappropriate for measuring performance and for compensation of management and instead recommend EVA as the preferred measure for performance and management compensation.

2.14 South African Studies

Espag (2003) researched the methodologies used by analysts to evaluate companies during an expansion phase, and Musara (2003) investigated the use of EVA for the evaluation of mineral projects. Both of these studies made reference to the platinum mining industry, but focused only on one company and neither investigated the correlation between share price and economic value added.

De Wet (2005) performed a study on 89 South African listed industrial companies, over the period 1994 to 2004, in order to investigate the strength of the relationship between EVA and other conventional accounting measures relative to market value added (MVA). His findings indicated that EVA did not show the strongest relationship with MVA (only 8% of change explained), and that cash flow from operations explained the biggest percentage of changes in MVA (38%), with ROA as the second best performer (15%). He further found that there was a weak correlation between MVA and EPS and DPS.

According to Stern Stewart & Co. (2007) there is very limited data currently available on EVA and EVA / Share price correlations for platinum mining companies in South Africa. This study is intended to address this gap.

2.15 Conclusion

From this literature review it can be concluded that both the global and South African economies experienced favourable growth rates and offered many opportunities for business to grow and enter new markets during the past decade.

Markets however became more liquid and investors more selective, not just considering commercial performance but also company competitive performance in the global markets, resulting in companies having to be able to

demonstrate real economic value added. Economic Value Added (EVA®) has been identified as one of the best accounting – based measures to reflect true operating performance and wealth created for shareholders.

Considering the global and local market trends, combined with global platinum demand trends and acknowledging that South Africa is the largest platinum producing country in the world, it would be reasonable to expect platinum mining companies operating within South Africa to create wealth and add economic value to shareholders.

This study therefore proposes to establish whether South African platinum companies were indeed able to create economic value fore shareholders during this growth phase and also to determine if EVA do correlate well with share price performance and other conventional performance measures.

CHAPTER 3 - RESEARCH HYPOTHESES

The past decade has seen favourable growth rates in the both the global and South African economies and in the South African platinum mining industry as a whole. From the literature review it would be a reasonable to assume that the four major South African platinum mining companies should have been able to experience similar growth rates and to create similar value for shareholders during this period.

Although there are many performance metrics available in the market to measure company performance as discussed in the literature review above, Economic Value Added (EVA®) has been identified and selected as the preferred measure of true economic value added by companies for shareholders.

The following research hypotheses have been formulated to test if these companies were indeed able to experience similar growth rates, to create similar value for shareholders, and to further test the correlation of EVA® to share price performance and alternative performance valuation methods.

Hypothesis 1:

H_0: The null hypothesis states that growth rates for the respective mining companies in the South African platinum mining industry are similar.

H_A: The alternative hypothesis states that growth rates for the respective mining companies in the South African platinum mining industry are not similar.

Hypothesis 2:

H_0: The null hypothesis states that EVA®, expressed as percentage of invested capital (IC), for the respective mining companies in the South African platinum mining industry are similar.

H_A: The alternative hypothesis states that EVA®, expressed as percentage of turnover, for the respective mining companies in the South African platinum mining industry are not the similar.

Hypothesis 3:

H_0: The null hypothesis states that EVA®, expressed as percentage of invested capital (IC), for the respective mining companies in the South African platinum mining industry correlate well with growth rates in these companies.

H_A: The alternative hypothesis states that EVA®, expressed as percentage of invested capital (IC), for the respective mining companies in the South African platinum mining industry do not correlate well with growth rates in these companies.

Hypothesis 4:

H_0: The null hypothesis states that Share Price for the respective mining companies in the South African platinum mining industry correlates well with EVA® for these companies.

H_A: The alternative hypothesis states that Share Price for the respective mining companies in the South African platinum mining industry do not correlate well with EVA® for these companies.

Hypothesis 5:

H_0: The null hypothesis states that EVA®, expressed as percentage of invested capital (IC), for the respective mining companies in the South African platinum mining industry correlate well with conventional performance measures for these companies.

H_A: The alternative hypothesis states that EVA®, expressed as percentage of invested capital (IC), for the respective mining companies in the South African platinum mining industry do not correlate well with conventional performance measures for these companies.

Hypotheses 1 to 5 are tested at the 5% error level using the One-way Anova, Two-tailed t-tests, and Regression analyses statistical techniques respectively.

CHAPTER 4 - RESEARCH METHODOLOGY

4.1 Research Methodology

This research compared economic value added performance of specific companies and investigated specific correlations between variables. The research data used was primarily obtained from the McGregor BFA database, with supplementary information extracted from company annual financial statements and reports.

According to Leedy (1993, p139) “The nature of the data and the problem for research dictate the research methodology” and with the numerical data obtained for this study, a quantitative research approach was required.

Based on the nature of the data and the need for statistical and mathematical assistance to extract their meaning the specific quantitative methodology used was secondary data analysis (analytical survey method) (Leedy, 1993).

Secondary data had the advantage that it was immediately available at low cost but unfortunately, as it was not always directly related to the specific research needs of this study, it was in some instances necessary to make some adjustments to extract the correct meaning from the data.

4.2 Population of relevance

The population of relevance was all South African Platinum Mining companies.

4.3 Sample size and selection

Leedy (1993) states that not all data lend themselves to sampling, and that sampling is appropriate wherever large populations, that have an outward semblance of homogeneity, are investigated.

The three largest producers in the population , Anglo Platinum, Impala Platinum and Lonmin, produce more than 85% of South Africa's supply, and the top five producers, including Northam Platinum and Aquarius Platinum, account for more than 95% of the South African production (Johnson Matthey, 2007).

Due to the relatively small size of the population and the significant role that the three primary platinum producing companies play within South Africa it was decided to only analyse these three companies, and therefore the sampling method was Non-probability, Judgemental sampling.

4.4 Data collection

Operating, financial and share price performance data for the respective companies for the past five years was used for the analysis.

Standardised annual financial statements and supporting financial and performance data for the respective platinum mining companies, for the period 1997 to 2006, were obtained from the McGregor BFA database. Standardised financial statements, instead of normal published statements, were used in order to make the financial results of the respective companies, listed on the JSE Securities Exchange, comparable with each other.

Standardised financial statements were required due the fact that companies often apply accounting conventions, and therefore General Accepted Accounting Practices, in different ways and according to different interpretations. It is hence important to note that some accounting figures in the income statements and balance sheets of companies were actually changed during the standardization process, according to set rules and standards, and may therefore differ from the company's published financials.

Supplementary and supporting information were also extracted from company annual financial statements and reports, obtained from the respective company internet web sites.

Economic data such as exchange rates, interest rates, etc. have been obtained from the South African Reserve Bank (SARB) published reports and statistical database accessed through SARB's internet web site.

4.5 Data analysis

Models and templates have been set up in Excel in order to analyse the annual financial statements and reports of the respective platinum mining companies in the sample, and to calculate EVA® and other required valuation, and performance parameters according to the financial / accounting principles that apply to them.

Calculation of EVA®

Economic value added (EVA®) was calculated according the standard equations as discussed under section 2.8.

Where:	EVA®	=	[NOPAT – c* x IC]
and NOPAT is,	NOPAT	=	EBIT – Tax
		=	Net Operating Profits After Tax and before Interest
	c*	=	Cost of capital (WACC)
	IC	=	Economic book value of Invested Capital employed in the business

Standard NOPAT was calculated by using the earnings before interest and tax figure (EBIT) from the McGregor BFA standard financial statements and adding back the tax portion, based on the calculated effective tax rate for the

respective companies. Specific adjustments were then made in order to reflect NOPAT as a more realistic measure of actual cash yield generated for investors from recurring business activities (Stewart, 1992). The specific adjustments are discussed in table 3.

Invested Capital (IC) was calculated using the operating approach, by subtracting Short Term Non-Interest Bearing Liabilities (NIBL's) from the Total Assets figure reported in the McGregor database. These figures were verified by also using the financing approach, where Short Term and Long Term Interest Bearing Debt, and other Long Term Liabilities were added to Shareholders Equity. Specific adjustments, as presented in table 3, were again made to IC, in order to reflect the true economical capital employed in the business (Stewart, 1992). For the EVA® calculation, average IC for the year, $[(IC_{End} – IC_{Begin}) / 2]$, was used.

Table 3: EVA Adjustments to NOPAT and IC

Adjustments affecting NOPAT	
+ Net increase in deferred tax reserve	Because deferred tax is not a true cash cost, the deferred tax expense should be neutralised.
+ Current year's R&D	For most resource companies R&D, in reality, is more of an investment than an expense – some times this investment pays off, sometimes it doesn't, in either case, it remains an investment.
- Amortization expense for R&D	If R&D is treated as an investment, it must be capitalised and amortized over an appropriate period. For the purpose of this study straight - line amortization of a period of five years was selected.
+ Increase in (net) capitalised intangibles	Because of McGregor BFA's interpretation, and treatment of mining assets, they are transferred to intangible assets, and mining assets are therefore not included in total assets. We do however, have

	to account for the increase in mining assets utilised in the business.
+ Unusual loss (gain) after tax	Total of all (profits) or losses on transactions of an extraordinary or non-recurring nature, including the realization of investments or non-trading assets, were taken into account.
Adjustments affecting IC	
+ Dividend provision	Dividend provision has been deducted as a NIBL during the standard IC calculation process, but should in fact be treated as IC.
- Deferred tax reserve (balance in deferred tax assets)	Because deferred tax is not a true cash cost, the deferred tax expense should be neutralised.
+ Unamortized R&D for past five years	For most resource companies R&D, in reality, is more of an investment than an expense – some times this investment pays off, sometimes it doesn't, in either case, it remains an investment and must be capitalised.
+ (Net) Capitalised Intangibles	Because mining assets are ordinally written off immediately upon acquisition, the McGregor BFA system transfers these to intangible assets, and mining assets (property, plant, and equipment) were therefore not included in BFA's total assets.
+ Cumulative unusual loss (gain) after tax	Total of all (profits) or losses on transactions of an extraordinary or non-recurring nature, including the realization of investments or non-trading assets, were taken into account.

The weighted average cost of capital (WACC) was determined by using appropriate weights for each component of long-term capital, and multiplying it

with the after-tax cost of debt, and cost of equity respectively. The equation used to determine WACC is presented below (Ward and Price, 2005):

WACC = [(%Debt of TF x Kd) + (%Equity of TF x Ke)]

Where:
- TF = Total Financing Cost
- Kd = After-tax Cost of debt
- T = Effective tax rate
- Ke = Cost of Equity (Rf + (B x MRP)
- Rf = Risk free investment rate
- B = Company Beta factor
- MRP = Market Risk Premium

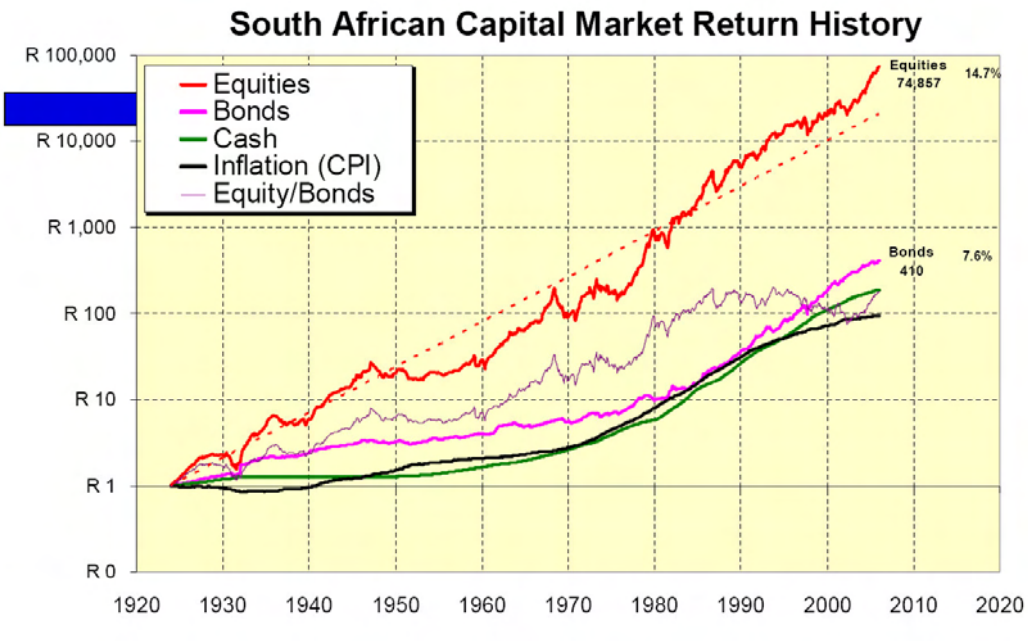
In order to determine the total financing cost, the market value of equity was used, but due to the difficulty associated in obtaining the actual market value of debt, book value of debt was used. Due to the very high equity-to-debt ratios for the respective companies, this assumption will not adversely affect the final WACC and EVA® calculations.

The after-tax, effective interest rate for short and long term, interest bearing debt was used for the cost of debt, and the capital asset pricing model (CAPM) was used to calculate the cost of equity (Ke).

For the calculation of the cost of equity the following assumptions were made. Firstly, the five to ten year South African government bond rate was used as a proxy for risk-free rate. Secondly, due to the volatility in annual beta factors from the McGregor BFA system, it was decided to use a five year beta factor for calculations. Finally, an estimate of 7% was used for the market risk premium (MRP) based on the historical returns of bonds and equitities respectively as illustrated in figure 11 (Ward, 2007).

An example of the EVA Calculation spread sheet that was used for analysis is presented in figure 12.

Figure 11: Trend in South African capital market return history



Source: Ward, 2007

Statistical Analysis

For the scenarios where two or less sub-groups were analysed either the two-sample T-test, Mann-Whitney U-test or Kolmogorov-Smirnof test methods were used due to the relatively small population and characteristics of the data.

For the scenarios where three or more sub-groups were analysed either the Kruskall-Wallis, one-way ANOVA or T-test method was used due to the relatively small population and characteristics of the data.

NCSS statistical analysis and graphics software was used to perform the statistical analysis.

Figure 12: Example of EVA Calculation Sheet for 2006

	2006 ANGLOPLAT (ZAR '000)	2006 Implats (ZAR '000)	2006 LONMIN (US$ '000)
CALCULATING NOPAT			
NOPAT = EBIT - Tax			
Profit Bef Interest and Tax (EBIT)	19,276,800	7,581,500	751,000
- Tax on Operating Profit (at effective tax rate)	3,417,148	2,277,675	246,973
= NOPAT (Before Adjustments)	**15,859,652**	**5,303,825**	**504,027**
NOPAT EVA Adjustments			
+ Net Increase in Deferred Tax reserve (Def Tax Li	2,188,200	646,900	60,000
+ Current Year's R&D	211,300	-	-
- Amortization expense for R&D	170,700	-	-
+ Increase in (net) capitalized intangibles	3,938,600	2,285,500	57,000
+ Unusual loss (gain) AT	(270,185)	(296,480)	118,792
= NOPAT (After Adjustments)	**21,756,867**	**7,939,745**	**739,819**
CALCULATING INVESTED CAPITAL			
IC = Total Assets - Short Term NIB Liabilities			
Total Assets from BFA	16,618,500	11,034,500	834,000
- Short Term NIB Liabilities	18,107,800	7,191,200	394,000
= INVESTED CAPITAL (Before Adjustments)	**(1,489,300)**	**3,843,300**	**440,000**
INVESTED CAPITAL EVA Adjustments			
+ Dividend Provision	8,956,100	1,523,200	79,000
- Deferred Tax Reserve (Balance in Def Tax Asset	-	-	-
+ Unamortized R&D for past five years	353,660	-	-
+ (Net) Capitalized intangibles	29,694,200	12,270,100	1,791,000
+ Cumulative unusual loss (gain) AT	(1,987,919)	(296,480)	118,792
= INVESTED CAPITAL (After Adjustments)	**35,526,741**	**17,340,120**	**2,428,792**
CALCULATING WACC			
WACC = [(%Debt of TF x Kd x (1-T)) + (%Equity of TF x Ke)]			
with Ke = Rf + (B x MRP)			
+ Actual Short-term and Long-term Interest Bearin	1,301,000	648,900	817,000
+ Market value of Equity	146,686,341	67,402,335	**6,150,754**
= Total Financing Cost	147,987,341	68,051,235	6,967,754
Cost of Debt ***(Kd = I x (1-T))***			
Effective Interest Rate (Based on actual interest pa	14.9%	9.0%	0.7%
After Tax Interest Rate (%)	12.2%	6.3%	0.5%
Cost of Equity ***(Ke = Rf + (B x MRP))***	15.8%	14.9%	14.2%
Rf	8.0%	8.0%	8.0%
Beta (B)	1.1186	0.9898	0.8892
MRP	7.0%	7.0%	7.0%
WACC			
+ Percentage Debt	0.9%	1.0%	11.7%
x After tax cost of Debt	12.2%	6.3%	0.5%
+ Percentage Equity	99.1%	99.0%	88.3%
x Cost of Equity	15.8%	14.9%	14.2%
= WACC	**15.8%**	**14.8%**	**12.6%**
CALCULATING EVA			
EVA = NOPAT - (IC x WACC)			
+ NOPAT	21,756,867	7,939,745	739,819
- Invested Capital	30,997,984	16,304,031	2,182,297
x WACC	15.79%	14.84%	12.62%
= EVA	**16,861,784**	**5,519,862**	**464,503**

4.6 Potential research limitations

The size of the population that was analysed was a research constraint. Ideally a larger population / sample would have been more ideal for statistical analysis.

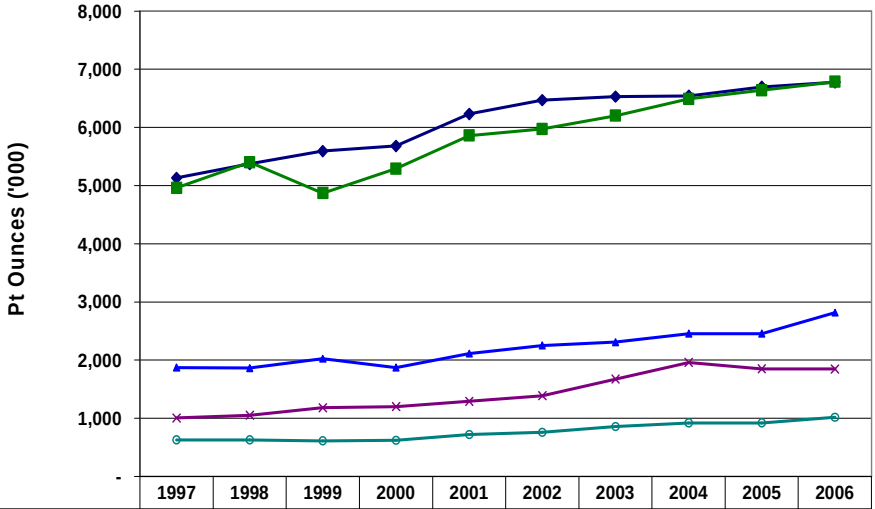
This study focussed on the three largest South African platinum producers, and due to economies of scale and different business models, the findings of this research might not be representative of smaller platinum producing companies.

CHAPTER 5 - RESULTS AND DISCUSSION

5.1 Company growth

Both global platinum demand and supply increased during the past decade and years, providing all three of the South African platinum mining companies under review the opportunity to grow into this market as illustrated in figure 13.

Figure 13: Global Platinum demand and supply for 1997 to 2006



	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Global Demand	5,130	5,370	5,590	5,680	6,230	6,470	6,530	6,540	6,695	6,775
Global Supply	4,960	5,400	4,870	5,290	5,860	5,970	6,200	6,490	6,640	6,785
Anglo Plat Production	1,871	1,861	2,023	1,872	2,109	2,251	2,308	2,454	2,453	2,817
Implats Production	1,002	1,052	1,181	1,199	1,291	1,387	1,673	1,961	1,848	1,846
Lonmin Production	625	628	610	620	717	757	854	917	916	1,017

Production growth rates for the respective mining companies are presented in table 4 and illustrate how the respective companies had different annual growth rates in different years during the period. This is largely due to the fact that expansion (growth) projects, that typically take years to execute, for the respective companies came into production at different times. The average annual growth rates however appear to be similar over the period, with the

average and cumulative growth rate for Implats slightly higher than those for Anglo Platinum and Lonmin.

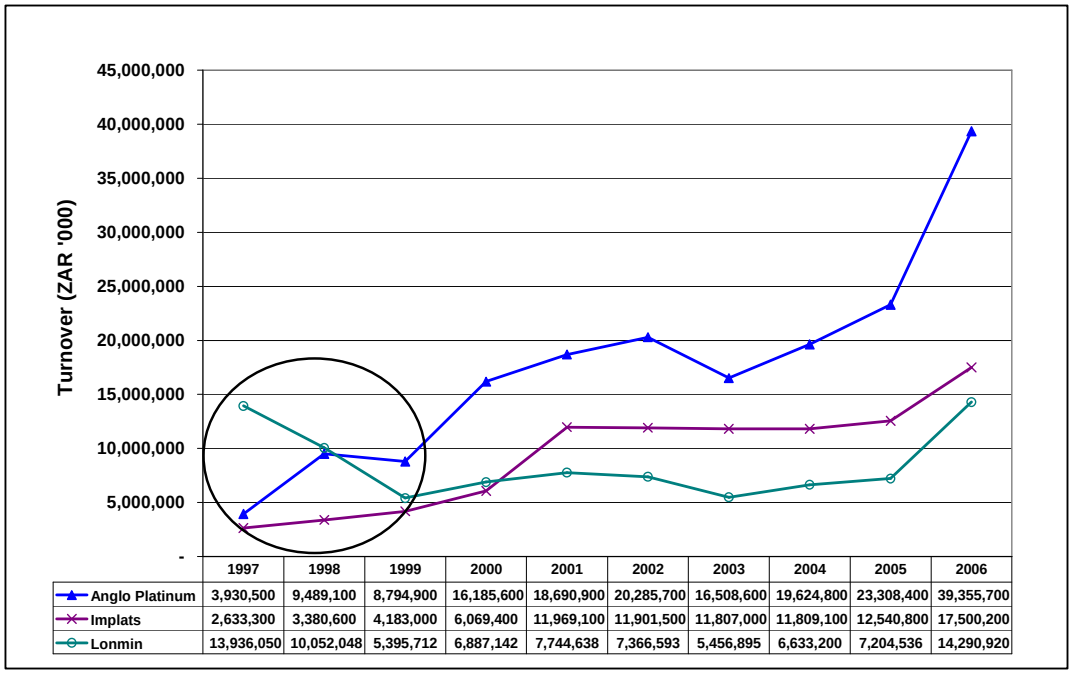
Table 4: Platinum production growth rates for 1997 to 2006

		Anglo Platinum	Implats	Lonmin
1996 Pt oz Production		***1,657***	***954***	***598***
Annual Growth Rate	1997	12.9%	5.0%	4.5%
	1998	-0.5%	5.0%	0.5%
	1999	8.7%	12.3%	-2.9%
	2000	-7.5%	1.5%	1.7%
	2001	12.7%	7.7%	15.6%
	2002	6.7%	7.4%	5.7%
	2003	2.5%	20.6%	12.7%
	2004	6.3%	17.2%	7.4%
	2005	0.0%	-5.8%	0.0%
	2006	14.8%	-0.1%	11.0%
Average Annual Growth Rate		5.7%	7.1%	5.6%
Cummulative Growth (1997-2006)		70.0%	93.5%	70.1%
2006 Pt oz Production		***2,817***	***1,846***	***1,017***

The financial turnover for the respective companies is also presented in figure 14, and illustrates that companies' turnover showed similar trends to production growth for Anglo Platinum and Implats for the past ten years, and for Lonmin only for the past seven years.

The downward trend in Lonmin's turnover from 1997 to 1999 was due to the company's sale of its non-platinum businesses in order to create a purely platinum focussed company. Lonmin's platinum business only contributed 10.3% of its annual turnover in 1997, with the majory of revenue being generated from coal, gold, and other minerals. Lonmin decided to focus on its platinum business, and by 2000, approximately 80% of its turnover came from platinum business, and by 2001 Lonmin was a pure platinum group metals producer (Lonmin, 1998 and Lonmin, 2001).

Figure 14: Turnover for Platinum mining companies

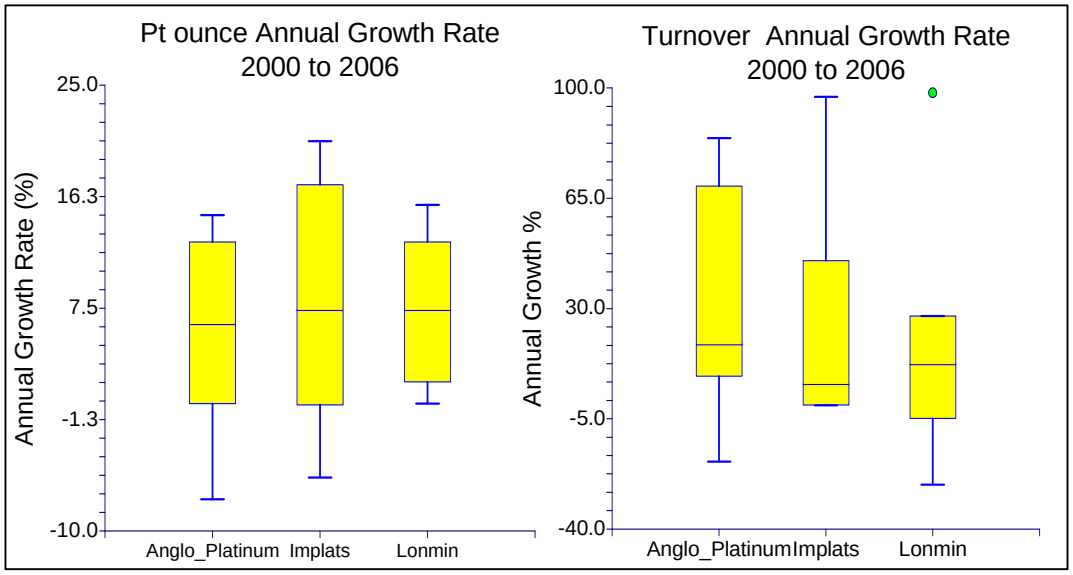


	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Anglo Platinum	3,930,500	9,489,100	8,794,900	16,185,600	18,690,900	20,285,700	16,508,600	19,624,800	23,308,400	39,355,700
Implats	2,633,300	3,380,600	4,183,000	6,069,400	11,969,100	11,901,500	11,807,000	11,809,100	12,540,800	17,500,200
Lonmin	13,936,050	10,052,048	5,395,712	6,887,142	7,744,638	7,366,593	5,456,895	6,633,200	7,204,536	14,290,920

Unfortunately, due to Lonmin's structure in earlier years as mentioned, the financial statements in the McGregor BFA database for 1997 to 1999 include the non-platinum businesses, and it would therefore not be representative to compare financial figures for the respective companies during this period. It was therefore decided to only compare fincial performance data for the respective platinum mining companies for the past seven years, 2000 to 2006.

According to the platinum ounce prodcution and company turnover data presented and discussed so far, and as presented in figure 15, the platinum ounce and turnover growth rates appear to be similar for the respective mining companies.

Figure 15: Box Plots of Pt oz and Turnover



In order to determine if these growth rates are indeed statistically comparable, hypothesis testing was used. The results from the hypothesis testing are presented under Hypothesis 1.

Hypothesis 1:

Null Hypothesis (H_0):

The respective South African platinum mining companies experienced similar growth rates over the past seven years, from 2000 to 2006.

Alternative Hypothesis (H_0):

The respective South African platinum mining companies did not experience similar growth rates over the past seven years, from 2000 to 2006.

Significance Level:

Reject the null hypothesis if there is a less than 5% chance of being wrong (95% confidence level).

Because growth rates can be interpreted both in terms of platinum ounce production and financial turnover, it was decided to perform the statistical test for both scenarios.

Statistical Test:

Since there are more than two sub-groups the ANOVA test is applied. For the platinum ounce growth rates, normality and equal variance were accepted, and the normal ANOVA test can be used (see tests of assumptions in figure 16), but for the turnover growth rate test, normality was rejected and the Kruskal Wallis One-way Anova test is more accurate (see tests of assumptions in figure 17).

Test Result:

The probabilities from the respective ANOVA and Kruskal Wallis tests were 0.807 and 0.901, as presented in figures 16 and 17. Therefore the null hypothesis cannot be rejected for either scenario.

Figure 16: NCSS Statistical output for Pt oz annual growth rates

Analysis of Variance Report – Pt Ounce Growth Rates for period 2000 to 2006

Response: Anglo_Platinum, Implats, Lonmin

Tests of Assumptions Section

Assumption	Test Value	Prob Level	Decision (0.05)
Skewness Normality of Residuals	0.0778	0.937954	Accept
Kurtosis Normality of Residuals	-0.6499	0.515755	Accept
Omnibus Normality of Residuals	0.4284	0.807174	Accept
Modified-Levene Equal-Variance Test	0.5674	0.576797	Accept

Analysis of Variance Table

Source Term	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (Alpha=0.05)
A (...)	2	26.01524	13.00762	0.22	0.807035	0.078812
S(A)	18	1079.163	59.95349			
Total (Adjusted)	20	1105.178				
Total	21					

* Term significant at alpha = 0.05

Figure 17: NCSS Statistical output for Turnover annual growth rates

Analysis of Variance Report – Turnover Growth Rates for period 2000 to 2006

Tests of Assumptions Section

Assumption	Test Value	Prob Level	Decision (0.05)
Skewness Normality of Residuals	1.9747	0.048306	Reject
Kurtosis Normality of Residuals	0.5403	0.589024	Accept
Omnibus Normality of Residuals	4.1912	0.122997	Accept
Modified-Levene Equal-Variance Test	0.0129	0.987240	Accept

Kruskal-Wallis One-Way ANOVA on Ranks
Hypotheses
Ho: All medians are equal.
Ha: At least two medians are different.

Test Results

Method	DF	Chi-Square (H)	Prob Level	Decision(0.05)
Not Corrected for Ties	2	0.2077922	0.901319	Accept Ho
Corrected for Ties	2	0.2077922	0.901319	Accept Ho

Conclusion:

Because the null hypothesis cannot be rejected at the 95% confidence level, it is concluded that there is no significant difference between the means of the annual platinum ounce and turnover growth rates for the respective platinum mining companies.

This is in-line with the expectations discussed earlier in this report that companies operating in a growing market should be able to have similar growth opportunities.

5.2 Economic Value Added (EVA®) for respective companies

The economic value added (EVA®) for the respective companies was calculated according to the formulas and guidelines discussed in chapter 4 and are presented in table 5. Detailed EVA calculation sheets are appended in appendix 1.

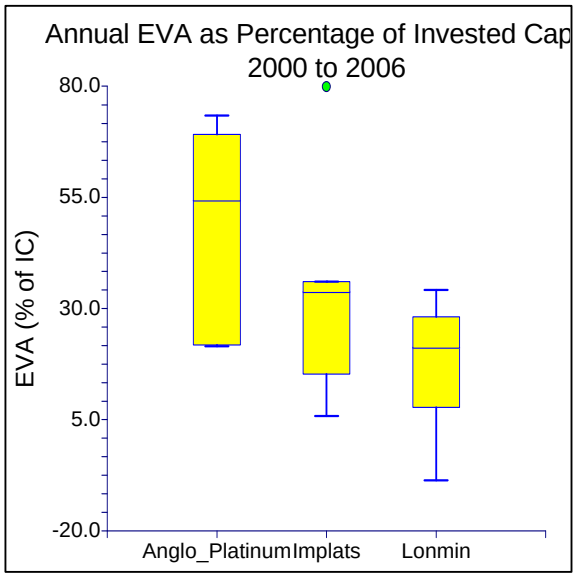
Table 5: Economic Value Added for SA Platinum Mining companies

Year	Anglo Platinum		Implats		Lonmin	
	EVA® (R '000)	EVA® / IC (%)	EVA® (R '000)	EVA® / IC (%)	EVA® (R '000)	EVA® / IC (%)
2000	8,053,037	73.4%	2,000,607	33.8%	(800,133)	-8.7%
2001	9,116,563	69.1%	5,798,765	79.9%	2,890,342	24.6%
2002	8,818,518	61.1%	3,340,298	36.0%	1,077,386	7.8%
2003	7,115,580	44.0%	3,911,838	32.9%	1,054,223	11.4%
2004	4,332,288	21.5%	794,495	5.8%	3,220,684	34.1%
2005	5,463,054	21.8%	2,247,437	15.2%	3,103,988	28.1%
2006	16,861,784	54.4%	5,519,862	33.9%	3,578,531	21.3%
Average	***8,537,261***	***45.6%***	***3,373,329***	***29.9%***	***2,017,860***	***17.4%***

From table 5 it can be seen that Anglo Platinum had a larger EVA contribution per year than both Implats and Lonmin, but Anglo Platinum also has a larger asset base, production output and turnover. It was therefore decided to use the EVA divided by Invested Capital (IC) as the measure for comparative analysis as all companies are expected to generate favourable returns on the capital they invested.

The annual EVA® / IC ratios for the respective companies are presented as box plots in figure 18, and it appears from these graphs as if Anglo Platinum added more economic value during the past seven years than Implats or Lonmin, but in order to determine if the EVA® / IC ratios for the respective companies are statistically comparable, hypothesis testing was used. The results from the hypothesis testing is presented under Hypothesis 2.

Figure 18: Box Plot of annual EVA® / IC for Platinum mining companies for period from 2000 to 2006



Hypothesis 2:

Null Hypothesis (H_0):

The EVA®, expressed as a percentage of invested capital (IC), for the respective mining companies in the South African platinum mining industry are similar.

Alternative Hypothesis (H_A):

The EVA®, expressed as a percentage of invested capital (IC), for the respective platinum mining companies in the South African platinum mining industry are not similar.

Significance Level:

Reject the null hypothesis if there is a less than 5% chance of being wrong (95% confidence level).

Statistical Test:

Because there are more than two sub-groups, the ANOVA test was selected. Because both normality and equal variance were accepted, the normal ANOVA test could be used (see tests of assumptions in figure 19).

Test Result:

The probability from the ANOVA test was 0.025, as presented in figure 19, and the null hypothesis was therefore rejected.

Conclusion:

Because the null hypothesis was rejected it is concluded that there is a significant difference between the means of the EVA / IC ratios for the respective platinum mining companies.

Figure 19: NCSS Statistical output for EVA / IC ratios

Analysis of Variance Report – EVA / IC for period 2000 to 2006

Response Anglo_Platinum, Implats, Lonmin

Tests of Assumptions Section

Assumption	Test Value	Prob Level	Decision (0.05)
Skewness Normality of Residuals	0.6500	0.515693	Accept
Kurtosis Normality of Residuals	0.5892	0.555739	Accept
Omnibus Normality of Residuals	0.7696	0.680575	Accept
Modified-Levene Equal-Variance Test	0.2973	0.746365	Accept

Analysis of Variance Table

Source Term	DF	Sum of Squares	Mean Square	F-Ratio	Prob Level	Power (Alpha=0.05)
A (...)	2	3673.854	1836.927	4.58	0.024717*	0.701217
S(A)	18	7224.326	401.3514			
Total (Adjusted)	20	10898.18				
Total	21					

* Term significant at alpha = 0.05

The results presented in the box plots in figure 18, combined with the fact that the means of the EVA / IC for the respective platinum mining companies were statistically found not to be similar, serves as an indication that Anglo Platinum's EVA /IC is higher than those of Implats and Lonmin, and additional Paired T-tests were run to proof this point.

Figure 20: NCSS Statistical Paired T-Test Report for EVA / IC ratios

T-Test For Difference Between Means Section

Null Hypothesis (H_0)	T-Value	Probability Level	Decission (5%)
Anglo Platinum = Implats	2.5871	0.04134	Reject H_0
Anglo Platinum = Lonmin	2.5881	0.04131	Reject H_0
Implats = Lonmin	1.5224	0.1787	Accept H_0

T-Test For Difference Between Means Section

Null Hypothesis (H_0)	T-Value	Probability Level	Decission (5%)
Anglo Platinum < Implats	2.5871	0.0207	Reject H_0
Anglo Platinum < Lonmin	2.5881	0.0207	Reject H_0

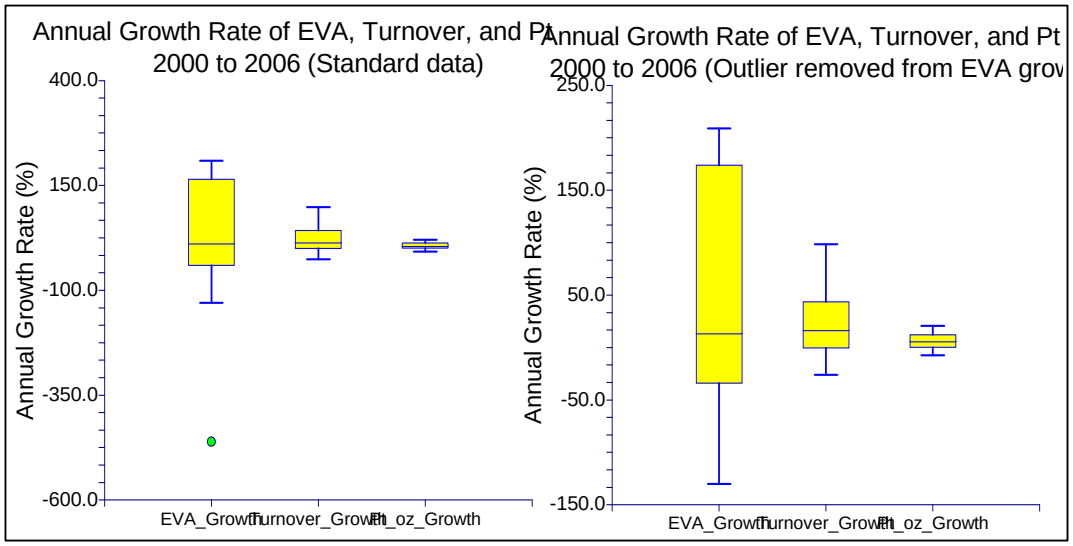
The results for the Paired T-tests presented in figure 20 indicate that both the Null Hypotheses stating that the mean of Anglo Platinum's EVA / IC are equal to or smaller than Implats and Lonmin respectively have been statistically rejected, and it can therefore be concluded that Anglo Platinum's EVA / IC for the past seven years have been higher than both Implats and Lonmin.

5.3 EVA® vs. Turnover and Platinum Production Growth

Annual growth rates in EVA, Turnover and Pt oz production were compared to determine if there was any statistically significant correlation between the respective parameters.

Two box plots for the respective parameters are presented in figure 21 for the period between 2000 and 2006. The first box plot identifes an outlier for EVA growth, identified as Lonmin's 2001 figure, while this outlier has been removed in the second box plot.

Figure 21: Box Plots for EVA, Turnover, and Pt oz Production growth



The linear regression technique was used to determine if there were statistically significant correlations between EVA growth and Pt ounce production growth, and EVA growth and Turnover growth respectively.

Hypothesis 3:

Null Hypothesis (H_0):
The regression coefficient (slope of regression equation) of correlation between EVA growth and Pt oz Production growth, and EVA growth and Turnover growth respectively is zero.

Alternative Hypothesis (H_A):
The regression coefficient (slope of regression equation) of between EVA growth and Pt oz Production growth, and EVA growth and Turnover growth respectively is not zero.

Significance Level:
Reject the null hypothesis if there is a less than 5% chance of being wrong (95% confidence level).

Statistical Test:
The linear regression statistical analysis technique was used for correlation testing.

Test Result:
The linear regression results are presented in figure 22.

Figure 22: NCSS Regression Analysis for period 2000 to 2006

Linear Regression Report

Parameters	*Null Hypothesis (H_0)*	*T-Value*	*Probability Level*	*R^2*	*Reject H_0 (Alpha=0.05)*
EVA Growth vs. Pt oz Production Growth	Slope is zero	-1.756	0.0952	0.1396	No
EVA Growth vs. Pt oz Production Growth (*Excl. outlier)	Slope is zero	-1.142	0.2685	0.0675	No

Linear Regression Report

Parameters	*Null Hypothesis (H_0)*	*T-Value*	*Probability Level*	*R^2*	*Reject H_0 (Alpha=0.05)*
EVA Growth vs. Turnover Growth	Slope is zero	2.0859	0.0507	0.1863	No
EVA Growth vs. Turnover Growth (*Excl. outlier)	Slope is zero	2.7812	0.0123	0.3006	Yes

Conclusion:

The results from the linear regression indicate that there is insufficient statistical evidence to reject the null hypothesis for the EVA vs. Pt oz growth scenarios, and therefore suggest that there isn't a significant correlation between EVA growth and Platinum ounce production growth, for both the standard data and the data excluding the outlier as discussed.

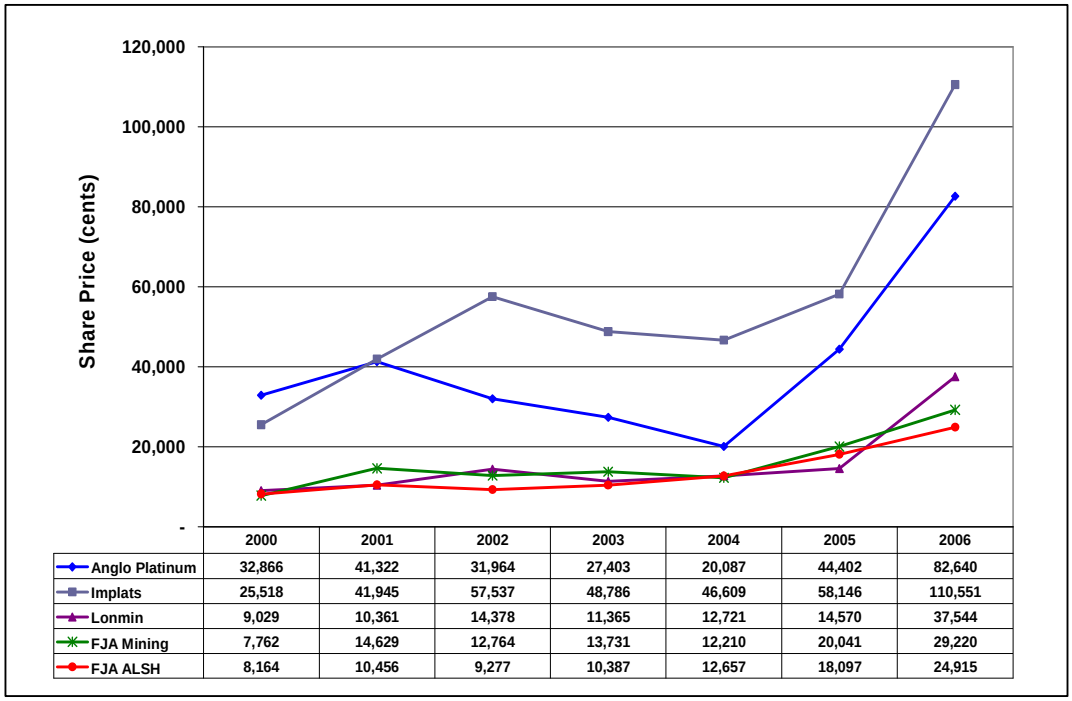
The results further indicate that there is not enough statistical evidence to reject the null hypothesis for EVA growth vs. Turnover growth, and therefore suggest that there isn't significant correlation between EVA growth and Turnover growth for the standard data, but that there is enough statistical evidence to reject the null hypothesis for the data excluding the outlier as discussed, and to suggest that there is a statistically significant correlation between EVA growth and Turnover growth for the platinum mining companies under review.

5.4 Company Share Price

The weighted average annual share prices for the respective platinum mining companies for the past seven years are presented in figure 23 and illustrate

how all three companies under review performed relative to the JSE FJA Mining index and JSE FJA All-Share index.

Figure 23: Share Price performance of Platinum Mining companies



	2000	2001	2002	2003	2004	2005	2006
Anglo Platinum	32,866	41,322	31,964	27,403	20,087	44,402	82,640
Implats	25,518	41,945	57,537	48,786	46,609	58,146	110,551
Lonmin	9,029	10,361	14,378	11,365	12,721	14,570	37,544
FJA Mining	7,762	14,629	12,764	13,731	12,210	20,041	29,220
FJA ALSH	8,164	10,456	9,277	10,387	12,657	18,097	24,915

The annual increases in share price for the respective companies are presented in table 6, and indicate similar average annual growth rates for all three companies, but higher cumulative growth rates for Implats and Lonmin than for Anglo Platinum.

As discussed earlier in chapter 2, EVA proponents promote EVA as a good proxy for share price and found in other studies that it correlates well with share price. In order to test this point, a linear regression analysis technique was used to determine if there was any statistically significant correlation between EVA and share price of the respective selected platinum mining companies.

Table 6: Share Price performance of selected Platinum mining companies

		Anglo Platinum	Implats	Lonmin
1999 Weighted Average Share Price		***18,117***	***16,320***	***5,614***
Annual Growth Rate	2000	81.4%	56.4%	60.8%
	2001	25.7%	64.4%	14.8%
	2002	-22.6%	37.2%	38.8%
	2003	-14.3%	-15.2%	-21.0%
	2004	-26.7%	-4.5%	11.9%
	2005	121.0%	24.8%	14.5%
	2006	86.1%	90.1%	157.7%
Average Annual Growth Rate		35.8%	36.2%	39.6%
Cummulative Growth (1997-2006)		356.1%	577.4%	568.8%
2006 Weighted Average Share Price		***82,640***	***110,551***	***37,544***

Because the analysis is done for each individual company it was decided to use the data for the full ten years, 1997 to 2006, for Anglo Platinum and Implats, in order to provide more points for the statistical analysis, but for Lonmin only the data from 2000 to 2006 could be used due to the financial statements including non-platinum businesses prior to this date as discussed earlier.

Hypothesis 4:

Null Hypothesis (H_0):

The regression coefficients (slope of regression equation) of correlation between EVA and Share Price of respective companies are zero.

Alternative Hypothesis (H_A):

The regression coefficients (slope of regression equation) of correlation between EVA and Share Price of respective companies are not zero.

Significance Level:

Reject the null hypothesis if there is a less than 5% chance of being wrong (95% confidence level).

Statistical Test:

The linear regression statistical analysis technique was used for correlation testing.

Test Result:

The linear regression results for respective companies are presented in figures 24 and 25.

Figure 24: NCSS Regression Analysis output for Share Price vs. EVA

Linear Regression Report

Parameters	*Null Hypothesis (H_0)*	*T-Value*	*Probability Level*	*R^2*	*Reject H_0 (Alpha=0.05)*
EVA vs. Share Price - Anglo Platinum	Slope is zero	6.2110	0.0003	0.828	Yes
EVA vs. Share Price - Implats	Slope is zero	3.2789	0.0112	0.5734	Yes
EVA vs. Share Price - Lonmin	Slope is zero	1.3383	0.2384	0.2637	No

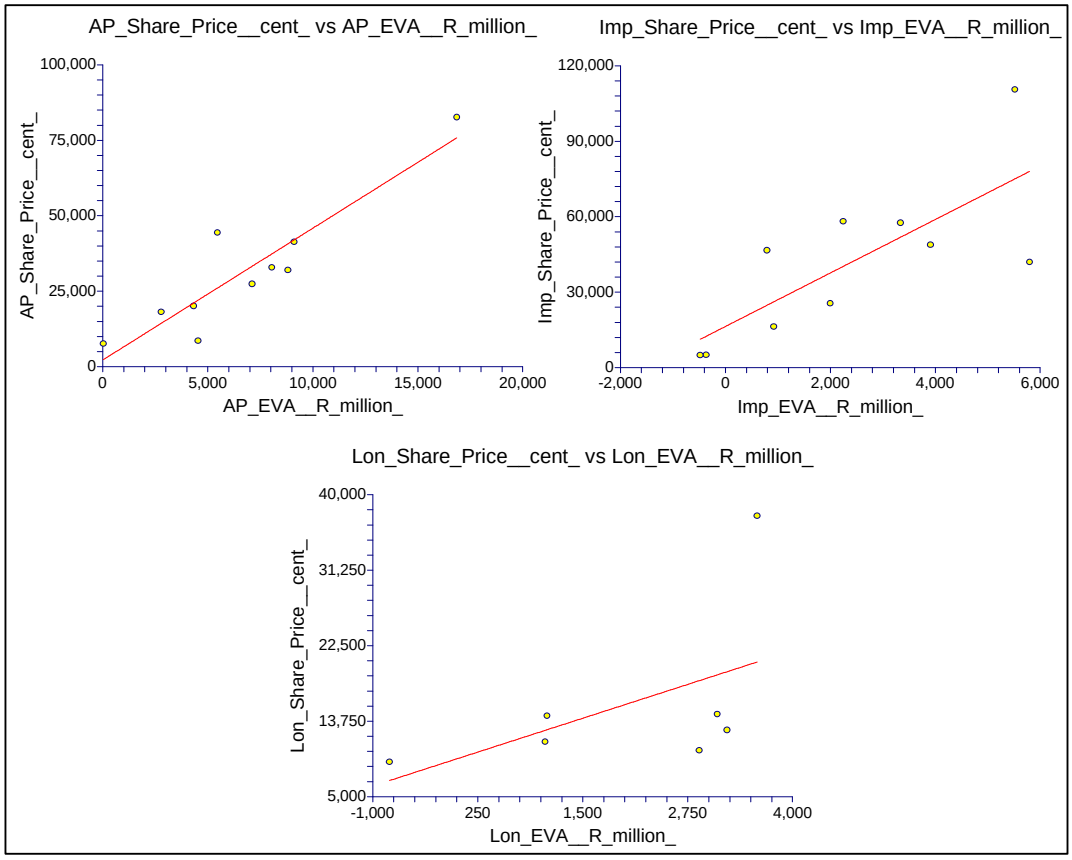
Conclusion:

The results from the linear regression indicate that there is enough statistical evidence to reject the null hypothesis for both Anglo Platinum and Implats respectively, and therefore suggest that there is a significant correlation between EVA and Share Price for these companies.

Unfortunately, based on the regression analysis, there is not enough statistical evidence to reject the null hypothesis for Lonmin, and it suggests that there is not a significant correlation between EVA and Share Price for Lonmin. This

finding may be attributed to the limited data that was available for this company, relative to the others.

Figure 25: NCSS Regression Analysis Plots for Share Price vs. EVA [Anglo Platinum (1997-2006), Implats (1997-2006), and Lonmin (2000-2006)]



5.5 Conventional Performance Measures

Companies and investors use a wide range of conventional performance measures to determine company performance and upon which to base their investment decisions.

Unfortunately not all of these measures address the cost of capital in the same way, and it is the aim of this research to compare some of the more commonly used performance measures against EVA, to determine how they correlate with

a measure that takes the cost of capital into account and provides a true reflection of economic value added.

Table 7: Conventional Performance Measurements

	Anglo Platinum			
Year	EPS (cent)	P/E	ROA (%)	EBITDA (R '000)
2000	3,142	10.5	73.5	3,688,400
2001	3,696	11.2	69.0	10,197,300
2002	2,625	12.2	156.0	12,955,800
2003	972	28.2	75.4	9,669,900
2004	1,138	17.7	63.2	4,495,700
2005	1,947	22.8	72.3	5,661,500
2006	5,374	15.4	93.7	8,391,500
Average	***2,699***	***16.8***	***86.2***	***7,865,729***

	Implats			
Year	EPS (cent)	P/E	ROA (%)	EBITDA (R '000)
2000	3,307	7.7	42.3	1,778,000
2001	7,024	6.0	70.5	3,181,300
2002	6,863	8.4	47.8	6,717,800
2003	5,140	9.5	53.2	6,213,100
2004	3,966	11.8	35.6	4,356,300
2005	4,325	13.4	33.7	2,915,300
2006	6,006	18.4	44.4	6,954,700
Average	***5,233***	***10.7***	***46.8***	***4,588,071***

	Lonmin			
Year	EPS (cent)	P/E	ROA (%)	EBITDA (R '000)
2000	979	9.2	44.4	1,523,566
2001	1,385	7.5	50.7	3,932,406
2002	1,279	11.2	65.8	5,177,997
2003	365	31.2	37.2	3,995,082
2004	629	20.2	86.5	2,122,515
2005	706	20.7	78.6	2,782,080
2006	2,214	17.0	81.9	2,656,992
Average	***1,079***	***16.7***	***63.6***	***3,170,091***

Table 7 contains Earnings per Share (EPS), P/E Ratios, Return on Assets (ROA), and EBITDA data for the respective platinum mining companies for the past seven years. The first three ratios were obtained directly from a McGregor BFA report, while EBITDA was calculated from the standardised McGregor BFA financial statements.

In order to investigate how these conventional performance measures correlate with EVA, the linear regression technique was again utilised to test for statistically significant correlations between EVA and the respective measures for the respective companies.

Hypothesis 5:

Null Hypothesis (H_0):
The regression coefficients (slope of regression equation) of correlation between EVA and the respective conventional performance measures of respective companies are zero.

Alternative Hypothesis (H_A):
The regression coefficients (slope of regression equation) of correlation between EVA and the respective conventional performance measures of respective companies are not zero.

Significance Level:
Reject the null hypothesis if there is a less than 5% chance of being wrong (95% confidence level).

Statistical Test:
The linear regression statistical analysis technique was used for correlation testing.

Test Result:

The linear regression results for respective companies are presented in figure 26.

Conclusion:

The results from the linear regression indicate that there is only enough statistical evidence to reject the null hypothesis for three scenarios listed in figure 26. Only EPS for both Anglo Platinum and Implats (strong correlation) and ROA for Implats were found to have a statistically significant correlation with EVA.

For the rest of the scenarios there was not sufficient statistical evidence to reject the null hypothesis, and to suggest that EVA correlates well with these measures.

Figure 26: NCSS Regression Analysis for period 2000 to 2006

	Parameters	*Null Hypothesis (H_0)*	*T-Value*	*Probability Level*	*R^2*	*Reject H_0 (Alpha=0.05)*
Anglo Platinum	EVA vs. Earnings per Share (EPS)	Slope is zero	4.6300	0.0057	0.811	Yes
	EVA vs. P/E	Slope is zero	-0.7573	0.483	0.103	No
	EVA vs. ROA	Slope is zero	0.6948	0.5181	0.088	No
	EVA vs. EBITDA	Slope is zero	0.7935	0.4634	0.112	No
Implats	EVA vs. Earnings per Share (EPS)	Slope is zero	2.9459	0.032	0.635	Yes
	EVA vs. P/E	Slope is zero	0.1345	0.8982	0.004	No
	EVA vs. ROA	Slope is zero	2.6499	0.0454	0.584	Yes
	EVA vs. EBITDA	Slope is zero	0.9315	0.3943	0.148	No
Lonmin	EVA vs. Earnings per Share (EPS)	Slope is zero	0.7400	0.4926	0.099	No
	EVA vs. P/E	Slope is zero	0.3784	0.7207	0.028	No
	EVA vs. ROA	Slope is zero	2.3813	0.0631	0.531	No
	EVA vs. EBITDA	Slope is zero	0.0256	0.9806	0.000	No

CHAPTER 6 - CONCLUSION

During the past decade the global economy has been booming with global GDP growth rates increasing steadily, reaching its highest levels in 25 years during 2004 to 2006, peaking at 5.25% in 2006 (South African Reserve Bank, 2007).

This growth in the global economy, combined with tighter emission standards and more stringent environmental legislation in Europe, North America and Japan, has been the main driver for global platinum demand during the past decade and set the stage for platinum mining companies to grow into this market.

Due to sustained global growth, increasing commodity prices, and strong consumer demand for platinum, South African platinum mining companies are expected to grow, to deliver superior returns, and to create economic value for shareholders.

Growth

Hypothesis testing techniques have been used to determine if South African platinum mining companies were indeed able to grow and create economic value for shareholders during the past decade.

This study has found that all three primary platinum producers in South Africa, Anglo Platinum, Implats, and Lonmin, were able to grow at statistically similar growth rates, both in terms of platinum ounce production and turnover.

The average platinum ounce production growth rates for the respective companies was between 5.6% and 7.1%, with average annual turnover growth rates between 20% and 28%. The average annual turnover growth rates for the respective companies were higher than the platinum ounce growth rates, due to a combination of higher platinum group metals (PGM) commodity prices and South African exchange rate fluctuation.

Economic Value Added (EVA®)

Based on the South African industry structure and the similar growth rates of these companies during the past decade, it was expected that EVA® for the respective companies should be similar in a growing market.

This study however, found that EVA®, expressed as a percentage of invested capital (IC), was not statistically similar for the respective companies, and hypothesis testing confirmed that the EVA® for Anglo Platinum (45,6%) was statistically higher than that of Implats (29.9%) and Lonmin (17.4%) respectively.

A comparison of the annual increase in EVA® and respective increases in platinum ounce production and turnover indicated that there was no statistical correlation between increase in EVA® and platinum ounce production, and that only a weak (R^2=0.3) correlation between increase in EVA® and turnover was found. This is consistent with the findings discussed so far where the respective companies experienced similar growth but not similar EVA®.

Share Price and EVA®

Knowing that shareholder's wealth culture became increasingly predominant during the past few decades, and that investors don't just consider commercial performance these days, but also consider a company's competitiveness in capital markets (Young and O'Byrne, 2000), and acknowledging that shareholders expect to gain a return for making their funds available to the business, it is expected that share price should correlate well with EVA®.

Statistical linear regression analysis techniques were used to determine the correlation between share price and EVA® for the respective companies. Strong, significant, correlations have been found for both Anglo Platinum and Implats, but there was insufficient statistical evidence to confirm a similar relationship for Lonmin.

Alternative performance measures

Although Economic Value Added (EVA®), as a measure of company performance, has been widely adopted by companies and securities analysts globally, its use in South African platinum mining companies has been limited to date, and most companies and analysts still rely on conventional performance measurements.

Among the alternative performance metrics (EPS, P/E, ROA, EBITDA) tested, EPS was the only metric found to have a notable correlation with EVA® and then only for Anglo Platinum and Implats. The correlation between the other metrics and EVA® was found not to be statistically significant. This might be an indication that these measures don't reflect the true economic performance of these companies.

Recommendation

With economists still forecasting a favourable global economic environment and world markets to retain their momentum in the near future (South African Reserve Bank, 2007), and considering the favourable platinum market outlook for the future (Johnson Matthey, 2007), South African platinum mining companies should be able, and will be expected to continue growing and to add economic value for shareholders.

It is recommended that South African platinum mining companies measure, manage, and communicate EVA® to shareholders in order to demonstrate true economic value added.

Future research

This study focused on EVA® and its respective relationships with other parameters in the three largest, dominant, platinum mining companies, and it would be of interest to determine if these same trends and relationships exist in the smaller, minor, players in the market, who often operate according to different business models.

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