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COMPARISON OF CAPITAL ASSET PRICING MODEL AND GORDON'S WEALTH GROWTH MODEL FOR SELECTED MINING COMPANIES

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A research report submitted to the Faculty of Engineering and the Built Environment, University of the Witwatersrand, Johannesburg, in partial fulfilment of the requirements for the degree of Master of Science in Engineering.

Johannesburg, 2015

DECLARATION

I declare that this research report is my own, unaided work. It is being submitted to the Degree of Master of Science to the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination to any other University.

Signed:

_____

Adeodatus Sihesenkosi Nhleko

This _____ day of _____year_____

ABSTRACT

Capital is a scarce resource globally and mining projects must compete with projects from other sectors for this resource. A decision to invest available capital in mineral projects requires that valuation be conducted to assess the expected return on the projects. The discounted cash flow (DCF) analysis method is commonly used for the valuation of mining projects whereby future cash flows are discounted to present value using a discount rate. Economic and finance theory provides valuable tools to calculate discount rates. However, there is often uncertainty on an appropriate discount rate to apply to a project, as the discount rate must account for such factors as risk and stage of development of the project, despite the significant impact this parameter has on the outcome of a valuation.

There are several methods for determining the cost of equity. This study considers the commonly applied Capital Asset Pricing Model (CAPM) and Gordon's Wealth Growth Model because of their simplicity and availability of parameters required to estimate the cost of equity. CAPM and Gordon's Wealth Growth Model are based on different assumptions, resulting in differences in the estimated cost of equity. This study explores how differences in the cost of equity obtained by these two methods can be explained for a mining company environment and proposes a way forward.

These models have theoretical superiority when estimating the cost of equity. However, the final test of any model must be on the accuracy of its estimates. The relationship between estimated cost of equity and actual cost of equity represented by the equity component extracted from Weighted Average Cost of Capital (WACC) values from the Bloomberg database was examined. It was observed from the analysis that the empirical performance of CAPM and Gordon's Wealth Growth Model was severely affected by numerous uncertainties in the global economic markets during the period under review.

The application of CAPM and Gordon's Wealth Growth Model during economic instability renders these models improper to estimate the cost of equity for mining companies reliably. Gordon's Wealth Growth Model seemed to be more superior over CAPM based on the graphical presentation and statistical analysis applied in the

research. Therefore, this research recommends that Gordon's Wealth Growth Model be used to estimate the discount rates for mining companies during a state of economic market instability.

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1 INTRODUCTION

1.1 Background

The first step in project valuation is an investment decision which is based on a cash flow analysis. Once the project is deemed viable, the next vital step is to make a financing decision. Financing looks at the best financing option available for the project. This option can be all-equity financing; all-debt financing or a mixture of the two, depending on the availability and cost of the funding options. The weighted sum of debt and equity is called the Weighted Average of Cost of Capital (WACC) which is the after-tax cost of capital. The cost of debt is derived from the interest rate adjusted for the tax rate, normally fixed for the length of the loan, which needs to be paid to the lender irrespective of the financial performance of the business. The cost of equity can be calculated using the commonly applied Capital Asset Pricing Model (CAPM) or Gordon's Wealth Growth Model, although there are other less commonly used methods such as the Arbitrage Pricing Theory (APT).

The cost of equity is defined as the expected return on an asset's common stock in capital markets (Witmer and Zorn, 2007). There is a risk that the investor may not receive the expected return; therefore, investors are expected to take the risk of the investment into account when determining the returns they want to receive. There is a relationship between risk and expected return of a stock; the greater the risk, the greater is the expected return on investment the investor expects (Fehr, 2010).

It is vital then that a proper analysis of a stock is done in order to determine its true value and forecast future returns. According to Witmer and Zorn (2007), estimating the cost of equity is not a straightforward exercise; different assumptions and methods result in different answers. Hence, this study undertook an analysis of the cost of equity estimation, considering the differences in the commonly applied CAPM and the Gordon's Wealth Growth Model.

1.2 Problem statement and research question

CAPM relies on historical data to estimate the beta (β) value, which is used to calculate forward looking returns. This process is based on a premise that past

performance of an entity is a good estimator of expected future returns. This proposition is not entirely correct because there are periods in the past where unexpected returns were realised due to events not captured by the beta value. Therefore, unreliability in estimated beta values results in the need to explore the use of forward looking models such as Gordon's Wealth Growth Model in estimating a more appropriate estimate of the cost of equity.

Gordon's Wealth Growth Model is based on a principle that dividends grow at a constant rate to perpetuity. It is difficult to realise this proposition because of volatility in earnings and uncertainty in estimates of expected inflation and real growth in the economy (Stowe et al, 2007; Damodaran, 2002).

CAPM and Gordon's Wealth Growth Model are based on assumptions, which may result in difficulty when applied in real investment problems. Therefore, care must be exercised to appreciate the constraints of the underlying assumptions. This raises the question: *"How can differences in cost of equity obtained by these two methods be explained for a mining company environment?"*

1.3 Significance of the research

The South African mining industry is the fifth largest contributor to the country's gross domestic product (GDP) with an 8.8% contribution between 1993-2011 (Lane and Kamp, 2012). The industry has also contributed to the establishment of secondary industries and encouraged development of efficient and widespread infrastructure. Owing to the nature of mineral resource assets, it is essential to continuously reinvest. Capital investment is vital in the mining sector in order to sustain and/ or expand production, implying that continual investment is necessary. Mining projects require large amounts of upfront capital injection to establish a mine with long payback periods when compared to other sectors (Smith et al, 2007; Benning, 2000; Park and Matunhire, 2011; Van Wyk and Smith, 2008).

Investors can put their capital in many different projects away from mining projects. Therefore, a decision to invest the capital in mineral projects requires that valuation be conducted to assess the expected return on the projects. Use of Discounted Cash Flow (DCF) analysis to forecast the value gained (future cash flows) is accepted as a

primary method of project valuation and investment decision making (Park and Matunhire, 2011; Smith et al, 2007; Janisch, 1976).

Selection of an appropriate discount rate is fundamental to an accurate and valid assessment of the value of any mineral project. The discount rate is applied to cash flows in estimating the value of an asset and it is used as the rate of return for an investment. A discount rate that is lower than the true rate will overvalue the project resulting in the commissioning of an uneconomic project. A discount rate that is higher than the true rate will undervalue the project resulting in the rejection of a financially viable project. Hence, it is important to estimate the discount rate as close to the true discount rate as possible. Therefore, valuation should incorporate a thorough and objective analysis in determining an appropriate discount rate reflecting the acceptable returns matching with the project's risk profile and market conditions (Ballard, 1994). It is important to identify a model that can be used to reliably estimate the appropriate discount rate.

1.4 Outline of chapters

Chapter 1 defined the problem statement, posed the research question and provided the significance of the research. In addition to the introductory chapter, the remainder of this report is structured as briefly discussed in the rest of this paragraph. Chapter 2 (Literature review) compares and contrast models (including literature incorporating all the major parameters that are present in the proposed study). Chapter 3 (Research methodology) outlines the tasks carried out in order to achieve the set objectives. The tasks include data used in the project; method for sample selection is discussed in detail; and data analysis. Chapter 4 (Results and discussion) presents the results of data analysis in light of the research question. Chapter 5 (Conclusion and recommendations) presents implications of the results. Recommendations for future research are discussed.

2 LITERATURE REVIEW

2.1 Introduction

After projecting the free cash flow of a project, it is important to determine the present value of the cash flow. Future cash flows of any project need to be discounted to present value in order to be able to perform valid comparisons with current cash flows. This requires determination of an appropriate discount rate, which is used to calculate the net present value (NPV) of the cash flow stream. Investment in a mining project is economically justified when the NPV is positive (Rudenno and Seshold, 1983). The concept of discounting cash flows is broadly accepted. However, selection of the appropriate discount rate is widely debated and there is no agreement on the appropriate model to utilise (Hartman et al, 1992). There is, therefore, no certainty that the discount rate a company uses is the correct one for that company. A discount rate can be defined as the opportunity cost of providing capital to a firm or simply referred to as the firm's cost of capital (Lilford, 2006).

The cost of capital is determined as the weighted cost of various sources of finance used in the investment (i.e. debt, equity and/or preferred stocks) and is called the weighted average cost of capital (WACC). The weighted average cost of capital is used as a proxy of the minimum rate at which free cash flows should be discounted such that the capital used to finance the project yields the return at least equal to the cost associated with securing the funds (Lilford, 2006). Consequently, the cost of capital represents the discount rate also known as the hurdle rate.

Economic and finance theory provides valuable tools to calculate discount rates. However, care must be taken when using these tools to calculate discount rates for mining companies. This is because of gearing associated with a beta, pre- or post- tax determinants, real or nominal applications and how project dependent technical risks are dealt with (Smith, nd.). The discounted cash flow analysis method is commonly used for the valuation of mining projects. However, there is no agreed method for determining a discount rate. In this method, cash flow uncertainties are accounted for using a single discount rate, the risk-adjusted discount rate.

A discount rate for a mining operation varies depending upon the type of risk and other variables, such as long-term risk-free interest rate, perceived mineral property risks

and country risk (Lilford, 2011; Ellis and Collins, 2013). Discount rates differ for different stages of a mineral property's development stage and also depend on the purpose of the valuation. For instance, owners and purchasers will select different discount rates for the same mineral project (Ellis, 1995). There are several problems with regard to the selection of an appropriate discount rate for mineral properties; these include:

- CAPM is a one period pricing model; single period representation of risk tends to be inappropriate for mineral projects. This is because mineral projects have economic lives over cyclical periods of unpredictable growth and declines;
- Most mining companies use CAPM to compute the cost of equity; this model depends largely on historical information to compute a forward-looking cost of equity. However, in some instances, the past does not accurately predict the future which results in the application of an incorrect discount rate;
- Gordon's Wealth Growth Model attempts to alleviate the problem of relying on historical information to predict the future. This model compares the stream of projected future dividends with current share prices. However, the mining industry has business cycles therefore estimates of future dividends are subject to large errors;
- Discounted cash flows use constant discount rates which can bias mineral project alternatives;
- The discount rate is affected by the debt to equity ratio. In mining companies the ratio of debt to equity levels sometimes changes, therefore, application of a constant discount rate for a mining project is inappropriate (Lilford, 2011);
- The use of multiple discount rates in mining projects may be reasonable. According to Smith (nd.), during the evaluation period, the available information of the project is no better than the knowledge obtained in the intermediate stage of the project. Therefore, only when these project stages approach and pass will the knowledge of them be enough to apply a lower discount rate in the evaluation.

The last point emphasises the importance of selecting the correct discount rate at the beginning of the project's life. The parameters used in determining the discount rate are a function of uncertainty. Therefore, a valuer has to strive to ensure that the project

assessment incorporates the very best and robust forecast that can be used. Lilford (2011) suggested that project risk should not be accounted for in a discount rate but a certain rate be applied on a discounted cash flow to determine the NPV of the project.

There are several methods for determining the cost of equity. However, this project considers the commonly applied CAPM and Gordon's Wealth Growth Model because of their simplicity and availability of parameters required to estimate the cost of equity. The main reasons for using original models are as follows. In CAPM, the factors that determine asset prices are known and it is a widely used model in the mining industry to estimate cost of capital. In Arbitrage Pricing Theory (APT), the appropriate factors that determine asset prices are not known *ex ante* therefore it is not an easy and verifiable model when applied in cost of equity estimation.

Another version of CAPM is the International Capital Asset Pricing Model (ICAPM). In this model investors can invest in assets across national markets thus investment decisions will be guided by risk to return trade-offs available in all capital markets. The validity of this method depends on the regulator's assumptions about the extent of integration of national markets and international portfolio diversification of investors. In reality, national markets are segmented thus usage of CAPM remains strong. Gordon's Wealth Growth Model requires fewer parameter estimates and it depends on robust and unbiased earnings or dividend growth forecasts. The Gordon's Wealth Growth Model is therefore a viable alternative to the CAPM (Sudarsanam et al, 2011). These two models are popular in finance theory and practice for estimating the cost of equity and they are discussed in the next sections.

2.2 Capital Asset Pricing Model

Security prices result from different analyses of different information accompanied by different conditions and preferences relevant to a particular investor. Therefore, it is necessary to have some standard principles that have to be employed when estimating security prices. In 1952, Markowitz introduced the foundations of portfolio management. In the early 1960s, William Sharpe, John Lintner and Jan Mossin developed the CAPM. CAPM describes the relationship between risk and return in an efficient market. An efficient market is one where the market price is an unbiased

estimate of the intrinsic value of the investment (Damodaran, 2002). CAPM is regarded as a single factor model because it is based on the hypothesis that the required rate of return can be predicted by using a single factor i.e. systematic risk. Thus, the expected return is independent of firm-specific risks.

The systematic risk prevalent in any investment is represented by beta (ß). The beta is typically calculated as the historical volatility of a company's shares compared to the market and is therefore a proxy for risk. A minimum level of return required by the investor results when the actual return on an asset is equal to the expected return $E(R_i)$, this is known as risk free return (R_f). CAPM is a one-period mean-variance portfolio model that is based on a number of assumptions, which will be discussed in this section. CAPM assumes that an investor will only hold a market portfolio. A market portfolio (m) is defined as a portfolio which an investment into any asset is equal to the market value of that asset divided by the market value of all risky assets in the portfolio. The formula shown in Equation 2.1 is the CAPM equation for estimating the rate of return:

$$E(R_i) = R_f + \beta_i[(E(R_m) - R_f] \qquad (2.1)$$

Where $E(R_i)$ is the expected return (cost of equity) on an asset, i. R_f is the risk free rate and can be obtained from a totally safe investment (Rudenno and Seshold, 1983). When estimating this parameter it is vital to use a rate on long-term Treasury bonds (T-bonds) because common stocks are long-term securities; Treasury bills are more volatile than T-bonds. When using CAPM to estimate the cost of equity, the theoretical holding time horizon is the life of the project. Thus a rate on long-term T-bond is a logical choice for the risk free rate (Brigham and Ehrhardt, 2007).

The term $E(R_m) - R_f$, represents the market risk premium, where $E(R_m)$ is the expected return on a market portfolio. Since most investors are risk averse, they require a risk premium to induce them to invest into a risky asset instead of a low risk investment. Market risk premium can be estimated by using historical data (historical realised returns on stocks and T-bonds). The major challenge associated with the

market risk premium is deciding over what length of time the market return should be measured (Rudenno and Seshold, 1983).

The multiplier of the risk premium is called beta (ß), the measure of systematic risk. Beta can be defined as the expected covariance of returns from an investment to the return from a diversified portfolio (McDonald, 1993). The security market line (SML) in Figure 2.1 shows the expected return- beta relationship. SML is valid for both efficient portfolios and individual securities, thus if the assumptions of CAPM are to hold, all securities must lie on the SML in market equilibrium (Bodie et al, 2002). Sections 2.2.2 to 2.2.4 provide a detailed discussion of the parameters for CAPM.

In a market portfolio, each investor will hold a portfolio along the line R_f with R_m in expected return; standard deviation of the return space is called the security market line. The security market line describes all efficient portfolios (Figure 2.1) (Elton and Gruber, 1995).

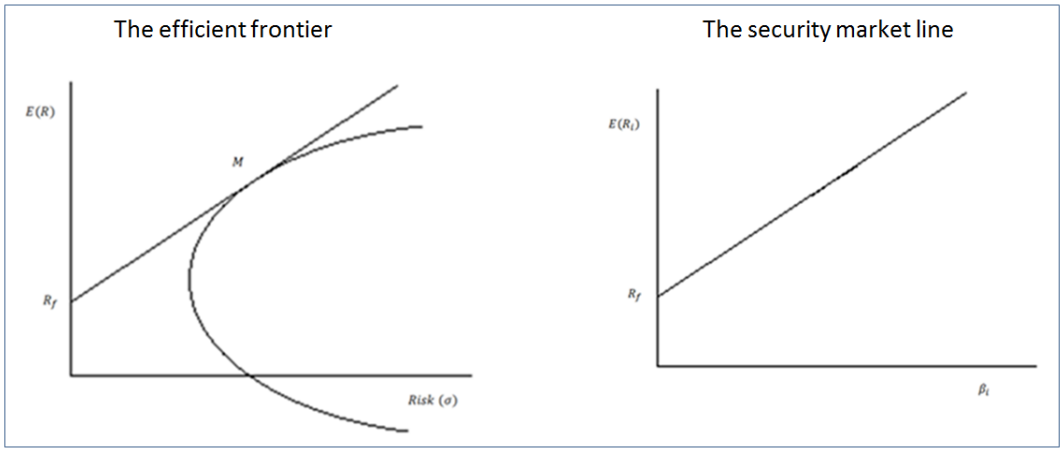


Figure 2.1 Efficient frontier and the security market

Source: Elton and Gruber (1995)

The return on an efficient portfolio (r) will be given by the risk free rate (R_f) plus market price of risk times the standard deviation of return on the efficient portfolio $(\frac{R_m - R_f}{\sigma_m})\frac{\sigma_{im}}{\sigma_m}$. Beta is usually estimated as the slope coefficient in a regression, $\frac{\sigma_{im}}{\sigma^2{}_m}$ (Brigham and Ehrhardt, 2007; Elton and Gruber, 1995). This relationship describes the equilibrium return on all assets and portfolios (Elton and Gruber, 1995). The basic premise of this

model is that there is a linear relationship between expected return and risk, that is, a high risk investment must yield high return.

2.2.1 Evaluation of the CAPM assumptions

CAPM envisages that the rate of return on a risky stock is a linear relationship between the risk-free rate and the equity risk premium with the stock's beta. The simplicity of this model may explain its dominance in application amongst practitioners. This simplicity comes at a price because the assumptions underlying this model are restrictive, hence it has been criticised in various studies.

CAPM is a one-period mean-variance portfolio model derived from the following assumptions (Krause, 2001; Wright et al, 2003; Macintosh, 1983):

- No transaction costs and taxes, therefore buying and selling of assets can be performed with ease. In reality, transaction costs can arise from commission and spreads paid on trading assets. Gains and losses associated with tax effects and book accounting could result from trading. Relatively small fixed transaction costs may impose substantial restriction in the number of assets traded;
- There are no restrictions, thus an investor can invest into every asset;
- Investors are price takers (acting as if their own trades do not affect security prices);
- The model uses only one-time period. An investor is always faced with a sequence of consumption-investment decisions, one for each period;
- Investors maximize expected utility by only considering mean and variance of returns and have the same one-period investment horizon. In the real world, investors do not have the same investment horizon because they have different risk appetites;
- Investors have identical expectations of mean and variance of returns. Investors have different expectations obtained from research studies and are most likely to be influenced by other investors in the market. However, it was found that the homogeneity of beliefs assumption does not play a critical role vis-à-vis the market equilibrium solution of the CAPM;
- There is unlimited borrowing and lending at the risk free rate;

- Unlimited short selling of shares is permissible;
- Assets are indefinitely divisible as to the amount held. The market portfolio should include all types of assets that are held in an investment. In reality, such a market portfolio is unobservable and it is interchanged with a stock index as a proxy for the true market portfolio. Unless the exact composition of the true market portfolio is known, the likelihood of the proxy being mean-variance with the true market portfolio is unverifiable (Roll, 1977).

The empirical test of the CAPM would be straightforward if the expected returns, beta values were known and market portfolio clearly identifiable. Regrettably, in practice none of these parameters are known, thus, must be estimated in order to perform empirical tests. While the assumptions appear unrealistic, the final test of the model should be on the reliability of its estimates.

2.2.2 Beta estimation

Beta indicates the riskiness of an investment when compared to the market as a whole; the market has a standardized beta value of 1. If an investment has a beta value that is less or greater than the market beta value, it means that it is less or more riskier than the market overall risk (Rudenno and Seshold, 1983). Beta values play a vital role in determining the expected return on an investment thus care needs to be exercised when estimating beta values. Otherwise, a project can be over- or undervalued which will have direct consequences on the expected returns. Generally beta values are calculated based on historical data and then assume that the *ex ante* volatility will be the same as it was in the past (Brigham and Ehrhardt, 2007). Elton and Gruber (1995) asserted that over a long time horizon, actual events can be used as proxies for future expectations. This supports the notion of using historical data to estimate future values.

Historical data is utilised to estimate beta using regression analysis. The ability of using historical data to predict future values of beta is determined by calculating the deviation between predicted betas and actual betas for the same period (Damodaran, 2002).

Another problem with beta estimation is the choice of data points. There is no notional guidance as to the correct holding period over which to compute the returns. For instance, monthly data has fewer data points than weekly or daily data over the same estimation period as a result the value of beta estimated using any of the holding intervals will be different. The beta coefficient decreases as the number of data points drop and the standard error declines when daily data is used relative to the monthly data for the same estimation periods. Therefore, daily data should be utilised for estimation of beta coefficient.

However, Kirtley (1994); Groenewold and Fraser (2000) and Brigham and Ehrhardt (2007) stated that daily data has many non-trading periods, thus, reflecting an inaccurate systematic risk profile for the share of an asset against the market index. The full effect of new information does not immediately reflect in prices because of delays in price adjustment. The share price for a mineral asset sometimes take days to react to market news and so using short return interval will yield erroneous systematic risk. However, using a return interval that is long enough, such as monthly, can reduce the bias introduced by price adjustment delays (Odabasi, 2003). According to Bradfield and Munro (2011), using weekly and daily data is ineffective because it introduces a substantial error that can bias the estimate. Monthly data prevents the underestimation of beta values because of thin trading effects.

Empirical evidence shows that beta values are not stable over time. The instability of the betas depends on the length of the period over which they are estimated and the length of the period over which they are applied to forecast the future returns. Accordingly, it is important to accommodate the instability in the procedure employed to estimate the beta values. The instability in betas may be contained by assuming that the betas are constant over a short-period of time and can be assessed using a suitable estimation technique such as the ordinary least squares (OLS). Typically, beta coefficients are estimated as a constant parameter in the OLS technique (Kirtley, 1994; Groenewold and Fraser, 2000).

Research has shown that the trade-off between the logic to include more data points and concerns about beta stationarity is best addressed by calculating beta using five

(5) years of monthly returns, that is 60 data points per period (Bradfield and Munro, 2011; Groenewold and Fraser, 2000).

Blume (1971) and Vasicek (1973) stated that beta has a tendency to regress to one over time. The beta regression to one is argued to be due to economic and statistical reasons. For instance, a mining company with risky assets (high beta) will seek to reduce its level of exposure to risk. On the other hand, a firm exposed to low risk (low beta) will venture to riskier projects in order to improve its returns and that can cause an increase to the value of beta. The beta values are estimates, thus, sampling errors may cause some variations away from the market beta of one. Blume and Vasicek developed different formulae for correcting beta estimates, these formulae are shown below:

Blume's technique: $$\beta_{it+1} = 0.343 + 0.677\beta_{it} \quad (2.2)$$

Where:

β_{it+1} is the adjusted beta;

β_{it} is the beta of the security calculated from historical data.

Vasicek's technique: $$\beta_{2i} = \frac{{\sigma_{\bar{\beta}_1}}^2}{{\sigma_{\bar{\beta}_1}}^2 + {\sigma_{\beta 1i}}^2}\beta_{1i} + \frac{{\sigma_{\beta 1i}}^2}{{\sigma_{\bar{\beta}_1}}^2 + {\sigma_{\beta 1i}}^2}\overline{\beta}_1 \quad (2.3)$$

Where:

β_{1i} and $\overline{\beta}_1$ denote the beta values for the security and sample respectively;

${\sigma_{\bar{\beta}_1}}^2$ is the variance of the distribution of the historical estimates of beta over the sample;

The square of the standard error of the estimate for beta for security i for time period *t* is represented by ${\sigma_{\beta 1i}}^2$;

β_{2i} is the adjusted beta value.

According to Diacogiannis (nd.), beta adjustment techniques are effective in reducing the forecast errors associated with higher or lower security betas and less effective for beta values near unity. There is consensus that the observed beta values do tend

toward unity and that using the adjustment techniques of Blume and Vasicek improves the estimated beta. However, there is no conclusive preference for either of these methods. Blume's technique was adopted for this report to adjust historical betas because of its simplicity and logic.

2.2.3 Risk-free rate

Risk-free rate is the expected rate of return on an asset earned on a riskless investment i.e. where the risk of default is zero and the actual return and the expected rate of return are equal when the investment matures (PricewaterhouseCoopers, 2013). In reality, it is difficult to find a riskless investment, since some form of reinvestment risk tends to exist. However, most companies use yields on government securities as a proxy for the risk free rate, simply because they are considered safe and liquid instruments with a negligible or zero default risks.

There is a consensus that the government security is the appropriate proxy for risk-free rate, but there is no agreement as to whether or not this security should be short-term T-bills or long-term T-bonds (Damodaran, 2008). Treasury bills have been favoured in the past (Mukherji, 2011; Macintosh, 1983), however, there is an increase in popularity of using T-bonds. The popularity of T-bonds is based on the fact that the minimum return required by investors generally surpasses the T-bill rates. T-bonds have a higher yield than T-bills to compensate investors for being without their funds for longer periods. Hence, T-bonds are used as a proxy for risk-free rate to reconcile theory and practice (Fama and French, 2004; Strydom and Charteris, 2009).

T-bills are more consistent with the CAPM as a single period model and reflect the true risk-free rate in the sense that investors avoid losses in value from interest fluctuations. Conversely, Kirtley (1994) argued that T-bills carry fluctuation risk over time because they are influenced by the central bank. Therefore, an investor must be rewarded for the risk by obtaining a return above the compensation for illiquidity and inflation. On the contrary, Firer and Bradfield (2002) indicated that even though T-bonds offer fixed income and small likelihood of defaulting by the government, alike to T-bills, they are sensitive to variations in inflation and real interest rates. Consequently, they cannot be considered as a risk-free rate. T-bills are better proxies for the risk-free rate than long-term T-bonds irrespective of the investment horizon as evinced in the findings of Mukherji (2011).

Studies show that the greater discrepancy between T-bills and T-bonds is only evident when the investment horizon does not match the maturity of the project being assessed. The investors buying T-bonds usually have long-term investment periods then short-term variations are unlikely to have impact on their wealth position. Hence, these investors do not require compensation for the volatility in the returns earned on the investment (Strydom and Charteris, 2009). Strydom and Charteris (2009, 2013) and Damodaran (2008, 2012) pointed out that the risk-free rate used has to match up the duration of the project under review.

The risk of inflation and liquidity introduced by T-bonds on an investment is considered appropriate for long-term investments that are equally subject to inflation and liquidity risks. However, this will hold provided the investment horizon is the same as that of the applied rate. Mining investments are long-term oriented, thus when estimating the risk-free rate it is important to use long-term T-bonds as a proxy. When using CAPM to estimate the cost of equity, the theoretical holding time horizon is the life of the project. Thus, a rate on long-term T-bond is a logical choice for the risk free rate.

When using South African government bonds to determine discount rates one has to take into account that these bonds are taxable in the holder's hands. Subsequently, the risk-free rate of the return on the government bond has to factor in the effects of tax when applied to an after-tax cash flow (Lilford, 2011).

2.2.4 Equity risk premium

Equity investment is associated with higher risk as compared to fixed-interest investments like T-bills. Therefore, investors will expect to obtain compensation for assuming risk over and above the return receivable on a riskless asset. The equity risk premium is a forward-looking expectation of the excess returns that the market as a whole will achieve over a risk-free investment. Equity risk premium is interchangeably referred to as risk premium, equity premium or market premium.

The premium is calculated using Equation 2.4:

$$ERP = R_m - R_f \qquad (2.4)$$

Where:

ERP is the market premium;

R_m is the expected return from the market;

R_f is the risk free rate.

Therefore, the important estimates to determine ERP are the return on the market and the risk free rate. The return on the market is linked to debate about the choice of the market risk proxy. There is a wide disproportionality in the research results around the estimates of the ERP. The estimation of the equity risk premium appears to be highly variable depending on the period selected; risk-free rate; the method of weighting and the method of averaging employed.

Wright et al (2003) indicated that a true measure of the risk premium that investors expect from equities over riskless assets is unmeasurable. Therefore, only returns received in the past are measurable. There is consensus among various authors that the market risk premium estimated over a long period provides a better estimate for equity premium because short-term volatility does not influence the estimated value. Firer and Bradfield (2002) argued that when estimating ERP, T-bills should be preferred over T-bonds because the T-bonds are sensitive to changes in expectations of inflation and real interest rates. The effect of changes in inflation and real interest rates on T-bonds will yield a lower ERP. Hence, T-bills are a preferred risk-free rate proxy.

However, when the discounted cash flows emanate from projects that have long investment horizons such as mineral projects, T-bonds are a preferred risk-free rate benchmark. The T-bonds are a better proxy because their prices reflect not only short-term interest rates but also future expected rates. Therefore, there will be less bias in the estimate resulting from short-term volatility; the estimate will be more precise as the standard error will decline for the same standard deviation (Damodaran 2012).

Digby et al (2006) stated that the arithmetic average of the long-term historical excess equity returns is the widely used technique for estimating an unbiased expected ERP. In a contrary argument, Kirtley (1994) proposed that the geometric average return be calculated for investors who hold shares that experience a process of continuous compounding. Conversely, the CAPM is a single period model thus implying that the

arithmetic mean return methodology be used to estimate the market return. Damodaran (2012) and Wright et al (2003) suggested that the geometric return be used because the arithmetic returns on stocks are negatively correlated overtime. Thus, the arithmetic average return is likely to overstate the premium. The estimates of risk premium determined using geometric means are smaller than that of arithmetic means. Nonetheless, the geometric mean is applied because it produces estimates of the equity premium that are consistent with economic theory predictions (Stowe et al, 2007).

Wright et al (2003) and Damodaran (2012) aforesaid that it is vital to treat the historic averages of market risk premium and risk-free return consistently in order to reduce the standard deviation from the true value. Brigham and Ehrhardt (2007) stated that there is no way to prove that a particular risk premium is either right or wrong but one must be suspicious of an estimated market risk premium that is less than 3.5% or more than 6%. Therefore, this ERP range acts as a guideline when selecting the market risk premium.

2.3 Gordon's Wealth Growth Model

Gordon's Wealth Growth Model was developed by Gordon and Shapiro in 1956 and Gordon in 1962 based on the premise that dividends grow at a constant rate to infinity. However, this assumption is not true in reality because projections of dividends cannot be made indefinitely; hence, various versions of the dividend discount model have been developed. These models are based on different assumptions concerning future growth. Gordon's Wealth Growth Model is regarded as the simplest form of dividend discount models. This model is used to value stock of a firm that has stable growth and pays out dividends (Stowe et al, 2007; Damodaran, 2002).

This model assumes that the stock is equal to the present value of all its future dividend payments. The predicted dividends are discounted back to their present value. Gordon's Wealth Growth Model is well suited for evaluating firms that have well established policies on dividend pay-outs and growth rate comparable or lower than the small growth in the economy (Damodaran, 2002). The expected growth rates may vary amongst firms but the dividends growth rate for most mature companies is expected to be the same rate as the nominal gross domestic product (GDP). Nominal

gross domestic product is given by real GDP plus inflation (Brigham and Ehrhardt, 2007).

2.3.1 Assumptions of Gordon's Wealth Growth Model

Foerster and Sapp (2005) and Foerster (2011) found that Gordon's Wealth Growth Model performs well in explaining the observed prices under the said assumptions than other sophisticated and arguably realistic models. The underlying assumptions of Gordon's Wealth Growth Model are as follows (Rudenno and Seshold, 1983; Kibido, 2003):

- The current share price of a company's share is the same as the discounted value of all expected future share dividends;
- The capital structure of the entity is preserved and a proportion of earnings are retained for re-investment purposes;
- The earnings and dividends grow at a constant rate to infinity;
- Investors expect to receive the same return on the retained earnings as they do on the existing equity.

The drawbacks of Gordon's Wealth Growth Model are summarised below:

- There is no evidence in dividends for constant growth to perpetuity. Furthermore, companies do not distribute all their earnings as dividend payout, directors may decide to retain all of the profit for re-investment to maintain company growth;
- It is evident that the expected rate of return changes over time as the financial market fluctuates. Subsequently, the assumption that investors expect the same return on retained earnings as the current stock cannot be sustained;
- Determining the expected future dividends growth rate, *g*, is difficult because forecasting errors have direct effect on the estimate of return rate.

Gordon's Wealth Growth Model has strengths and weaknesses. The strengths of this model are that it:

- Offers a way of estimating expected rate of return given efficient prices;
- Is vital for understanding the relationship between growth and value, required rate of return and pay-out ratio because of its simplicity;

- Is useful for valuing companies that have stable growth rates and pay dividends.

The weaknesses of this model are that:

- Calculated values are sensitive to the estimated rate of return and growth rate;
- In practice, this method cannot be applied to firms that are not paying dividends;
- Even if a company pays dividends, it has to have stable growth for the proper application of this model (Stowe *et al*, 2007).

2.3.2 Gordon's Wealth Growth Model parameters

The model's expected rate of return is calculated by using Equation 2.5:

$$r = \frac{D_{t-1}(1+g)}{P_t} + g = \frac{D_t}{P_t} + g \qquad (2.5)$$

Where

r represents the investors required rate of return (discount rate);

D_{t-1} : represents dividends at the present time (paid in the previous period);

D_t: represents dividends at the next consecutive time (paid in the next period);

P_t: represents current stock price;

g : represents the constant growth rate of the dividend stream.

In order to obtain a reliable estimate of the expected rate of return, it is important that stable growth rate and future dividends reflect the expectations of investors and are reliable. Estimating reliable and unbiased forecasts of future dividends, their timing and growth patterns for deriving cost of equity is regarded as a major challenge in using dividend discount models.

Mining projects have long-lead development phases (i.e. ± 10 years). During the development phase there is capital injection and little to no profit generated. In either case, dividend payout is likely to be small or negligible. As the company reaches maturity, its profits reach a high level and its investment needs might be lessened. At this stage, the company may be able to finance a high dividend payout. However, past the maturity phase, when the orebody is depleted the company's profits start to decline and cannot sustain high dividend payouts. Hence, it is crucial to take a view of long-term sustainable growth rate of the company. A typical view is that the entity will grow

at the same rate as the economy, i.e. its earnings and dividend growth rate will be equivalent to the GDP growth rate (Sudarsanam et al, 2011).

The dividend growth rate can be estimated using Equation 2.6, shown below (Brigham and Ehrhardt, 2007):

g = return on equity times retention ratio (assuming there is no leverage)

$$g = ROE \times retention\ ratio \tag{2.6}$$

Where, the retention ratio is: $Retention\ ratio = 1 - payout\ ratio$

Return on equity is: $ROE = \frac{net\ income\ available\ for\ common\ stockholders}{common\ equity}$

According to Foerster and Sapp (2005) and Whitcutt (1992), the growth rate,(g), can also be estimated using the nominal GDP because it is argued that GDP is the maximum sustainable growth rate for a company's dividend. Therefore, it can be assumed that GDP over a long time horizon can be used as a proxy for an average nominal growth rate in the South African economy. However, using GDP growth rates to approximate long-term growth rate in dividends appears to work well at estimating the dividends for the stock of a mature and dividend paying company. There is evidence that the dividend and GDP growth rates are positively correlated Foerster and Sapp (2005).

2.4 Chapter summary

This section discussed the divergence of the CAPM and Gordon's Wealth Growth Model from the reality based on the assumptions these models are based on. However, these models have superiority in practice when estimating the expected rate of return based on historical data. Hence, the final test on the model must be on the reliability of its estimates. The next section discusses the methodology followed to estimate values of the cost of equity using the CAPM and Gordon's Wealth Growth Model.

3 DATA AND METHODOLOGY

3.1 Introduction

This chapter provides a description of the data and methodology utilised in explaining the differences in the cost of equity values for selected mining companies. The study focuses on the CAPM and Gordon's Wealth Growth Model for the reasons provided in Chapter 2. Section 3.2 describes the sources of data and nature of the data required for this research. The parameters used to estimate the rate of return are discussed in Sections 3.3 to 3.4.

3.2 Data from JSE-listed mining companies

The research is limited to mining companies quoted on the Johannesburg Securities Exchange (JSE). The JSE was selected because of the following reasons:

- It is a member of the World Federation of Exchanges and one of the most reliable trading platforms in the world;
- It adheres to global standards and legislative requirements;
- It acts as a regulator to its members and ensures that markets operate in a transparent manner, ensuring investor protection;
- It ensures accurate and sufficient disclosure of all information relevant to investors (City of Johannesburg, 2014);
- JSE data can be accessed for a sufficient length of time.

The sectors of the JSE were defined differently prior to June 1995, so one will have to reconstruct each sectoral index in order to obtain data prior to June 1995. Reconstruction of the data is beyond the scope of this study, thus, only data post 1995 was used. The JSE was illiquid prior to 1998; therefore, the time horizon period for the study is January 1998 to December 2012. Data for the last five years was reserved for the purpose of forecast valuation. Moreover, the top mining companies, by market capitalisation, are used in this study as the smaller companies are thinly traded. Larger mining companies are unlikely to experience extended periods of mispricing compared to smaller companies, which will have dire effects on the findings if it occurs.

Gordon's Wealth Growth Model is useful when valuing companies that regularly pay dividends and have stable growth. Small mining enterprises do not pay dividends frequently and have variations in growth rates, thus, it will be futile to determine their discount rates using this model. Tholana et al (2013) stated that gold, platinum and coal are the most important minerals in South Africa; hence, the focus of this study is confined to these commodities. However, in this study only gold and platinum were analysed because Gordon's Wealth Growth Model can only be applied to companies paying dividends. Therefore, coal-mining companies (not multi-commodity) were not considered because they did not pay dividends regularly to be classified as 'stable growth' companies. The top three (3) mining companies, by market capitalisation, quoted on the JSE over the period of the study were selected for platinum and gold mining companies. The mining companies used were:

- Platinum: Anglo American Platinum Limited, Lonmin Plc and Impala Platinum Holdings Limited;
- Gold: AngloGold Ashanti Limited, Harmony Gold Mining Company Limited and Gold Fields Limited;

Data for the purpose of this research was collected from I-Net Bridge, McGregor BFA and Bloomberg databases. Table 3.1 provides a summary of the data gathered from the above-mentioned sources. Returns, betas and standard deviations were computed using Microsoft's Excel spreadsheet program, see Appendix 7.1-7.7.

Table 3.1 Databases and data collected

Database
• I-Net Bridge • McGregor BFA • Bloomberg
Data collected
• Historical monthly closing prices of shares • Dividend payouts • South African government bond yields • Dividend yields • Actual beta values • WACC values split into debt and equity components (Bloomberg only)

The frequency of data is monthly similar to various studies as discussed in Section 2.2.2. The monthly return for a stock, i is calculated using the formula in Equation 3.1.

$$R_i = \frac{(S_{i,t} - S_{i,t-1}) + D_{i,t}}{S_{i,t-1}} \quad (3.1)$$

Where:

R_i is the return for stock, i;

$S_{i,t}$ is the stock price at the present time;

$S_{i,t-1}$ represents the asset price at the previous month;

$D_{i,t}$ is the dividend price at the present time for the stock.

According to Marx et al (2009), the market portfolio contains all risky financial assets (for instance debentures, options, shares, etc.) and risky real assets (i.e. jewellery, precious metals, real estate, etc.). This kind of a market is not discernible, thus, a broad-based share index is used as proxy for the market portfolio. Bradfield (2003) agreed that there is no practical way to conduct a test with reference to the actual market portfolio. Roll (1977) stated that unless the precise composition of the true market is known, the probability of the proxy for the market portfolio being mean-variance with the true market portfolio is directly unverifiable. Consequently, the FTSE/JSE All Share Index was used as the proxy for the market portfolio.

WACC can be pre-tax or after-tax and these two are related by the following general formula:

$$WACC_{pt} = WACC_{at} / (1-t) \quad (3.2)$$

Where $WACC_{at}$ is the weighted average cost of capital after-tax; $WACC_{pt}$ is the weighted average cost of capital pre-tax; and t is the corporate income tax rate. The cost of debt in WACC is tax deductible hence the term (1-t) while cost of equity does not have tax treatment and is therefore the same cost either pre- or post-tax. It is for this reason that the cost of equity component of WACC was extracted and used as the benchmark for testing the reliability of either CAPM or Gordon's Wealth Growth Model estimates. In other words the pre-tax CAPM estimates were compared independently

of the post-tax Gordon's Wealth Growth Model estimates in order to determine which model closely estimated the cost of equity.

3.3 CAPM research methodology

Beta is calculated as the slope coefficient of the OLS linear regression equation using monthly return data over the period of the preceding 60 months against the All Share Index (ALSI) on the X-axis. Coefficients of determination, which measure the degree to which the estimated beta is explained by the previous beta coefficient, were calculated for the same values as the ones utilised in the estimation of beta values. Microsoft Excel's r-squared (RSQ) function was used to calculate the coefficient of determination. Correcting for regression bias was calculated using Blume's technique for all time periods for each mining company.

The holding period used in this report is inadequate to estimate reliable risk-free rate and equity risk premium. Therefore, values used as proxies in various studies determined over long time horizon were used. Fernandez et al (2013) provided estimates of market risk premium and risk-free rate used for various countries. The values used in South Africa have remained relatively stable from 2011 to 2013.
Table 3.2 shows various estimates of market risk premium for South Africa as recommended by different authors.

Table 3.2 Estimates of market risk premium

Source	Equity Risk Premium (%)	Risk free rate proxy
Digby et al (2006)	6.6	T-bills
Fernandez, et al (2013)	6.8	T-bonds
Dimson et al (2014)	6.5	T-bonds
Brigham and Ehrhardt (2007)	3.5 to 6	Not specific
Firer and Staunton (2002)	5.4	T-bonds

The studies in
Table 3.2 show that the general consensus with regard to the South African market premium remains around 6%. The market risk premium over T-bonds averages at 6.5% using data from 1964- 2013 (Dimson et al, 2014). The average ERP and risk-free rate (T-bonds) used in South Africa for the year 2013 are 6.8% and 6.4%

respectively (Fernandez et al, 2013). These estimates were adopted for this study in order to reduce the error in the estimated cost of equity.

3.4 Gordon's Wealth Growth Model research methodology

As discussed in Section 2.3 that it is vital to take a view of long-term that a company will grow at the rate of the economy, therefore, GDP growth rate was adopted as a proxy for company's growth rate. GDP measures the level of economic activity for a country. Changes in the GDP figure are negligible when measured from year to year and can be predicted with acceptable accuracy. The constant growth rate proxy used was the GDP rate over a relatively long period to reduce the effect of variations due to market fluctuations. The GDP rate was based on the annualized percentage change for seasonally adjusted quarterly gross domestic product (Fama and French, 1988; Shepherd, 1987).

3.5 Descriptive statistics

Descriptive statistics are used to illustrate the major dataset features because they are a rapid and brief way to extract the characteristics of the data. The descriptive statistics included in the analysis of the data are the mean, standard deviation, range, sum, box and whiskers plot and correlation coefficient. A summary of the descriptive statistics for mining companies is shown in Appendix 7.8. The mean describes the central tendency of the data. However, if there is an outlier, the arithmetic mean value does not become the true representative of the central tendency of the data. An outlier has the same impact on the standard deviation as it has on the mean. Therefore, the box and whisker plot (box plot) was adopted to further analyse the data because it is based on the robust statistics thus its resists the effect of outliers (Massart et al, 2005; Potter, 2006).

When using box and whisker plot the mean is replaced by a median that is the middle observation in a ranked dataset. The interquartile range describes the spread of the data that is the range where the middle 50% of data is found (Potter, 2006), see Appendix 7.9. The correlation coefficient is one of the most utilised statistical method in summarising research data (Taylor, 1990). This coefficient was used to examine the

degree of the linear relationship between the CAPM and Gordon's Wealth Growth Model with the equity component of WACC.

3.6 Chapter summary

This chapter dealt with the data sources and data used in the study and the methodology employed to calculate parameters necessary to estimate the rate of return using the commonly applied CAPM and Gordon's Wealth Growth Model. The next section presents the results obtained from the analysis of the data.

4 RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the estimation results of the CAPM and Gordon's Wealth Growth Model. A model that explained better the differences in the cost of equity values for the mining companies under review was recommended. The WACC values obtained from the Bloomberg database were utilised as benchmark for analysis in explaining the differences in the estimated cost of equity, see Appendix 7.10. In order to have a meaningful comparison it was important to split the WACC into its debt and equity components so that CAPM and Gordon's Wealth Growth Model could be benchmarked against the equity component of WACC.

The cost of equity estimates calculated using the CAPM model in this study were derived using readily available pre-tax T-bond rates as the risk-free rate. The input values for the CAPM equation are risk free rate and ERP of 6.4% and 6.8%, respectively. The beta values were calculated using the OLS linear regression, covariance of stock returns against the market returns and adjusted using the Blume's technique. The adjusted beta coefficient for the preceding 60 months was used to estimate the cost of equity.

Gordon's Wealth Growth Model assumes that dividends grow at a constant rate to perpetuity. The cost of equity estimates calculated using the Gordon's Wealth Growth Model in this study were derived using post-tax dividends. Subsequently, the GDP rate was applied as an alternative to company specific growth rates, which are not constant over time. The GDP growth rate in South Africa averaged 3.16% in real terms from 1993 until 2014, as shown in Figure 4.1.

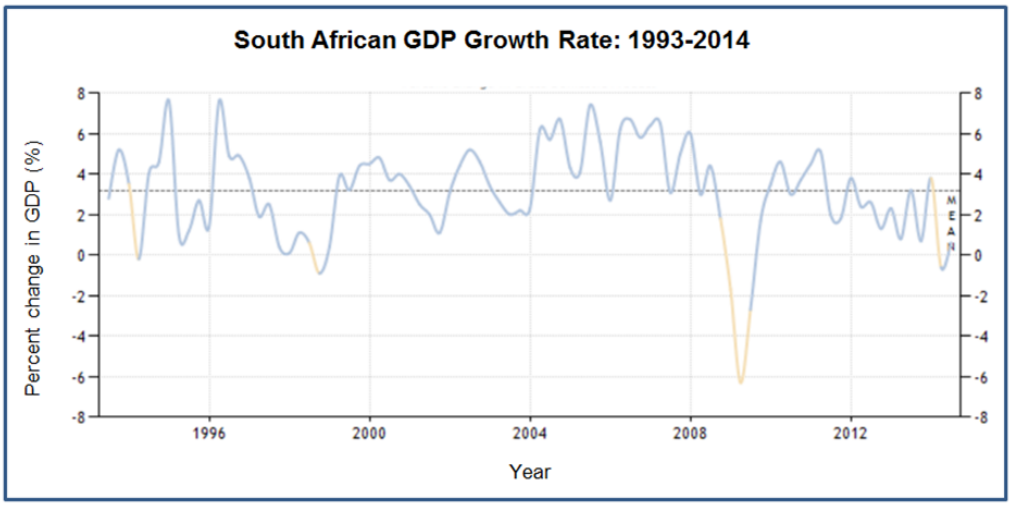


Figure 4.1 South African real GDP growth rate: 1993-2014

Source: Taborda (2014)

The real GDP rate was used to calculate the nominal GDP rate by applying the effect of inflation. The ability to forecast the rate of inflation over a reasonable period accurately is highly unlikely due to its volatility (Bora, 2013) (Barnett and Sorentino, 1994). According to Aisen and Veiga (2006), the main causes of inflation volatility are political instability; lower economic freedom; political fragmentation and higher degree of ideological polarization. Barnett and Sorentino (1994) alluded that a single inflation rate based on recent values be used. Stowe et al (2007) and Sudarsanam et al (2011) suggested that a long-run inflation rate be applied in estimating the cost of equity using the Gordon's Wealth Growth Model.

The inflation rate used in South Africa is usually the inflation based on the consumer price index (CPI). The CPI shows the change in prices of standard households goods and services purchased for consumption. The inflation rate in South Africa averaged 6.26% from 1993 until 2013 on year-on-year changes of the CPI (Statistics South Africa, 2013).

Nominal GDP growth rate was calculated using Fisher's effect (Bora, 2013) shown in Equation 8:

$$(1 + R) = (1 + r) \times (1 + i) \qquad (8)$$

Where:

R is the nominal GDP growth rate;

r is the real GDP growth rate;

i is the inflation rate.

There was no change in dividend pay-out ratios or dividend yield rates noted for the companies during the period under study, which might have impacted to a lesser degree, the reliability of the Gordon's Wealth Growth Model.

4.2 The impact of the Global Financial Crisis on the South African mining industry

The period over which the study is undertaken covers an era of commodities boom and bust. The commodity boom commenced in 2001 driven by material-intensive growth in developing countries and emerging economies such as China, Russia, India and Brazil; weakening US dollar; reasonable growth in the advanced economies and constraint in material supply from mining companies. These factors worked together to drive the commodity price upwards between 2001 and mid-2008 as alluded to by Padayachee (nd) and Baxter (nd).

In 2008, the global commodity market crashed slowing down economic growth, for instance, the South African economic growth rate plummeted to 1.8% in the last quarter of 2008, then dropped further to -3.2% in the second quarter of 2009. The economic growth slowdown affected the world for minerals and companies had to restrict supply in response to weakening demand environment as mentioned by Padayachee (nd) and Baxter (nd). Njowa et al (2014) alluded that since the Global Financial Crisis (GFC) of mid-2008, it has been difficult to obtain capital for mining projects.

Estimating the cost of equity during market bull and bear periods may yield results rendering the model applied unsuitable to estimate the discount rate. Therefore, it is vital during the period of estimation to take into account all external factors that might affect the results.

4.3 Cost of equity for platinum mining companies

The platinum mining industry was severely affected by the GFC causing a reduced demand for the commodity. The price of platinum plunged from US$ 2048 per ounce in May 2008 to US$ 834 per ounce by December 2008. Subsequently, the companies adopted cost saving strategies in order to remain in business (Donovan, 2013). Figure 4.2 shows that dividends paid by all the platinum mines dropped post the recession, with only Impala declaring dividends in 2009. Therefore, it is clear that the Global Financial Crisis affected the platinum industry significantly.

In 2012 platinum miners were hit by low prices, wildcat industrial strikes across almost all PGM producers, safety stoppages and inflationary pressures on costs. Anglo American Platinum and Lonmin did not pay dividends citing future funding commitments and uncertainty in global economic markets as the main reasons. Impala Platinum declared dividends in FY2012 because the lower prices were offset by a weaker Rand/Dollar exchange rate (Anglo American Platinum, 2012; Impala Platinum, 2012; Lonmin, 2012).

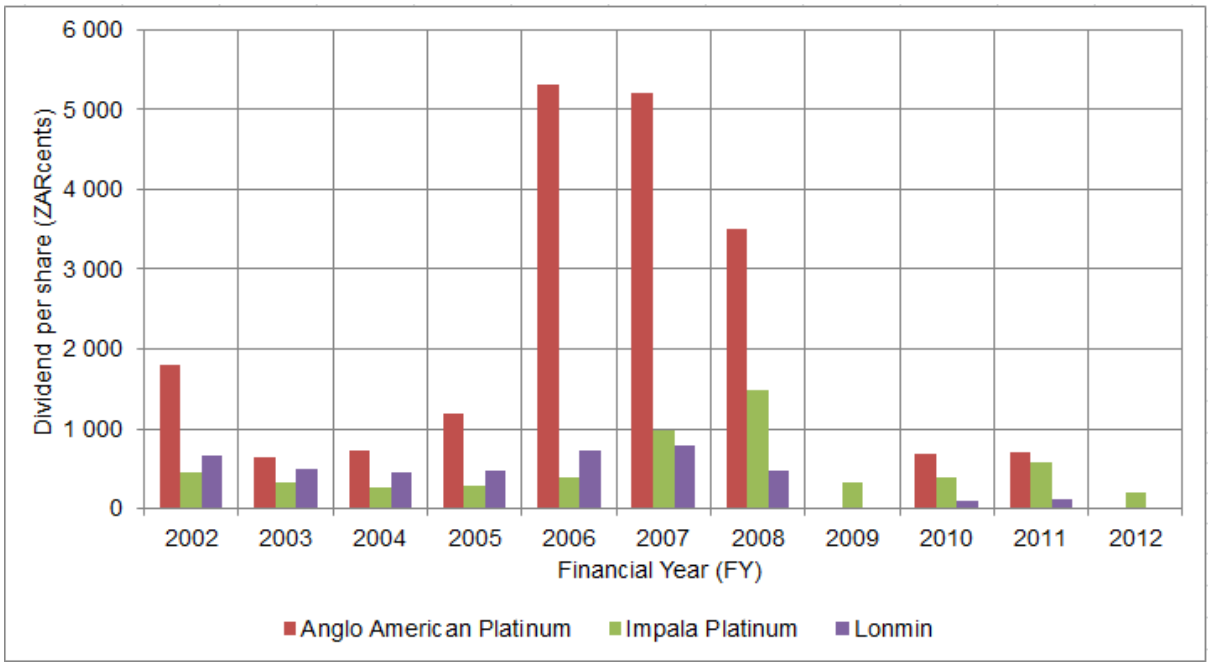


Figure 4.2 Declared dividends per share for platinum mining companies

4.3.1 Anglo American Platinum

The discount rate estimates for FY2002 to FY2012 period are shown in Figure 4.3. The estimates are divided according to different phases according to event occurrences. The phases are labelled as ‘A’, ‘B’ and ‘C’ representing the periods of market boom; recession and steady economic growth, respectively. During Phase A (boom period), the commodity prices increased drastically due to increased global demand of platinum group metals (PGMs). Anglo American Platinum saw improved headline earnings because of higher US dollar prices realised in metals sold and weaker rand/US dollar exchange rates.

However, while demand was growing, South African producers failed to gain from such price increases because they were experiencing operational challenges that reduced their supply into the market. These challenges include industrial action; safety-related production stoppages; shortage of skilled labour and processing bottlenecks. Failure to meet the set production targets and supply demands may have a negative impact on a company, which is evident in an increasing risk profile of a company. The effect of these challenges can be seen in Figure 4.3 where values for the equity component of WACC were on a steady increase during Phase A.

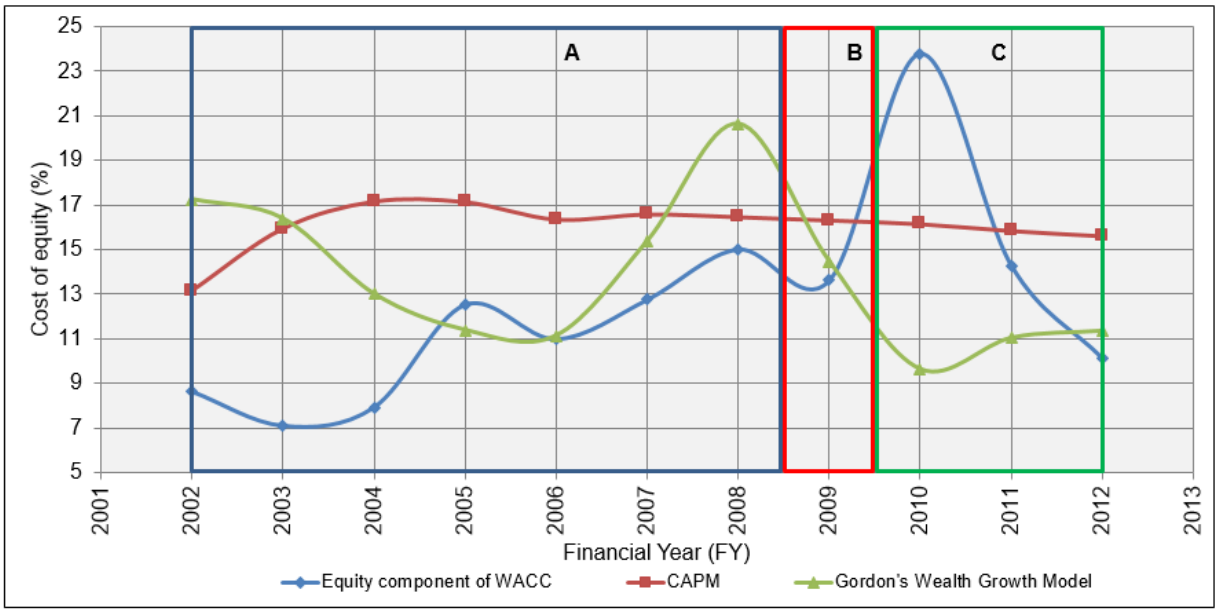


Figure 4.3 Cost of equity for Anglo American Platinum from FY2002 to FY2012

In Phase B (recession period), both the estimate cost of equity rates for CAPM are flat and that for Gordon's Wealth Growth Model show a sharp decrease while the actual discount rate shows an upward trend. The Global Financial Crisis curbed the demand of PGMs, causing a price decline. Anglo American Platinum suffered a decrease in headline earnings per ordinary share of 95% in FY2009 due to lower US dollar prices realised on metals sold.

In Phase C (steady economic growth period), in the second half of 2009, there were signs of market recovery with a consequential increase in metal demand and recovering prices. However, no dividends were paid in FY2009 sighting the need to retain cash for maintenance of operations as the main reason. Anglo American Platinum focused on cost management strategies (curtailing non-value adding operations such as putting high cost shaft Siphumelele 3 on care and maintenance), which had an effective contribution to the company's performance (Anglo American Platinum Limited, 2010). It can be seen from Figure 4.3 that both the CAPM and Gordon's Wealth Growth Model failed to estimate the actual discount rates during periods of economic instability observed throughout the period under study.

4.3.1.1 Descriptive statistics for Anglo American Platinum

The descriptive statistics tool was adopted in order to be able to analyse the data from equity component of WACC, CAPM and Gordon's Wealth Growth Model. Descriptive statistics allow data to be presented in a more meaningful manner from which, simpler interpretation can be performed. The relationship between actual and estimated discount rates was analysed checking how similar the values are to each other by looking at the mean squared error (MSE), mean, standard deviation, range, sum, correlation coefficient and box and whisker plot.

Estimated discount rates using CAPM and Gordon's Wealth Growth Model are contrasted against the equity component of WACC values in Table 4.1 using MSE. The actual cost of equity for Anglo American Platinum in FY2010 was 23.78%, which is higher than the other years. This may be attributed to the reaction to the GFC that curbed the demand for the PGMs; lower US dollar prices on metals sold experienced in 2009 (Anglo American Limited, 2009).

Table 4.1 Cost of equity and the mean squared error for Anglo American Platinum

Year	Equity component of WACC (%)	CAPM (%)	Difference (%)	MSE	Gordon's Wealth Growth Model	Difference (%)	MSE
2002	8.65	13.13	4.48	0.002	17.25	8.60	0.007
2003	7.11	15.95	8.84	0.008	16.39	9.28	0.009
2004	7.93	17.18	9.25	0.009	13.01	5.08	0.003
2005	12.53	17.16	4.63	0.002	11.38	-1.15	0.000
2006	10.99	16.36	5.37	0.003	11.13	0.14	0.000
2007	12.75	16.60	3.85	0.001	15.37	2.62	0.001
2008	15.01	16.47	1.46	0.000	20.63	5.62	0.003
2009	13.62	16.32	2.70	0.001	14.46	0.84	0.000
2010	23.78	16.15	-7.63	0.006	9.62	-14.16	0.020
2011	14.28	15.84	1.56	0.000	11.03	-3.25	0.001
2012	10.13	15.61	5.48	0.003	11.34	1.21	0.000
Average	**12.43**	**16.07**	**3.64**	**0.003**	**13.78**	**1.35**	**0.004**

The mean square error between the equity component of WACC and either of the models must be zero to prove that there is similarity between actual and estimated cost of equity values. From Table 4.1, it can be seen that CAPM and Gordon's Wealth Growth Model produce similar estimates for the MSE that are very close to zero. However, when considering the years individually, Gordon's Wealth Growth Model produces more values of MSE close to zero. The main problem with using unweighted mean as measure of analysis is that all values are assumed to have the same weighting. Therefore, when there is a wider range in values, as observed with Gordon's Wealth Growth Model, the calculated mean is biased towards narrowly spread values (Massart et al, 2005). Hence, it is important that other measures are employed in an analysis.

Statistical analysis using some of the measures is presented in Table 4.2 for the CAPM and the Gordon's Wealth Growth Model against the equity component of WACC. Gordon's Wealth Growth Model has a mean of 14%, which is close to that of the equity component of WACC of 12% while CAPM has a mean of 16%.

Table 4.2 Descriptive statistics for Anglo American Platinum

Measure	Equity component of WACC	CAPM	Gordon's Wealth Growth Model
Mean	12.40%	16.10%	13.80%
Standard deviation	4.60%	1.10%	3.40%
Range	16.70%	4.10%	11.00%
Correlation coefficient	1.00	0.19	0.31
Sum	136.80%	176.80%	151.60%

The standard deviation for Gordon's Wealth Growth Model is similar to that of the equity component of WACC by approximately 74% while that of CAPM is about 24%. Therefore, the spread of data around the average for the equity component of WACC and Gordon's Wealth Growth Model is almost identical. As with the analysis using MSE, the range of Gordon's Wealth Growth Model is close to that of the equity component of WACC whereas CAPM differs by approximately 76%. The main cause of this disparity is because the spreads of Gordon's Wealth Growth Model and the equity component of WACC values are wide while the estimates of CAPM have a narrow spread.

The sum yields the same results as with the other measures, Gordon's Wealth Growth Model showing superiority over CAPM. The cost of equity estimates from Gordon's Wealth Growth Model vary from 9.62% to 17.25% while the CAPM estimates vary from 13.13% to 17.18%. Hence, the average discount rates are 13.78% and 16.07% for Gordon's Wealth Growth Model and CAPM, respectively, proving that CAPM has higher estimates.

Correlation of the equity component of WACC rates with the cost of equity estimates from CAPM and Gordon's Wealth Growth Model was tested. Perfect correlation exists if all values lie on a straight line and the correlation coefficient is at a unity. The

correlation coefficient values are very weak for both models (see Table 4.2); however, Gordon's Wealth Growth Model has a better correlation with the equity component of WACC than CAPM. The spread for CAPM data distribution is narrower as illustrated in Figure 4.4. The interquartile ranges (IQR) for the equity component of WACC and Gordon's Wealth Growth Model are 0.05 and 0.05, respectively. The IQR for CAPM is 0.01, which is significantly different from that of the equity component of WACC; this is expected because the spread of the CAPM data is narrower, see Table 4.1.

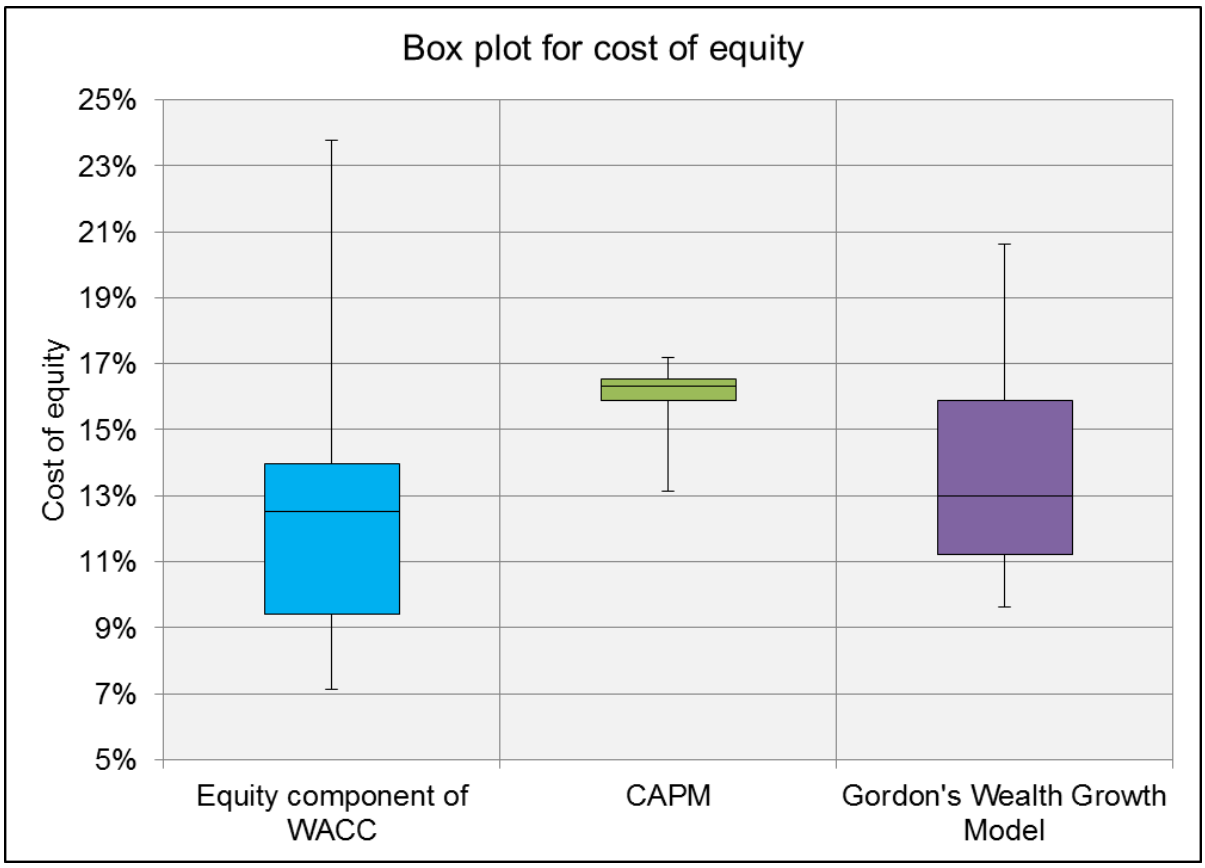


Figure 4.4 Box and whisker plot for Anglo American Platinum cost of equity

4.3.1.2 Summary for Anglo American Platinum

The cost of equity estimates using the CAPM and Gordon's Wealth Growth Model failed to predict the actual discount rates for Anglo American Platinum. Descriptive statistics were used to check for similarity in the data for CAPM and Gordon's Wealth Growth Model with the equity component of WACC rates. The statistics measures show that the data for Gordon's Wealth Growth Model and the equity component of WACC are similar only MSE results favouring CAPM when looking at the means.

4.3.2 Impala Platinum Holdings Limited

The cost of equity rates were divided into phases according to the events occurring during the period under study as labelled in Figure 4.5. In Phase A, the platinum group metals (PGMs) prices surged because of the demand driven by emerging markets. The high US dollar revenue realised from sales and weak rand against the US dollar exchange rate resulted in improved earnings for Impala Platinum. The platinum industry could not meet the demand from the markets thus metal prices increased beyond expectations (Impala Platinum Holdings Limited, 2007). The increase in the actual risk profile for the company may be alluded to safety related stoppages and failure to meet set production output, as seen in Figure 4.5 where the equity component of WACC rates were increasing from FY2004 to the beginning of Phase B.

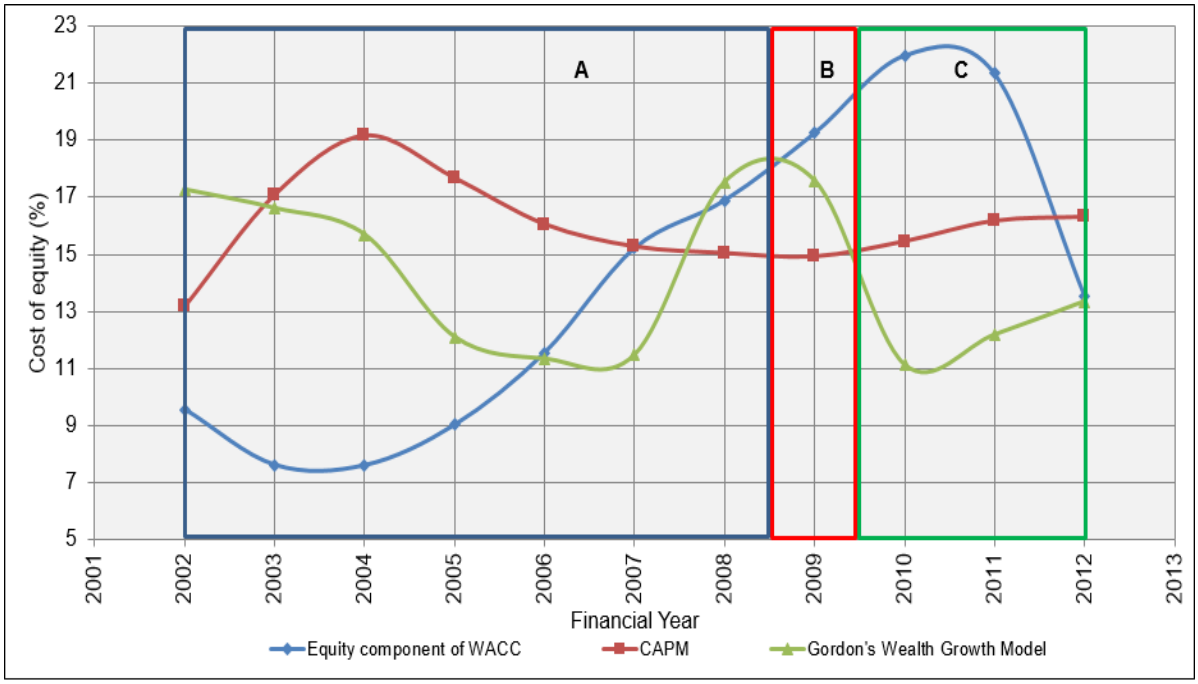


Figure 4.5 Cost of equity for Impala Platinum from FY2002 to FY2012

Phase B depicts a continuing increase in the actual discount rate while Gordon's Wealth Growth Model shows a sharp decrease in the risk profile of the company. The estimated cost of equity for CAPM is relatively flat. The Global Financial Crisis affected the mining industry as a whole and Impala Platinum was no exception. The cost of equity for the company kept increasing because of a decline in earnings resulting from low production output and high labour cost attributed to the disposal of Aquarius

Platinum assets and a 10% wage increase. In FY2009, the electricity cost increased by 24%; labour cost by 14.6% and other metal prices fell and the company's credit rating was under review.

The period post-recession, Phase C, was a challenging period for Impala Platinum as the company was faced with strike action at the beginning of 2010, soaring electricity cost and a wage increase of 11%. All these factors contributed to the declining headline earnings realised (Impala Platinum Holding Limited, 2010). In FY2012, Impala Platinum had reduced headline earnings by 38% compared to FY2011 due to industrial strike action and Section 54 stoppages resulting in low production levels (Impala Platinum Holdings Limited, 2012).

Despite all these factors mentioned above, the equity component of WACC started to drop post-recession, whereas the estimate discount rates for Gordon's Wealth Growth Model captured the pressure imposed by these factors. The estimate cost of equity for CAPM had a slight increase.

4.3.2.1 Descriptive statistics for Impala Platinum

The actual cost of equity for Impala Platinum in 2010 was 21.97% an increase from the previous year, which may be alluded to the response to the Global Financial Crisis, increase in cash operating costs and strike action, see Table 4.3 (Impala Platinum Holdings Limited, 2010).

Table 4.3 Cost of equity and the mean squared error for Impala Platinum

Year	Equity component of WACC (%)	CAPM (%)	Difference (%)	MSE	Gordon's Wealth Growth Model	Difference (%)	MSE
2002	9.56	13.16	3.60	0.001	17.26	7.70	0.006
2003	7.61	17.08	9.47	0.009	16.61	9.00	0.008
2004	7.6	19.15	11.55	0.013	15.68	8.08	0.007
2005	9.02	17.66	8.64	0.007	12.09	3.07	0.001
2006	11.55	16.04	4.49	0.002	11.33	-0.22	0.000
2007	15.22	15.26	0.04	0.000	11.47	-3.75	0.001
2008	16.89	15.03	-1.86	0.000	17.53	0.64	0.000
2009	19.25	14.91	-4.34	0.002	17.58	-1.67	0.000
2010	21.97	15.44	-6.53	0.004	11.12	-10.85	0.012
2011	21.34	16.16	-5.18	0.003	12.17	-9.17	0.008
2012	13.55	16.30	2.75	0.001	13.34	-0.21	0.000
Average	**13.96**	**16.02**	**2.06**	**0.004**	**14.20**	**0.24**	**0.004**

As the economic market stabilised post the recession period, the equity component of WACC rates started to decline. The mean squared error for both CAPM and Gordon's Wealth Growth Model is 0.004, thus, this measure is not conclusive. Table 4.4 displays the statistical analysis using mean, standard deviation, range and sum to contrast CAPM and Gordon's Wealth Growth Model against the equity component of WACC.

Table 4.4 Descriptive statistics for Impala Platinum

Measure	Equity component of WACC	CAPM	Gordon's Wealth Growth Model
Mean	14.00%	16.00%	14.20%
Standard deviation	5.40%	1.60%	2.70%
Range	14.40%	6.00%	6.50%
Correlation coefficient	1.00	0.42	0.25
Sum	153.60%	176.20%	156.20%

The mean for Gordon's Wealth Model is 14.20% and it is approximately equal to that of the equity component of WACC while the mean for CAPM is 16.00% that is 2% more. The standard deviation values for Gordon's Wealth Growth Model and CAPM are different from the one for the equity component of WACC. The spread of data around averages for these models is not similar, with CAPM having a narrower spread. The sum for the equity component of WACC and Gordon's Wealth Growth Model are relatively similar while that of CAPM is much higher. This disproportion may be attributed to the high estimate cost of equity rates from CAPM.

The average discount rates for CAPM, Gordon's Wealth Growth Model and the equity component of WACC are 16.02%, 14.20% and 13.96%, respectively. Therefore, the Gordon's Wealth Growth Model has superiority over CAPM based on these measures presented in Table 4.4. From Table 4.4, it can be seen that there is a modest correlation between the equity component of WACC and CAPM. There is low

correlation between Gordon's Wealth Growth Model and the equity component of WACC.

Box and whisker plots provide a picture of continuous data, as shown in Figure 4.6. The distribution of CAPM is much narrower when compared to the other two models. The spread for CAPM rates is narrower as expected since the estimate values in Table 4.4 have a small range of 0.06.

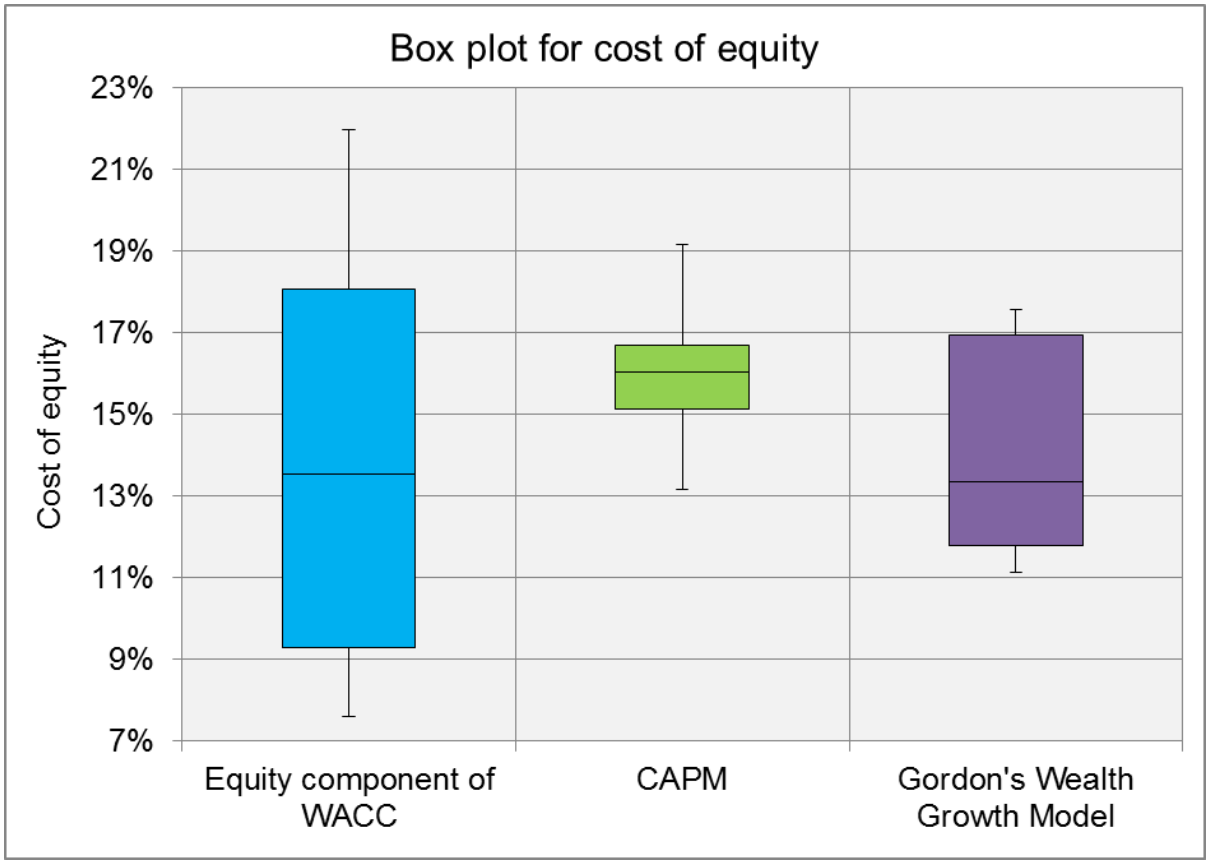


Figure 4.6 Box and whisker plot for Impala Platinum cost of equity

4.3.2.2 Summary for Impala Platinum

The CAPM and Gordon's Wealth Growth Models failed to estimate the discount rates for Impala Platinum during the period under review. The similarity of the data set was checked using descriptive statistics; however, there is no strong model preferred based on the analysis.

4.3.3 Lonmin Plc

The cost of equity rates for CAPM, Gordon's Wealth Growth Model and the equity component of WACC are shown in Figure 4.7. In Phase A (from 2002 to mid-2008),

on average the equity component of WACC rates for Lonmin were on the increase from FY2004 to FY2008. This discount rate increase may be attributed to a decrease in company earnings due to a drop in production output, inflationary pressures in the South African mining industry resulting in high production costs (Lonmin Plc, 2007).

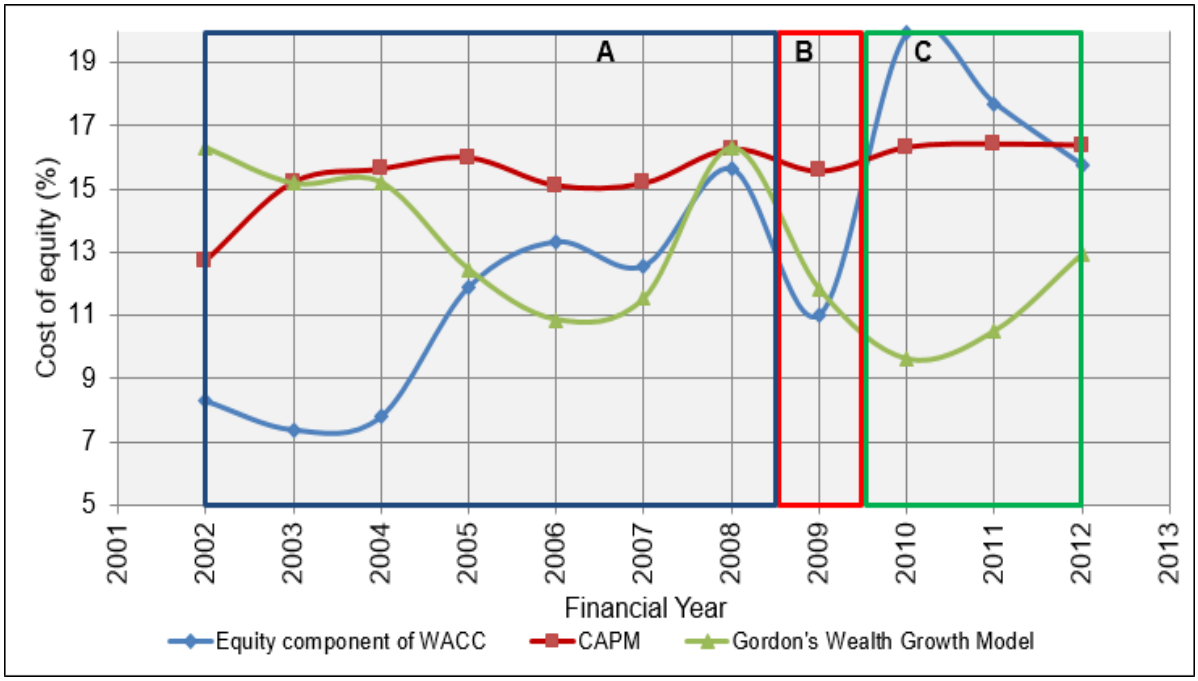


Figure 4.7 Cost of equity for Lonmin from FY2002 to FY2012

In Phase B, All the models show that there is a decrease in the cost of equity values even though it was during a recession period. When the price for PGM ounce plummeted by 49% in FY2009 compared to FY2008, Lonmin adopted cost cutting initiatives. The cost cutting initiatives included, inter alia, closure of unprofitable operations (such as the open cast at Marikana); restriction on capital expenditure; suspension of dividend payouts and shedding of 20% of the employees thus reducing costs. The relocation of management from London to Johannesburg in order to enhance day-to-day executive management close to operations might have positively impacted on the company risk profile (Lonmin Plc, 2009).

In the second half of 2009, there was optimism that the market would have a steady recovery supported by the recovery of the automotive and industrial sectors. In FY2010, Lonmin suffered unexpected problems with the Number One Furnace resulting in higher operational costs. The rand strengthened against the US dollar; however, its effect was outweighed by high dollar PGMs prices realised throughout

the year. The company did not meet its production targets due to safety stoppages and skill shortages (Lonmin Plc, 2010).

The benefits of an operational turnaround implemented in 2009 and 2010 were only realised in FY2011. However, illegal industrial actions, safety stoppages were major challenges faced by the company (Lonmin Plc, 2011). The discount rates started falling from the FY2010 level, this may be attributed to successful implementation of cost saving initiatives during the recession period.

Lonmin employees embarked on an illegal strike at Marikana, North West province in South Africa that lasted for seven weeks. The issues around this illegal strike have been subject to an ongoing judiciary inquiry at the time of writing this research report. The company did not pay dividends because of the uncertainty in the global economic markets (Lonmin Plc, 2012). The illegal strike action had a negative impact on the risk profile of the company. Consequently, the cost of equity for Lonmin is expected to increase. However, the actual discount rate in Phase C continued to drop in FY2012. The financial impact of the Marikana strike is likely to be evident in FY2013 as seen in FY2011 where the benefits of the cost saving initiatives implemented in FY2009 were realised. The CAPM and Gordon's Wealth Growth Model failed to estimate the actual cost of equity.

4.3.3.1 Descriptive statistics for Lonmin

The effect of the Global Financial Crisis in 2008 and 2009 can be seen in FY 2010's discount rates, see Table 4.5. The cost of equity for the equity component of WACC and CAPM were 19.93% and 16.33%, respectively. The discount rate for Gordon's Wealth Growth Model was 9.62% because the company did not pay dividends in FY2009 thus affecting the calculation when using Gordon's Wealth Growth Model.

Table 4.5 Cost of equity and the mean squared error for Lonmin

Year	Equity component of WACC (%)	CAPM (%)	Difference (%)	MSE	Gordon's Wealth Growth Model	Difference (%)	MSE
2002	8.30	12.74	4.440	0.002	16.31	8.010	0.006
2003	7.38	15.22	7.840	0.006	15.18	7.800	0.006
2004	7.79	15.64	7.850	0.006	15.21	7.420	0.006
2005	11.89	16.00	4.110	0.002	12.46	0.570	0.000
2006	13.33	15.12	1.790	0.000	10.87	-2.460	0.001
2007	12.57	15.19	2.620	0.001	11.54	-1.030	0.000
2008	15.64	16.27	0.630	0.000	16.30	0.660	0.000
2009	11.02	15.57	4.550	0.002	11.83	0.810	0.000
2010	19.93	16.33	-3.600	0.001	9.62	-10.310	0.011
2011	17.71	16.43	-1.280	0.000	10.51	-7.200	0.005
2012	15.76	16.39	0.630	0.000	12.95	-2.810	0.001
Average	**11.78**	**15.54**	**2.69**	**0.002**	**12.98**	**0.13**	**0.003**

The mean squared error for CAPM is closer to zero at 0.002 than that of Gordon's Wealth Growth Model at 0.003. However, this measure cannot be used alone to determine a model that best estimates the actual discount rates. The average cost of equity estimates for the equity component of WACC, CAPM and Gordon's Wealth Growth Model are 11.78%; 15.54% and 12.98% respectively. The averages for the equity component of WACC and Gordon's Wealth Growth Model are closer to one another than that of CAPM.

The mean for Gordon's Wealth Growth Model is 13% is equal to the one for the equity component of WACC whereas CAPM has a mean that is higher than the means from the two models (Table 4.6). The standard deviation values for CAPM and Gordon's Wealth Growth Model are different from that of the equity component of WACC. This may be attributed to the spread of data around the average.

Table 4.6 Descriptive statistics for Lonmin

Measure	Equity component of WACC	CAPM	Gordon's Wealth Growth Model
Mean	12.80%	15.50%	13.00%
Standard deviation	4.10%	1.10%	2.40%
Range	12.60%	3.70%	6.70%
Correlation coefficient	1.00	0.64	0.64
Sum	141.30%	170.90%	142.80%

CAPM and Gordon's Wealth Growth Model are identically correlated to the equity component of WACC. The sum of values for the equity component of WACC and Gordon's Wealth Growth Model is approximately equal while that of CAPM is higher; this is due to high estimate values for CAPM. The IQR values for the equity component of WACC, CAPM and Gordon's Wealth Growth Model are 0.060, 0.011 and 0.040 respectively (Figure 4.8). The spread for CAPM cost of equity estimates is narrower and that is expected as the estimated values in Table 4.5 are closely spaced.

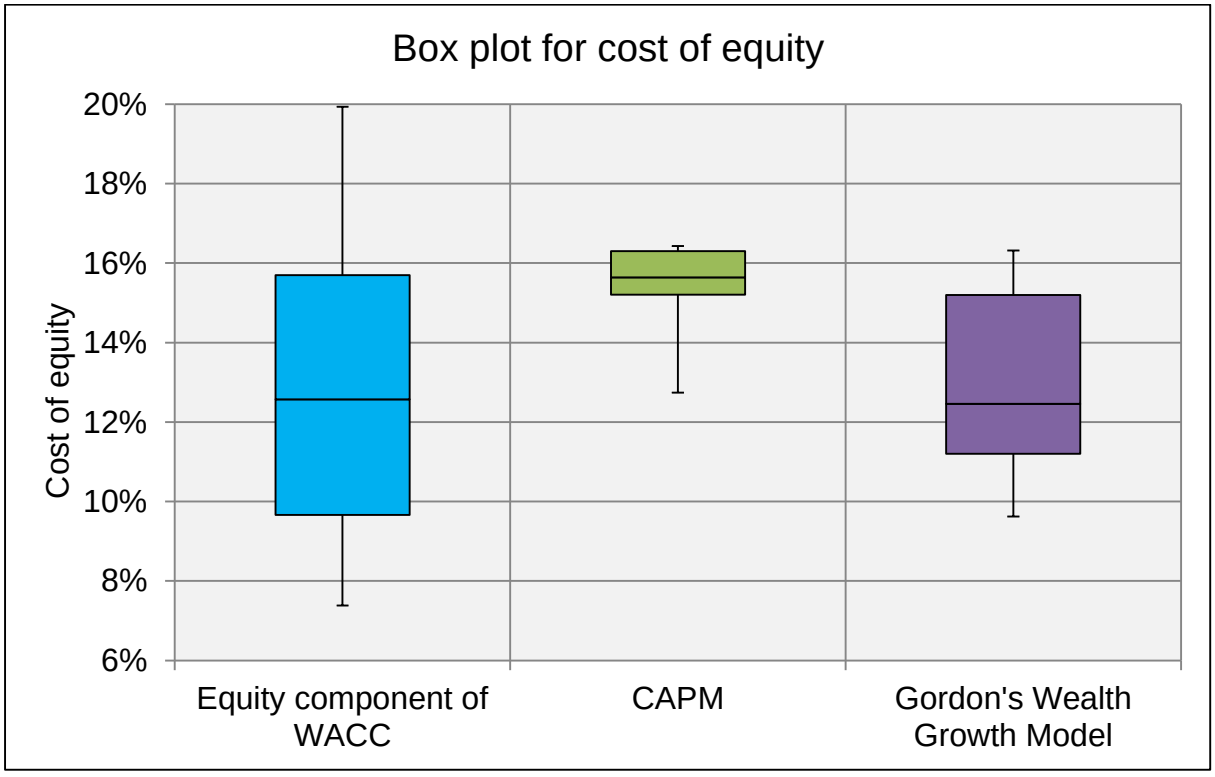


Figure 4.8 Box and whisker plot for Lonmin cost of equity

4.3.3.2 Summary for Lonmin

The CAPM and Gordon's Wealth Growth Model failed to capture the cost of equity rates during the period under study. During recession, CAPM managed to capture the movement in discount rates but failed to estimate accurately the values as its estimates were higher than that of the equity component of WACC rates. The average discount rate for Gordon's Wealth Growth Model approximates that of the equity component of WACC but failed to capture the effect of recession on the cost of equity for the company.

4.4 Cost of equity for gold mining companies

Gold is considered as a store of value and a safe haven during episodes of economic insecurity. Investors have conventionally used gold as a hedge against inflation or a falling currency. The price of gold experienced a secular increase in the years leading to 2008 and 2009 in line with the commodity boom across the mining industry. When the Global Financial Crisis deepened in the second half of 2008 with the collapse of Lehman Brothers, the fears of global recession sent stock markets dipping in October 2008. However, the gold price soared up indicating a positive response to the financial crisis. The increase in gold price was driven by the demand made up of jewellery, industrial and investment demand (Baur and Lucey, 2009).

Figure 4.9 presents the dividend paid by gold mining companies during the period leading to and post the Global Financial Crisis.

There was a reduction in the dividends declared by gold mining companies before FY2006, with Harmony suspending dividends from FY2005 to FY2008, see Figure 4.9. In FY2006, there was an increase in dividends payout by AngloGold Ashanti and Gold Fields. The increase in dividends payout was attributed to the surge in demand for physical gold from individuals in quest of wealth conservation instruments in the face of geopolitical and economic uncertainty (AngloGold Ashanti Limited, 2006).

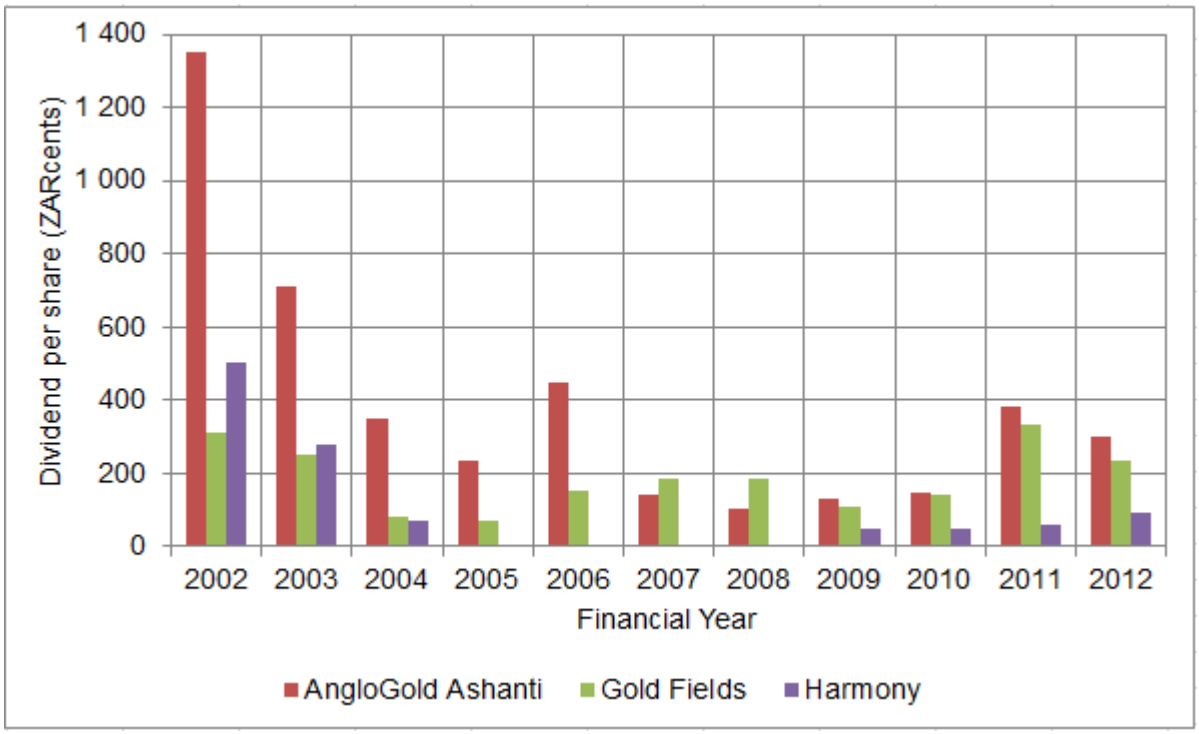


Figure 4.9 Declared dividend per share for gold mining companies

There is a steady increase in the amount of dividends declared during and post the period of the Global Financial Crisis due to high gold demand. The increase in gold demand is attached to the continued insecurity about the prospects of economic recovery in the United States, Europe, Japan and the fiscal measures implemented to mitigate the economic difficulties (AngloGold Ashanti Limited, 2010).

4.4.1 AngloGold Ashanti

A year-on-year increase of the actual cost of equity is observed in Figure 4.10 from FY2003. This increase may be attributed to the high cost driven by oil prices, mining contractor costs, drop in earnings resulting in reduced dividends, reduced return on equity (dropped from 7% to 4%), proposal by International Monetary Fund to sell part of its gold reserves (AngloGold Ashanti Limited, 2004 and 2005).

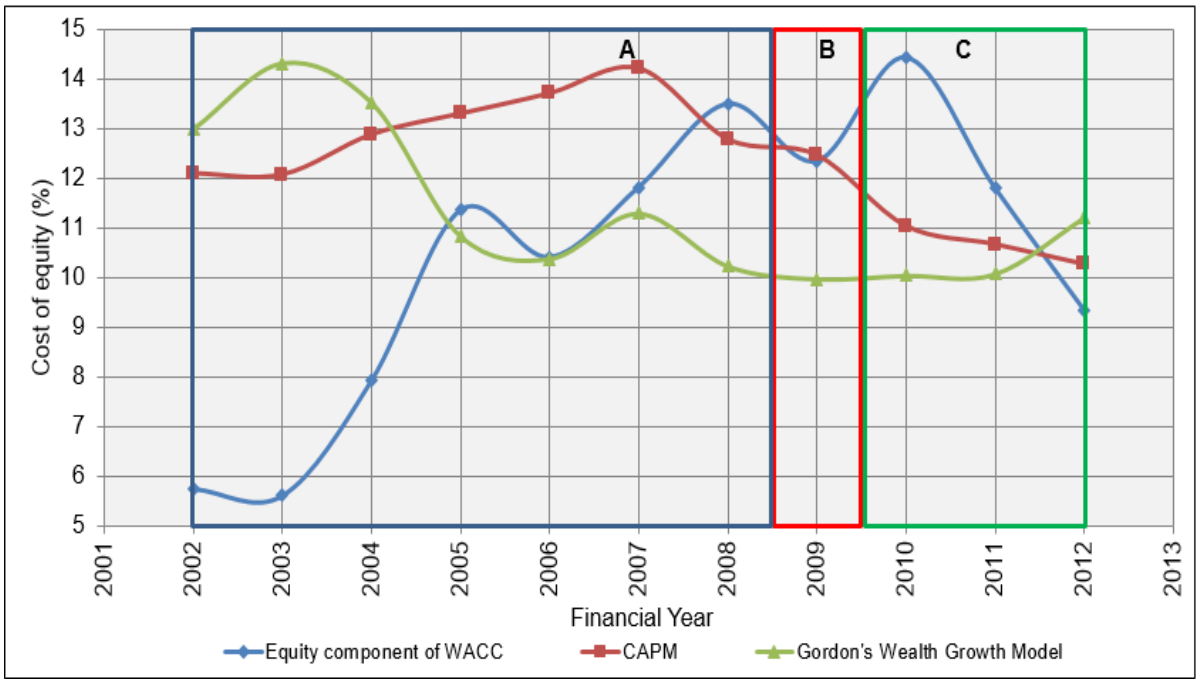


Figure 4.10 Cost of equity for AngloGold Ashanti from FY2002 to FY2012

The actual cost of equity for AngloGold Ashanti decreased in FY2006, this drop was ascribed to investor and speculator interest combined with volatility in the first half of the year that pushed the gold price to record highs. The Middle East and Chinese jewellery fabrication and electronics industry increased the gold demand. The demand for physical gold from individuals seeking wealth preservation instruments in the face of economic market instability increased in FY2006 (AngloGold Ashanti Limited, 2006).

The cost of equity for AngloGold Ashanti surged up until the Global Financial Crisis occurred due to various reasons. Some of the reasons are that higher gold price was eroded by inflation, rehabilitation costs, lower-income from by-products, low production output. The headline earnings of the company plunged by 32% (AngloGold Ashanti Limited, 2007). During the Global Financial Crisis, Phase B, the discount rate for AngloGold Ashanti decreased till the end of 2009 attributed to gold's status as a safe haven. When South Africa suffered a national power crisis, the mining industry was adversely affected and forced to reduce the energy consumption to about 95%. The rise in cost of equity between FY2009 and FY2010 may be attributed to the energy issues related to insecurity of power supply and a proposed increase on the unit price for energy (AngloGold Ashanti Limited, 2009).

The actual discount rates decreased from FY2010 to FY2012 due to the rise in gold price. The rise in gold price was driven by the demand for gold as an investment commodity during uncertainty about the prospect of economic recovery in the United States, Japan and Europe. The demand for exchange traded funds (ETFs) grew by 7% in FY2011 as compared with FY2010. The credit rating of AngloGold Ashanti was upgraded in March 2012 from Baa3 to Baa2 with stable outlook (AngloGold Ashanti Limited, 2010; 2011 and 2012). The investment grade credit rating upgrade further support the fall in discount rate seen in Figure 4.10. The CAPM and Gordon's Wealth Growth Model failed to estimates the actual cost of equity.

4.4.1.1 Descriptive statistics for AngloGold Ashanti

The mean squared error for CAPM is closer to zero than that of Gordon's Wealth Growth Model; however, they are not significantly different see Table 4.7. The estimate cost of equity for CAPM are higher than the estimates for Gordon's Wealth Growth Model and that of actual discount rates.

Table 4.7 Cost of equity and the mean squared error for AngloGold Ashanti

Year	Equity component of WACC (%)	CAPM (%)	Difference (%)	MSE	Gordon's Wealth Growth Model	Difference (%)	MSE
2002	5.76	12.10	6.34	0.004	13.01	7.25	0.005
2003	5.63	12.08	6.45	0.004	14.33	8.70	0.008
2004	7.95	12.89	4.94	0.002	13.53	5.58	0.003
2005	11.37	13.31	1.94	0.000	10.84	-0.53	0.000
2006	10.42	13.72	3.30	0.001	10.39	-0.03	0.000
2007	11.83	14.22	2.39	0.001	11.30	-0.53	0.000
2008	13.5	12.79	-0.71	0.000	10.24	-3.26	0.001
2009	12.35	12.47	0.12	0.000	9.98	-2.37	0.001
2010	14.43	11.04	-3.39	0.001	10.05	-4.38	0.002
2011	11.81	10.67	-1.14	0.000	10.08	-1.73	0.000
2012	9.36	10.27	0.91	0.000	11.21	1.85	0.000
Average	**10.40**	**12.32**	**1.92**	**0.001**	**11.36**	**0.96**	**0.002**

A statistical analysis of data is presented in Table 4.8 and will be discussed in conjunction with Figure 4.11**.** The range of the estimated discount rates for both models is significantly different from that of the equity component of WACC values. The estimate cost of equity had a narrower spread for CAPM and Gordon's Wealth Growth Model when compared to that of the equity component of WACC. This notion

was further supported by the range values of about 4% for CAPM and Gordon's Wealth Growth Model while the equity component of WACC had a range value of 9%.

Table 4.8 Descriptive statistics for AngloGold Ashanti

Measure	Equity component of WACC	CAPM	Gordon's Wealth Growth Model
Mean	10.40%	12.30%	11.40%
Standard deviation	2.90%	2.90%	1.50%
Range	8.80%	4.00%	4.40%
Correlation coefficient	1.00	0.02	0.90
Sum	114.40%	135.60%	125.00%

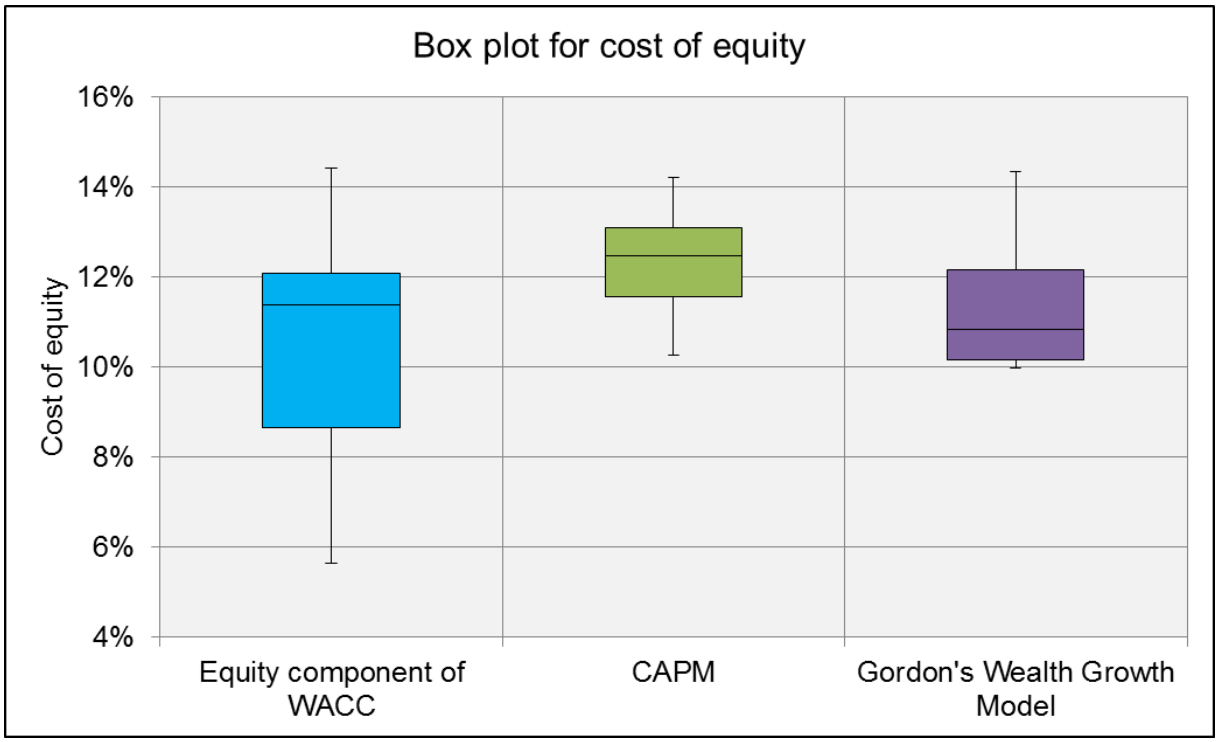


Figure 4.11 Box and whisker plot for AngloGold Ashanti cost of equity

Figure 4.10 shows that there is an inverse relationship between Gordon's Wealth Growth Model and the equity component of WACC for 2002-2005 and 2011-2012 periods. Conversely, when analysing the whole period under study, there is a high correlation between Gordon's Wealth Growth Model and the equity component of

WACC while CAPM shows a very weak correlation with the equity component of WACC (Table 4.8).

4.4.1.2 Summary for AngloGold Ashanti

Both CAPM and Gordon's Wealth Growth Model were unable to provide reliable estimates for the cost of equity. The cost of equity estimate for CAPM were decreasing from 2007 and this is caused by beta values that were less than the market beta of one, see Appendix 7.7. The beta values less than one indicate that AngloGold Ashanti was less riskier than the market. The mean squared error values indicate that the estimated cost of equity for both models are not significantly different from the actual discount rates. The descriptive statistics show that there is similarity in data for the equity component of WACC, CAPM and Gordon's Wealth Growth Model. Gordon's Wealth Growth Model has very high correlation with the equity component of WACC with a correlation coefficient of 0.9.

4.4.2 Gold Fields Limited

The actual cost of equity was on the rise from FY2003 with a slight decrease in FY2007 and continued to increase in FY2008 (Figure 4.12). Gold Fields was negatively impacted by external issues like strengthening of rand against the US dollar, shortage of skilled labour, power supply crisis and the national wage strike. The increase in gold demand drove prices high and Gold Fields could have achieved high earnings. The demand was due to continued political tensions in Iraq, North Korea and Middle East and the rapid economic growth in China resulting in severe shortages of gold (Gold Fields Limited, 2004; 2006; 2007 and 2008).

However, Gold Fields had other internal issues to address which hampered the gold production output. Internal challenges faced by the company included amongst others, the increase in cash costs due to wage increase above inflation rate, safety stoppages due to fatalities and delay in construction; all affecting the amount of gold produced. The investors were not satisfied with electricity supply security and safety performance of the company leading to a volatile share price (Gold Fields Limited, 2004; 2006; 2007 and 2008).

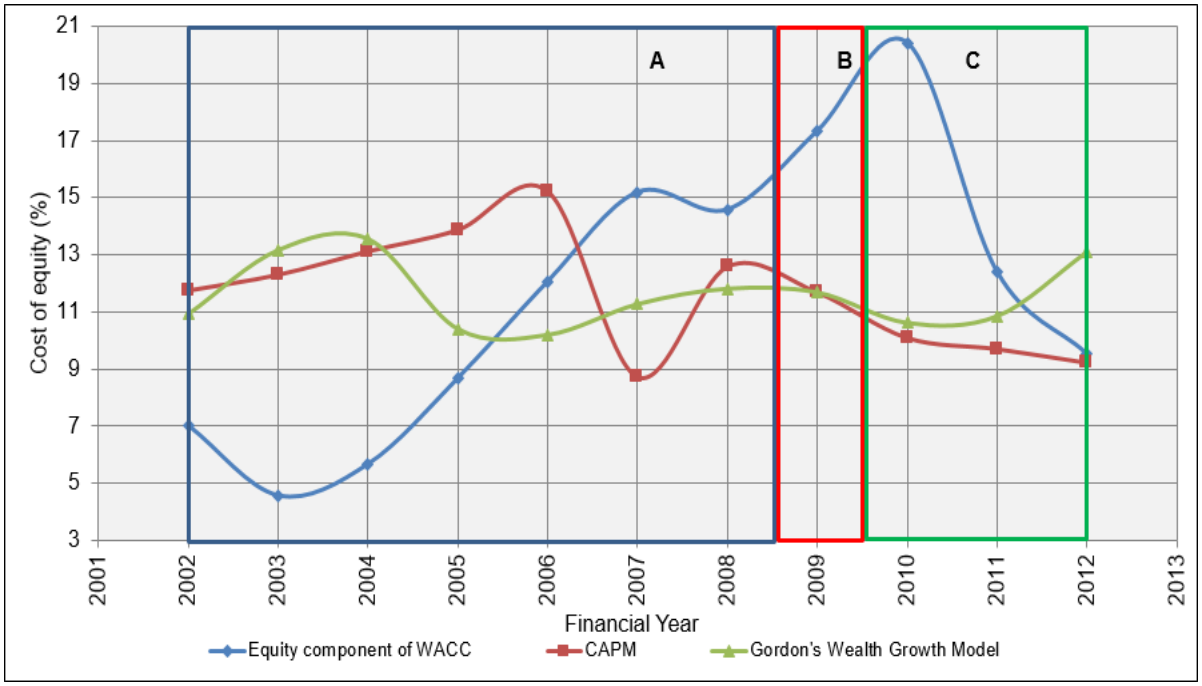


Figure 4.12 Cost of equity for Gold Fields from FY2002 to FY2012

In Phase C, the actual cost of capital started to drop; this can be attributed to the cost saving initiatives adopted by Gold Fields such as reduction of power consumption and review of surface labour complement. The continued economic growth of emerging markets like India and China underpinned strong demand for gold jewellery. Gold Fields adopted a strategy of focusing only on cash generating operations by selling high cost mines such as the selling of Beatrix and Kloof- Driefontein Complex (KDC) mines to Sibanye Gold (Gold Fields Limited, 2012).

4.4.2.1 Descriptive statistics for Gold Fields

The mean squared error values for CAPM and Gordon's Wealth Growth Model are at 0.003 in Table 4.9, which is almost equal to zero. The average cost of equity values for the equity component of WACC, CAPM and Gordon's Wealth Growth Model are approximately similar. However, the effect of an outlier is evident in the average value for the equity component of WACC because in FY2010 the cost of equity was 20.42%, thus, introducing a bias into the average value.

Table 4.9 Cost of equity and the mean squared error for Gold Fields

Year	Equity component of WACC (%)	CAPM (%)	Difference (%)	MSE	Gordon's Wealth Growth Model	Difference (%)	MSE
2002	7.00	11.76	4.76	0.002	10.94	3.94	0.002
2003	4.56	12.31	7.75	0.006	13.18	8.62	0.007
2004	5.67	13.13	7.46	0.006	13.56	7.89	0.006
2005	8.68	13.88	5.20	0.003	10.40	1.72	0.000
2006	12.07	15.22	3.15	0.001	10.20	-1.87	0.000
2007	15.19	8.73	-6.46	0.004	11.28	-3.91	0.002
2008	14.58	12.59	-1.99	0.000	11.82	-2.76	0.001
2009	17.33	11.69	-5.64	0.003	11.69	-5.64	0.003
2010	20.42	10.10	-10.32	0.011	10.62	-9.80	0.010
2011	12.41	9.71	-2.70	0.001	10.85	-1.56	0.000
2012	9.53	9.23	-0.30	0.000	13.10	3.57	0.001
Average	**11.59**	**11.67**	**0.08**	**0.003**	**11.60**	**0.02**	**0.003**

The mean values for estimates of the equity component of WACC, CAPM and Gordon's Wealth Growth Model are equal, see Table 4.10. The range of values for the equity component of WACC and Gordon's Wealth Growth Model are similar whereas CAPM is different, this is evident in Table 4.9. The correlation coefficient values states that there is a moderate and weak correlation for Gordon's Wealth Growth Model and CAPM with the equity component of WACC, respectively. The sum of the values is approximately similar, with Gordon's Wealth Growth Model having minor superiority.

Table 4.10 Descriptive statistics for Gold Fields

Measure	Equity component of WACC	CAPM	Gordon's Wealth Growth Model
Mean	11.60%	11.70%	10.60%
Standard deviation	5.00%	2.00%	3.70%
Range	15.90%	6.50%	13.50%
Correlation coefficient	1.00	0.36	0.49
Sum	127.40%	128.40%	116.80%

The spread of values can be seen in Figure 4.13, with Gordon's Wealth Growth Model having a narrower spread compared to CAPM values.

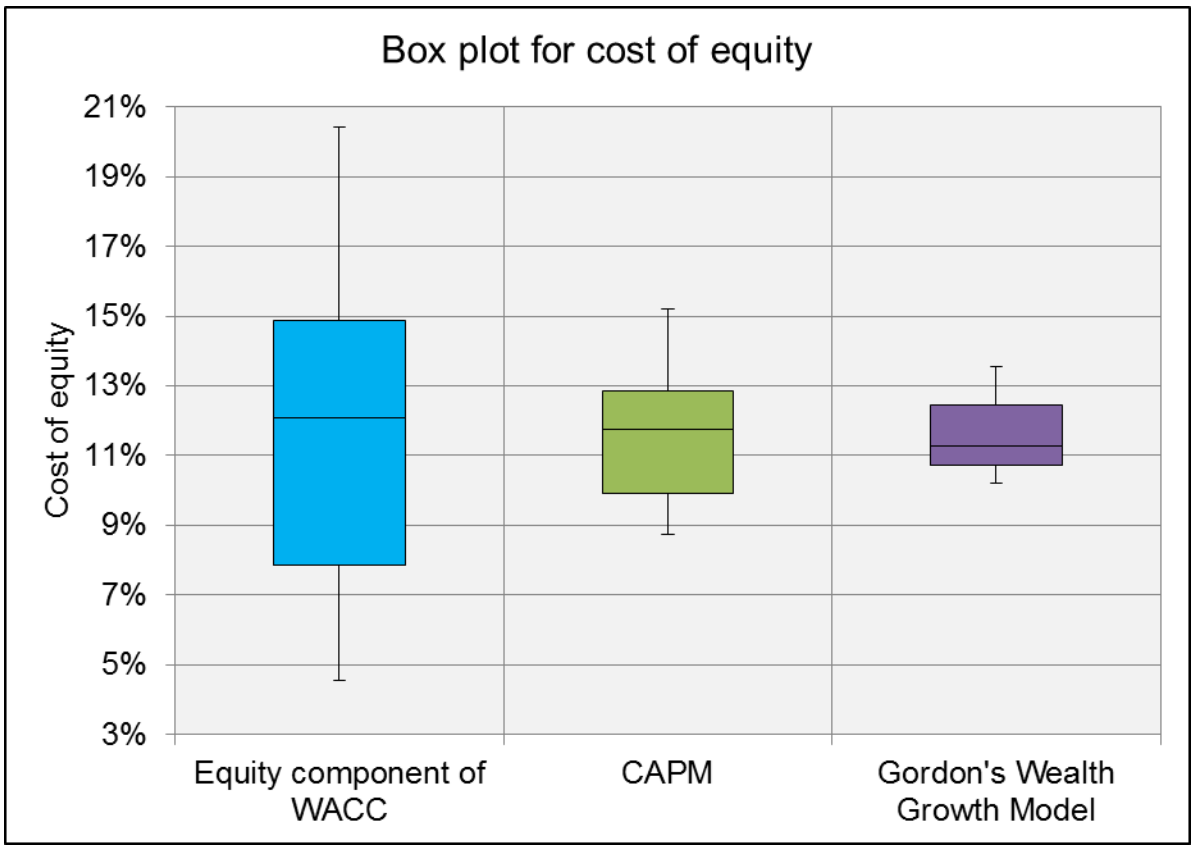


Figure 4.13 Box and whisker plot for Gold Fields cost of equity

4.4.2.2 Summary for Gold Fields

The CAPM managed to capture the trend in the post-recession phase, however, it consistently underestimated the cost of equity. The Gordon's Wealth Growth Model failed to estimate an upward movement in the cost of equity. The descriptive analysis was used to check the similarity of the data set for CAPM and Gordon's Wealth Growth Model with the equity component of WACC rates. The statistics measures show that the data for Gordon's Wealth Growth Model are similar to that of the equity component of WACC with sum, mean, MSE providing inconclusive comparisons.

4.4.3 Harmony Gold Mining Company Limited

In Phase A, the CAPM managed to capture the trend of the actual cost of equity; however, the discount rates for CAPM are overestimated, Figure 4.14. Harmony did not declare dividends from FY2005 to FY2008; resulting in the estimate cost of equity for this period using Gordon's Wealth Growth Model being constant at 9.62%, see Table 4.11. The main reason for not declaring dividends was cited to be the negative impact on the business performance due to various reasons. The leading causes of

the poor performance were the exposure to the cyclical nature of the gold price over preceding years and the volatility of the rand against the US dollar exchange rate, and the company decided to use its earnings to fund growth projects. Harmony sold non-strategic listed assets, such as Orkney shaft, and focused on turning loss-making shafts into profit making operations (Harmony Gold Mining Company Limited, 2004; 2005; and 2007).

The performance of Harmony was further affected by the shortage of electricity supply in 2008 resulting in closure of shafts and mining areas with high electricity consumption. Consequently, the production targets were not met and thus affecting the earnings. The Global Financial Crisis contracted equity funding, however, Harmony managed to clear its debts during Phase B (Harmony Gold Mining Company Limited, 2008 and 2009).

During Phase C, the discount rate for Harmony started declining and that can attributed to the cost saving initiatives the company adopted, such as closure of the HAR2, Evander 2, 5, and 7 shafts. The company resumed dividend payouts in FY2009 because the company was in a good financial position. The continued demand for gold from India and China coupled with low production output kept the price of gold on a steady increase (Harmony Gold Mining Company Limited, 2010; 2011 and 2012).

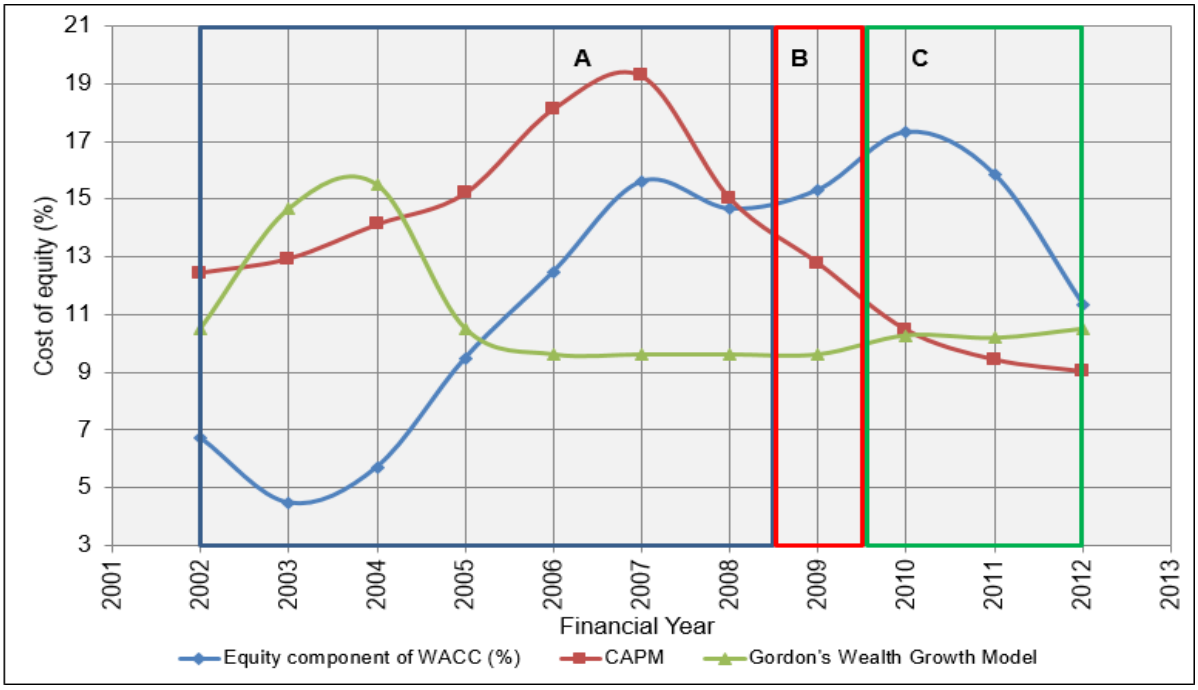


Figure 4.14 Cost of equity for Harmony from FY2002 to FY2012

4.4.3.1 Descriptive statistics for Harmony

The mean squared error values for CAPM and Gordon's Wealth Growth Model are not significantly different from zero, see Table 4.11. Therefore, the MSE is not a conclusive measure and other measures were used from the descriptive statistics in Table 4.12. The mean, standard deviation and range values for CAPM are similar to those of the equity component of WACC attributed to the similarity in the spread of cost of equity in Table 4.11.

Table 4.11 Cost of equity and the mean squared error for Harmony

Year	Equity component of WACC (%)	CAPM (%)	Difference (%)	MSE	Gordon's Wealth Growth Model	Difference (%)	MSE
2002	6.72	12.44	5.72	0.003	10.51	3.79	0.001
2003	4.47	12.93	8.46	0.007	14.67	10.20	0.010
2004	5.71	14.12	8.41	0.007	15.51	9.80	0.010
2005	9.49	15.20	5.71	0.003	10.52	1.03	0.000
2006	12.48	18.13	5.65	0.003	9.62	-2.86	0.001
2007	15.61	19.28	3.67	0.001	9.62	-5.99	0.004
2008	14.66	15.02	0.36	0.000	9.62	-5.04	0.003
2009	15.32	12.77	-2.55	0.001	9.62	-5.70	0.003
2010	17.32	10.45	-6.87	0.005	10.28	-7.04	0.005
2011	15.84	9.42	-6.42	0.004	10.19	-5.65	0.003
2012	11.34	9.01	-2.33	0.001	10.51	-0.83	0.000
Average	**11.72**	**13.52**	**1.80**	**0.003**	**10.97**	**-0.75**	**0.004**

Table 4.12 Descriptive statistics for Harmony

Measure	Equity component of WACC	CAPM	Gordon's Wealth Growth Model
Mean	11.70%	13.50%	11.00%
Standard deviation	4.50%	3.30%	2.10%
Range	12.90%	10.30%	5.90%
Correlation coefficient	1.00	0.02	0.77
Sum	129.00%	148.80%	120.70%

CAPM has a better correlation with the equity component of WACC for 2004-2008 period which is a period before the GFC. In contrary, for the whole period, the Gordon's Wealth Growth Model has a high correlation with the equity component of WACC of

0.8 compared to a very weak correlation for CAPM. The sum of the Gordon's Wealth Growth Model was similar to that of the equity component of WACC, while CAPM has a higher sum. It was expected for CAPM to have a high sum because of the high estimated cost of equity, see Figure 4.14.

The box and whisker plot for Harmony is shown in Figure 4.15. The Gordon's Wealth Growth Model has a narrower spread than CAPM and the equity component of WACC. This narrower spread is attributed to the period where there were no dividend paid, see Figure 4.9.

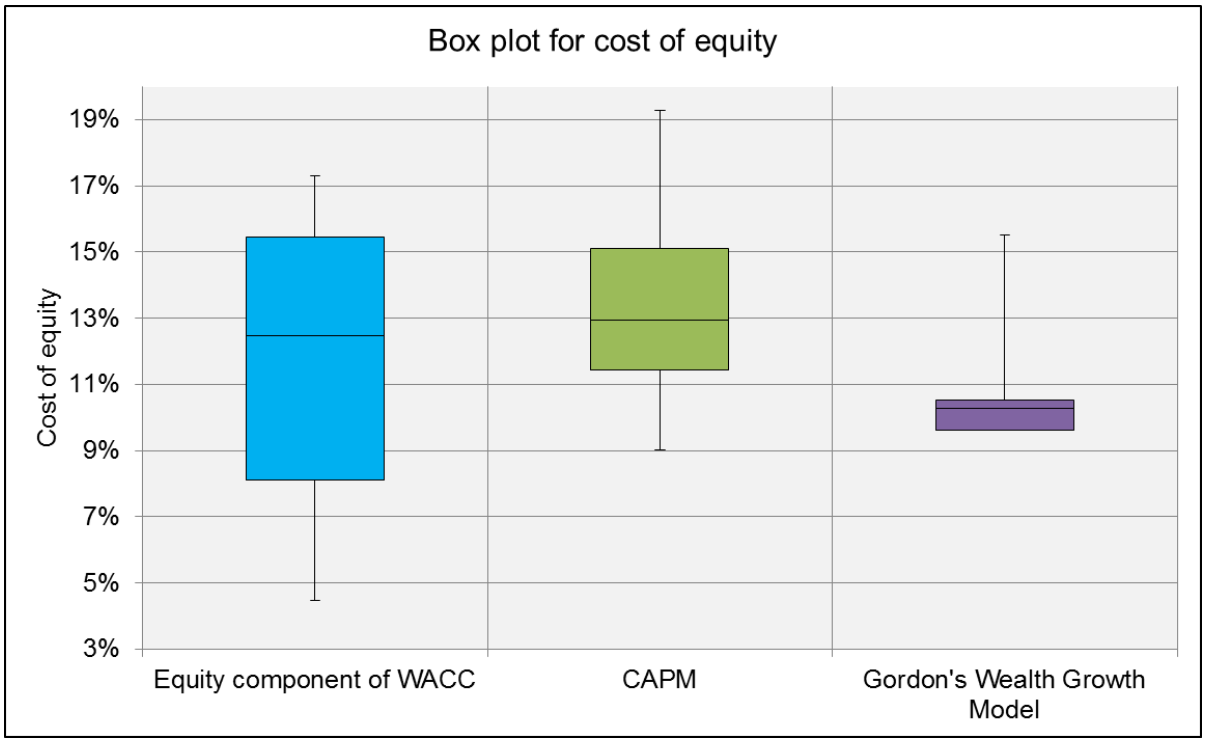


Figure 4.15 Box and whisker plot for Harmony cost of equity

4.4.3.2 Summary for Harmony

The estimate cost of equity using Gordon's Wealth Growth Model is not affected by the reduction in dividends payout of the company but a cut in dividends payout causes market value of the company to fall. Harmony did not declare dividends for a certain period of time, which affected the ability of Gordon's Wealth Growth Model to estimate the cost of equity. The estimate cost of equity for CAPM started declining from FY2007 and underestimating the actual discount rates. The CAPM and Gordon's Wealth Growth Models failed to estimate the actual cost of equity values throughout the

period. However, Gordon's Wealth Growth Model has a high correlation with the equity component of WACC compared to a very low correlation for CAPM.

4.5 Chapter summary

This chapter presented the results and analysis for each company under study. The discount rates were varying based on the state of the global economic market performance, with low discount rates experienced during bullish periods. Both models failed to estimate accurately the cost of equity for the companies under review. The trend for cost of equity estimated using Gordon's Wealth Growth Model is similar in all platinum companies and the same applies for all gold companies considered in the study. The CAPM has different trends for different companies, which can be attributed to company's individual risk profiles.

When the demand for PGMs from emerging markets increased, the price for PGMs surged up resulting in high returns for PGMs producers, evident from the dividends declared by companies. The Global Financial Crisis sent the demand of PGMs plummeting, consequently, the price of PGMs dropped. There was a sharp rise in cost of equity for platinum mining companies observed during Phase B. The discount rates started dropping in Phase C, which may be attributed to the cost saving initiatives companies adopted and a slow market recovery.

Investors redirected their investments from other commodity classes to gold when the stock market collapsed in 2008. The gold price increased as the demand from developed countries soared up for gold as an investment alternative. The cost of equity for all gold mining companies was increasing sharply during Phase A. When the Global Financial Crisis occurred, the rise in discount rates was relatively slow. The occurrence of the Global Financial Crisis caused a high demand for gold as a safe haven and investment instrument. Consequently, there was a drastic decrease in the cost of equity for gold mining companies.

The correlation coefficient was used to summarise the findings of this study. Table 4.13 provides the rating system used to analyse the ability of CAPM and Gordon's Wealth Growth Model to estimate the cost of equity for mining companies.

Table 4.13 Rating system for asset pricing models

Coefficient of correlation	0 - 0.4	0.4 - 0.6	0.6 - 1.0
Rating	poor	moderate	good
Colour	red	yellow	green
Rating value	1	2	3

The colour classifications in Table 4.13 were assigned values in order to calculate an overall rating score for CAPM and Gordon's Wealth Growth Model. A summary of the findings of this study using the correlation coefficient are shown in Table 4.14.

Table 4.14 Summary of findings based on correlation coefficient

Company	**CAPM**	**Gordon's Wealth Growth Model**
Anglo American Platinum	1	1
Impala Platinum	2	1
Lonmin	3	3
AngloGold Ashanti	1	3
Gold Fields	1	2
Harmony	1	3
Overall rating	**9**	**13**

The Gordon's Wealth Growth Model has a higher overall rating compared to CAPM. Hence, Gordon's Wealth Growth Model was chosen as the better model to estimate the cost of equity for mining companies. The next chapter will conclude the findings of the research and provide recommendations.

5 CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter recapitulates the findings, provide conclusions of the study and proposes a way forward. Section 5.2 presents the summary with reference to the research objectives. Limitations of the research and suggestions for future work are presented in Section 5.3 and Section 5.4, respectively.

5.2 Findings and recommendations

Investment capital is a scarce resource of which mining companies compete for with other industries. Therefore, it is vital that a present value for the project is determined. A commonly used valuation technique is DCF analysis method to discount future cash flows to present value using discount rates. There are various methods to determine discount rates but this research considered Gordon's Wealth Growth Model and CAPM because of their simplicity and availability of the parameters required to estimate the discount rates.

CAPM is the most commonly used method of estimating cost of equity for publicly traded stocks as practitioners find its risk and return relation to be intuitive. This method has strong theoretical backing; unfortunately, various authors have shown that there is weak empirical evidence to support its use because it fails to capture various anomalies. Some of the anomalies were discussed in Section 2.2.

Gordon's Wealth Growth Model is regarded as the simplest form of dividend discount models. This model is used to value stock of a firm that has stable growth and pays out dividends. This model assumes that the stock is equal to the present value of all its future dividend payments and dividends grow at a constant rate to infinite. The drawback for this model is that there is no evidence in dividends for constant growth to perpetuity, as depicted in Figure 4.2 and Figure 4.9 where some companies did not pay dividends. Some of the anomalies experienced with Gordon's Wealth Growth Model were outlined in Section 2.2. Henceforth, the objective of this research was to explain the differences in cost of equity estimated using CAPM and Gordon's Wealth Growth Model.

CAPM failed to capture the actual cost of equity throughout the period under study. The estimate cost of equity were greater than the actual equity component of WACC values in most cases. Gordon's Wealth Growth Model captured the trend for actual equity component of WACC values however, constantly underestimating the cost of equity. This can be attributed to the fact that economic market movements do not immediately affect the mining companies. The dataset for Gordon's Wealth Growth Model were similar to that of the equity component of WACC for both gold and platinum mining companies. There was a high correlation between Gordon's Wealth Growth Model and the equity component of WACC for gold mining companies, whereas, a weak correlation between the equity component of WACC and both CAPM and Gordon's Wealth Growth Model was identified for platinum mining companies. However, CAPM had a narrower spread than Gordon's Wealth Growth Model throughout suggesting that it is a better model for estimating cost of equity.

The use of CAPM and Gordon's Wealth Growth Model when the commodity market is bullish or bearish rendered the models unsuitable to estimate the cost of equity for mining companies. It is of paramount importance that external factors that affect the results are taken into consideration. It is almost impossible to ascertain the weight each external factor has on the result computed. From the findings in this report, it is recommended that investors, practitioners and/or researchers consider using Gordon's Wealth Growth Model when estimating cost of equity for mining companies under uncertain economic market conditions given that this method uses *ex-ante* data to estimate *ex-ante* returns. This recommendation is however limited by the length of the period under review and associated events within the review period. A longer time horizon and larger sample-pool may lead to a different conclusion and recommendation.

5.3 Limitations of the research

The limitations of this research are that:

- The study is limited to two commodities with only the top three companies by market capitalisation considered which may not be a true representative of the mining industry;

- The sample period of the research is fifteen (15) years, which is a short period compared to studies done in the past. A short period may be subject to increased standard errors in the data collected;
- The research period includes phases of global market instability that may result to inconsistencies in the data.

5.4 Recommendations for future work

The period of the research includes stages of global economic market uncertainty that affected the results. Therefore, a similar study can be undertaken under stable global economic conditions. This research only considered platinum and gold sectors, a study for the South African mining industry can be carried out to explain differences in cost of equity for various commodity classes. This study focused on estimating cost of equity for mining companies, therefore, one can embark on a research to determine a method that reliably estimate project specific discount rate. The cash flows upon which the DCFs are based maybe in real or nominal money terms. An area for further research is to determine whether the discounted cash flows should be in real or nominal monetary terms.

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7 APPENDICES

7.1 Input data for cost of equity using CAPM for Anglo American Platinum Limited

	JSE		Anglo American Platinum Limited		
Date	**Close (ZAR cents)**	**Return**	**Close (ZAR cents)**	**Dividends (ZAR cents)**	**Return**
2012 December	39250.24	**0.03**	44633		**0.14**
2012 November	38104.61	**0.03**	39125		**-0.03**
2012 October	37156.28	**0.04**	40300		**-0.06**
2012 September	35757.98	**0.01**	42800		**0.02**
2012 August	35389.45	**0.02**	41894		**-0.01**
2012 July	34596.9	**0.03**	42500		**-0.12**
2012 June	33708.31	**0.02**	48479		**0.02**
2012 May	33142.61	**-0.04**	47612		**-0.06**
2012 April	34399.04	**0.03**	50400		**-0.06**
2012 March	33554.21	**-0.02**	53400		**-0.10**
2012 February	34296	**0.01**	59206	200	**0.07**
2012 January	33792.48	**0.06**	55400		**0.04**
2011 December	31985.67	**-0.03**	53200		**-0.03**
2011 November	32812.64	**0.01**	55100		**-0.04**
2011 October	32348.54	**0.09**	57445		**0.04**
2011 September	29674.2	**-0.04**	55400		**-0.05**
2011 August	31005.5	**-0.01**	58550		**0.02**
2011 July	31208.04	**-0.02**	57300	500	**-0.08**
2011 June	31864.54	**-0.02**	62800		**-0.04**
2011 May	32565.73	**-0.01**	65100		**-0.02**
2011 April	32836.23	**0.02**	66700		**-0.04**
2011 March	32204.06	**0.00**	69700		**0.03**
2011 February	32272.09	**0.03**	67700	683	**-0.03**
2011 January	31398.75	**-0.02**	70300		**0.01**
2010 December	32118.89	**0.06**	69413		**0.05**
2010 November	30266.4	**-0.01**	66150		**-0.05**
2010 October	30430.9	**0.03**	69300		**0.05**
2010 September	29456.04	**0.08**	66100		**0.08**
2010 August	27253.87	**-0.04**	61050		**-0.13**
2010 July	28355.21	**0.08**	70300		**-0.04**
2010 June	26258.82	**-0.03**	72900		**-0.05**

2010 May	27145.36	**-0.05**	76900		**-0.05**
2010 April	28635.76	**0.00**	80959		**0.09**
2010 March	28747.56	**0.07**	74000		**0.04**
2010 February	26764.61	**0.00**	71450		**-0.02**
2010 January	26675.95	**-0.04**	72599		**-0.08**
2009 December	27666.45	**0.03**	79250		**0.04**
2009 November	26894.74	**0.02**	76200		**0.11**
2009 October	26360.55	**0.06**	68404		**0.03**
2009 September	24910.85	**0.00**	66700		**-0.03**
2009 August	24929.42	**0.03**	69000		**0.24**
2009 July	24258.51	**0.10**	55450		**0.02**
2009 June	22049.42	**-0.03**	54551		**-0.02**
2009 May	22770.62	**0.10**	55484		**0.21**
2009 April	20647.03	**0.01**	45800		**-0.04**
2009 March	20363.91	**0.10**	47600		**0.23**
2009 February	18465.33	**-0.10**	38587		**-0.09**
2009 January	20570.05	**-0.04**	42500		**-0.18**
2008 December	21509.2	**0.01**	51760		**0.12**
2008 November	21209.49	**0.01**	46400		**0.16**
2008 October	20991.72	**-0.12**	40000		**-0.46**
2008 September	23835.97	**-0.14**	74400		**-0.24**
2008 August	27702.06	**0.00**	97400		**0.01**
2008 July	27719.67	**-0.09**	96500	3500	**-0.23**
2008 June	30413.43	**-0.04**	130700		**-0.01**
2008 May	31841.27	**0.04**	132501		**0.09**
2008 April	30743.49	**0.04**	121250		**0.02**
2008 March	29587.51	**-0.04**	119000		**-0.04**
2008 February	30673.74	**0.12**	124000	2300	**0.19**
2008 January	27317.14	**-0.06**	106500		**0.05**
2007 December	28957.97	**-0.04**	101005		**0.04**
2007 November	30307.8	**-0.03**	97100		**-0.13**
2007 October	31334.99	**0.05**	111500		**0.07**
2007 September	29959.19	**0.05**	104260		**0.09**
2007 August	28660.35	**0.00**	95400		**-0.03**
2007 July	28561.81	**0.01**	98802	2900	**-0.13**
2007 June	28337.22	**-0.01**	116401		**-0.02**
2007 May	28627.79	**0.02**	119375		**0.04**
2007 April	28170.6	**0.03**	114501		**0.00**
2007 March	27267.24	**0.06**	114450		**0.11**
2007 February	25795.99	**0.01**	103000	3900	**0.18**
2007 January	25447.73	**0.02**	90800		**0.06**
2006 December	24915.2	**0.04**	85603		**0.03**
2006 November	23949.95	**0.03**	82790		**0.05**

2006 October	23338.16	**0.04**	79000		**0.00**
2006 September	22374.58	**0.02**	78701		**-0.03**
2006 August	21953.8	**0.05**	80800		**0.14**
2006 July	20885.57	**-0.02**	71000	1400	**-0.04**
2006 June	21237.87	**0.03**	75500		**0.26**
2006 May	20565.46	**-0.03**	59700		**0.03**
2006 April	21135.51	**0.04**	58101		**0.04**
2006 March	20351.74	**0.07**	55938		**0.14**
2006 February	19085.35	**-0.03**	49250	700	**-0.01**
2006 January	19745.16	**0.09**	50400		**0.10**
2005 December	18096.54	**0.08**	45700		**0.07**
2005 November	16774.54	**0.02**	42803		**0.10**
2005 October	16433.1	**-0.03**	39000		**0.04**
2005 September	16875.65	**0.09**	37500		**0.21**
2005 August	15414.01	**0.02**	31050		**0.06**
2005 July	15143.64	**0.07**	29200	480	**0.00**
2005 June	14154.73	**0.03**	29800		**0.02**
2005 May	13787.02	**0.10**	29201		**0.22**
2005 April	12555.96	**-0.06**	23900		**0.02**
2005 March	13298.58	**-0.01**	23400		**0.02**
2005 February	13476.59	**0.05**	23000	335	**0.08**
2005 January	12798.55	**0.01**	21551		**0.04**
2004 December	12656.86	**0.01**	20700		**-0.03**
2004 November	12490.79	**0.07**	21300		**-0.09**
2004 October	11655.31	**-0.01**	23400		**-0.14**
2004 September	11761	**0.05**	27200		**-0.08**
2004 August	11160.44	**0.08**	29550		**0.23**
2004 July	10305.89	**0.02**	24000	400	**0.04**
2004 June	10108.61	**-0.03**	23500		**-0.03**
2004 May	10413.81	**0.00**	24260		**0.01**
2004 April	10385.8	**-0.03**	24000		**-0.14**
2004 March	10692.56	**-0.02**	27800		**-0.06**
2004 February	10895.86	**0.00**	29500	270	**-0.09**
2004 January	10849.25	**0.04**	32800		**0.13**
2003 December	10387.22	**0.07**	29150		**0.06**
2003 November	9729.6	**0.00**	27400		**-0.07**
2003 October	9765.3	**0.09**	29500		**0.15**
2003 September	8925.69	**-0.03**	25700		**-0.06**
2003 August	9226.2	**0.05**	27230		**0.15**
2003 July	8809.63	**0.05**	23600	370	**0.01**
2003 June	8352.2	**-0.02**	23650		**-0.13**
2003 May	8564.33	**0.14**	27200		**0.33**
2003 April	7510.4	**-0.02**	20400		**-0.12**

2003 March	7679.88	**-0.09**	23300		**-0.19**
2003 February	8402.09	**-0.05**	28800	900	**-0.09**
2003 January	8798.35	**-0.05**	32800		**0.04**
2002 December	9277.22	**-0.03**	31600		**-0.05**
2002 November	9563.74	**0.02**	33300		**-0.08**
2002 October	9376.23	**-0.01**	36050		**0.02**
2002 September	9465.33	**-0.02**	35400		**-0.03**
2002 August	9677.26	**0.05**	36399	900	**0.19**
2002 July	9239.02	**-0.13**	31400		**-0.22**
2002 June	10657.73	**-0.05**	40500		**-0.15**
2002 May	11200.85	**0.02**	47500		**-0.06**
2002 April	11007.67	**0.00**	50700		**0.02**
2002 March	11015.04	**0.01**	49700		**0.06**
2002 February	10875.09	**0.05**	46900	2100	**0.11**
2002 January	10333.52	**-0.01**	44200		**-0.01**
2001 December	10456.47	**0.11**	44680		**0.24**
2001 November	9404.06	**0.11**	36000		**0.17**
2001 October	8473.51	**0.06**	30820		**0.03**
2001 September	7997.87	**-0.10**	30000		**-0.08**
2001 August	8886.72	**0.05**	32500		**0.21**
2001 July	8456.01	**-0.07**	26800		**-0.25**
2001 June	9089.89	**-0.02**	35900		**-0.15**
2001 May	9270.84	**0.04**	42000		**0.17**
2001 April	8902.33	**0.10**	36000		**0.34**
2001 March	8093.79	**-0.09**	26800		**-0.27**
2001 February	8916.29	**0.00**	36960	2300	**0.08**
2001 January	8942.37	**0.10**	36200		**0.03**
2000 December	8164.29	**0.06**	35200		**0.13**
2000 November	7687.08	**-0.04**	31200		**0.06**
2000 October	8026.39	**-0.01**	29480		**0.06**
2000 September	8146.75	**-0.03**	27820		**0.02**
2000 August	8361.62	**0.10**	27260	710	**0.36**
2000 July	7621.68	**0.01**	20600		**0.05**
2000 June	7570.39	**0.05**	19540		**0.01**
2000 May	7175.9	**-0.01**	19300		**0.18**
2000 April	7250.19	**-0.07**	16400		**-0.06**
2000 March	7765.41	**0.00**	17400		**-0.03**
2000 February	7733.24	**-0.06**	18000	425	**-0.03**
2000 January	8249.35	**-0.01**	19000		**0.02**
1999 December	8357.19	**0.13**	18700		**0.01**
1999 November	7405.91	**0.07**	18500		**0.05**
1999 October	6948.86	**0.05**	17700		**0.11**
1999 September	6628.98	**-0.01**	15920		**0.15**

1999 August	6673.17	**-0.02**	13840	275	**-0.03**
1999 July	6822.68	**0.02**	14620		**0.04**
1999 June	6721.15	**0.09**	14080		**0.21**
1999 May	6146.74	**-0.08**	11600		**0.05**
1999 April	6678.44	**0.12**	11060		**0.13**
1999 March	5973.43	**0.08**	9800		**-0.04**
1999 February	5543.5	**0.02**	10180	195	**0.16**
1999 January	5414.79	**0.08**	8950		**0.11**
1998 December	5015.72	**-0.04**	8070		**-0.12**
1998 November	5200.18	**-0.03**	9200		**0.08**
1998 October	5350.76	**0.14**	8500		**-0.01**
1998 September	4702.59	**0.05**	8600		**0.07**
1998 August	4479.85	**-0.29**	8050	190	**-0.01**
1998 July	6350.31	**0.05**	8350		**0.29**
1998 June	6035.63	**-0.11**	6450		**0.03**
1998 May	6795.3	**-0.08**	6250		**-0.23**
1998 April	7392.66	**0.10**	8080		**0.04**
1998 March	6749.22	**0.07**	7750		**0.10**
1998 February	6283.14	**0.08**	7040	115	**0.06**
1998 January	5830.29	**0.07**	6750		**0.04**
1997 December	5465.6		6500		

7.2 Input data for cost of equity using CAPM for Impala Platinum Limited

	JSE		Impala Platinum Limited		
Date	**Close (ZAR cents)**	**Return**	**Close (ZAR cents)**	**Dividend (ZAR cents)**	**Return**
2012 December	39250	**0.03**	16770		**0.16**
2012 November	38105	**0.03**	14465		**-0.07**
2012 October	37156	**0.04**	15600		**0.12**
2012 September	35758	**0.01**	13900		**0.05**
2012 August	35389	**0.02**	13300	51	**0.03**
2012 July	34597	**0.03**	13000		**-0.04**
2012 June	33708	**0.02**	13525		**0.01**
2012 May	33143	**-0.04**	13400		**-0.11**
2012 April	34399	**0.03**	15130		**0.00**
2012 March	33554	**-0.02**	15110		**-0.10**
2012 February	34296	**0.01**	16710	135	**-0.02**
2012 January	33792	**0.06**	17169		**0.03**
2011 December	31986	**-0.03**	16735		**-0.02**
2011 November	32813	**0.01**	17161		**-0.06**
2011 October	32349	**0.09**	18346		**0.12**
2011 September	29674	**-0.04**	16425		**-0.09**
2011 August	31006	**-0.01**	17976	420	**0.07**
2011 July	31208	**-0.02**	17140		**-0.06**
2011 June	31865	**-0.02**	18219		**-0.04**
2011 May	32566	**-0.01**	18900		**-0.08**
2011 April	32836	**0.02**	20503		**0.05**
2011 March	32204	**0.00**	19574		**-0.05**
2011 February	32272	**0.03**	20550	150	**0.02**
2011 January	31399	**-0.02**	20388		**-0.12**
2010 December	32119	**0.06**	23296		**0.15**
2010 November	30266	**-0.01**	20242		**0.02**
2010 October	30431	**0.03**	19800		**0.10**
2010 September	29456	**0.08**	18000		**0.03**
2010 August	27254	**-0.04**	17400	270	**-0.11**
2010 July	28355	**0.08**	19749		**0.10**
2010 June	26259	**-0.03**	18000		**-0.06**
2010 May	27145	**-0.05**	19152		**-0.09**
2010 April	28636	**0.00**	21080		**-0.01**
2010 March	28748	**0.07**	21400		**0.14**
2010 February	26765	**0.00**	18785	120	**-0.04**
2010 January	26676	**-0.04**	19750		**-0.03**
2009 December	27666	**0.03**	20299		**0.18**

2009 November	26895	**0.02**	17175		**-0.01**
2009 October	26361	**0.06**	17430		**0.00**
2009 September	24911	**0.00**	17500		**-0.04**
2009 August	24929	**0.03**	18180	200	**-0.02**
2009 July	24259	**0.10**	18799		**0.10**
2009 June	22049	**-0.03**	17045		**-0.12**
2009 May	22771	**0.10**	19300		**0.18**
2009 April	20647	**0.01**	16385		**0.04**
2009 March	20364	**0.10**	15825		**0.33**
2009 February	18465	**-0.10**	11859	120	**0.01**
2009 January	20570	**-0.04**	11892		**-0.12**
2008 December	21509	**0.01**	13500		**0.09**
2008 November	21209	**0.01**	12400		**0.23**
2008 October	20992	**-0.12**	10090		**-0.39**
2008 September	23836	**-0.14**	16600		**-0.24**
2008 August	27702	**0.00**	21795	1175	**-0.07**
2008 July	27720	**-0.09**	24582		**-0.20**
2008 June	30413	**-0.04**	30900		**-0.05**
2008 May	31841	**0.04**	32501		**0.06**
2008 April	30743	**0.04**	30800		**-0.02**
2008 March	29588	**-0.04**	31300		**-0.05**
2008 February	30674	**0.12**	32806	300	**0.19**
2008 January	27317	**-0.06**	27800		**0.17**
2007 December	28958	**-0.04**	23725		**0.00**
2007 November	30308	**-0.03**	23686		**-0.03**
2007 October	31335	**0.05**	24400		**0.02**
2007 September	29959	**0.05**	24000		**0.13**
2007 August	28660	**0.00**	21210	700	**0.04**
2007 July	28562	**0.01**	21000		**-0.03**
2007 June	28337	**-0.01**	21600		**-0.01**
2007 May	28628	**0.02**	21801		**-0.05**
2007 April	28171	**0.03**	23000		**0.01**
2007 March	27267	**0.06**	22801		**0.11**
2007 February	25796	**0.01**	20600	275	**0.01**
2007 January	25448	**0.02**	20755		**0.13**
2006 December	24915	**0.04**	18400		**0.02**
2006 November	23950	**0.03**	18100		**0.12**
2006 October	23338	**0.04**	16187.5		**0.01**
2006 September	22375	**0.02**	16062.5		**-0.04**
2006 August	21954	**0.05**	16687.5	2200	**0.18**
2006 July	20886	**-0.02**	16000		**-0.03**
2006 June	21238	**0.03**	16497.75		**0.16**
2006 May	20565	**-0.03**	14187.5		**0.00**

2006 April	21136	**0.04**	14250		**-0.02**
2006 March	20352	**0.07**	14562.5		**0.11**
2006 February	19085	**-0.03**	13125	6500	**0.50**
2006 January	19745	**0.09**	13125		**0.13**
2005 December	18097	**0.08**	11650		**0.10**
2005 November	16775	**0.02**	10575		**0.15**
2005 October	16433	**-0.03**	9188.125		**0.02**
2005 September	16876	**0.09**	9037.5		**0.08**
2005 August	15414	**0.02**	8375.125	1800	**0.34**
2005 July	15144	**0.07**	7606.25		**0.02**
2005 June	14155	**0.03**	7462.5		**0.05**
2005 May	13787	**0.10**	7126.25		**0.13**
2005 April	12556	**-0.06**	6312.5		**-0.04**
2005 March	13299	**-0.01**	6562.5		**0.03**
2005 February	13477	**0.05**	6387.5	500	**0.10**
2005 January	12799	**0.01**	6245		**0.04**
2004 December	12657	**0.01**	5987.5		**-0.03**
2004 November	12491	**0.07**	6200		**0.01**
2004 October	11655	**-0.01**	6165		**-0.05**
2004 September	11761	**0.05**	6487.5		**-0.07**
2004 August	11160	**0.08**	6981.25	1600	**0.38**
2004 July	10306	**0.02**	6198.75		**0.05**
2004 June	10109	**-0.03**	5887.5		**-0.02**
2004 May	10414	**0.00**	5999.875		**0.01**
2004 April	10386	**-0.03**	5918.75		**-0.08**
2004 March	10693	**-0.02**	6445.625		**-0.07**
2004 February	10896	**0.00**	6900	500	**0.03**
2004 January	10849	**0.04**	7150		**-0.01**
2003 December	10387	**0.07**	7250		**-0.03**
2003 November	9729.6	**0.00**	7500		**-0.05**
2003 October	9765.3	**0.09**	7918.75		**0.09**
2003 September	8925.7	**-0.03**	7262.5		**0.02**
2003 August	9226.2	**0.05**	7124.875	1750	**0.51**
2003 July	8809.6	**0.05**	5874.875		**0.05**
2003 June	8352.2	**-0.02**	5575		**-0.09**
2003 May	8564.3	**0.14**	6125		**0.36**
2003 April	7510.4	**-0.02**	4500		**-0.10**
2003 March	7679.9	**-0.09**	5012.5		**-0.18**
2003 February	8402.1	**-0.05**	6127.5	900	**-0.05**
2003 January	8798.4	**-0.05**	7387.5		**0.08**
2002 December	9277.2	**-0.03**	6812.5		**-0.04**
2002 November	9563.7	**0.02**	7075		**-0.02**
2002 October	9376.2	**-0.01**	7187.5		**0.03**

2002 September	9465.3	**-0.02**	7002.5		**0.05**
2002 August	9677.3	**0.05**	6675	2600	**0.73**
2002 July	9239	**-0.13**	5350		**-0.25**
2002 June	10658	**-0.05**	7147.5		**-0.11**
2002 May	11201	**0.02**	7995		**-0.07**
2002 April	11008	**0.00**	8625		**0.14**
2002 March	11015	**0.01**	7537.5		**0.02**
2002 February	10875	**0.05**	7425	1100	**0.32**
2002 January	10334	**-0.01**	6460		**-0.08**
2001 December	10456	**0.11**	7030		**0.31**
2001 November	9404.1	**0.11**	5375		**0.28**
2001 October	8473.5	**0.06**	4195		**0.06**
2001 September	7997.9	**-0.10**	3975		**-0.13**
2001 August	8886.7	**0.05**	4575	2380	**0.57**
2001 July	8456	**-0.07**	4425		**-0.12**
2001 June	9089.9	**-0.02**	5042.5		**-0.15**
2001 May	9270.8	**0.04**	5912.5		**0.23**
2001 April	8902.3	**0.10**	4812.5		**0.35**
2001 March	8093.8	**-0.09**	3562.5		**-0.32**
2001 February	8916.3	**0.00**	5247.5	7420	**1.59**
2001 January	8942.4	**0.10**	4897.5		**0.02**
2000 December	8164.3	**0.06**	4822.5		**0.06**
2000 November	7687.1	**-0.04**	4552.5		**0.12**
2000 October	8026.4	**-0.01**	4050		**0.04**
2000 September	8146.8	**-0.03**	3902.5		**-0.05**
2000 August	8361.6	**0.10**	4125	1420	**0.67**
2000 July	7621.7	**0.01**	3317.5		**0.05**
2000 June	7570.4	**0.05**	3152.5		**0.08**
2000 May	7175.9	**-0.01**	2907.5		**0.08**
2000 April	7250.2	**-0.07**	2687.5		**-0.05**
2000 March	7765.4	**0.00**	2837.5		**0.00**
2000 February	7733.2	**-0.06**	2827.5	340	**-0.08**
2000 January	8249.4	**-0.01**	3450		**0.11**
1999 December	8357.2	**0.13**	3112.5		**0.11**
1999 November	7405.9	**0.07**	2812.5		**0.06**
1999 October	6948.9	**0.05**	2660		**0.03**
1999 September	6629	**-0.01**	2587.5		**0.06**
1999 August	6673.2	**-0.02**	2437.5	710	**0.28**
1999 July	6822.7	**0.02**	2452.5		**0.29**
1999 June	6721.2	**0.09**	1897.5		**0.01**
1999 May	6146.7	**-0.08**	1887.5		**0.09**
1999 April	6678.4	**0.12**	1730		**0.31**
1999 March	5973.4	**0.08**	1325		**-0.05**

1999 February	5543.5	**0.02**	1390	170	**0.31**
1999 January	5414.8	**0.08**	1187.5		**0.19**
1998 December	5015.7	**-0.04**	1000		**0.02**
1998 November	5200.2	**-0.03**	976.25		**0.28**
1998 October	5350.8	**0.14**	763.75		**-0.16**
1998 September	4702.6	**0.05**	906.25		**0.19**
1998 August	4479.9	**-0.29**	762.5	290	**0.22**
1998 July	6350.3	**0.05**	862.5		**0.37**
1998 June	6035.6	**-0.11**	631.25		**-0.08**
1998 May	6795.3	**-0.08**	687.5		**-0.16**
1998 April	7392.7	**0.10**	821.25		**0.17**
1998 March	6749.2	**0.07**	700		**0.14**
1998 February	6283.1	**0.08**	612.5	60	**0.14**
1998 January	5830.3	**0.07**	587.5		**0.01**
1997 December	5465.6		581.25		

7.3 Input data for cost of equity using CAPM for Lonmin

	JSE		Lonmin Plc		
Date	**Close (ZAR cents)**	**Return**	**Close (ZAR cents)**	**Dividend (ZAR cents)**	**Return**
2012 December	39250.24	**0.03**	3891		**0.05**
2012 November	38104.61	**0.03**	3720		**-0.49**
2012 October	37156.28	**0.04**	7250		**-0.03**
2012 September	35757.98	**0.01**	7470		**-0.04**
2012 August	35389.45	**0.02**	7745		**-0.14**
2012 July	34596.9	**0.03**	9043		**-0.09**
2012 June	33708.31	**0.02**	9972		**0.07**
2012 May	33142.61	**-0.04**	9330		**-0.29**
2012 April	34399.04	**0.03**	13180		**0.05**
2012 March	33554.21	**-0.02**	12580		**-0.06**
2012 February	34296	**0.01**	13450		**0.04**
2012 January	33792.48	**0.06**	12989		**0.06**
2011 December	31985.67	**-0.03**	12200		**-0.10**
2011 November	32812.64	**0.01**	13628	122	**-0.02**
2011 October	32348.54	**0.09**	14076		**0.07**
2011 September	29674.2	**-0.04**	13140		**-0.12**
2011 August	31005.5	**-0.01**	15000		**0.07**
2011 July	31208.04	**-0.02**	14068		**-0.11**
2011 June	31864.54	**-0.02**	15800		**-0.12**
2011 May	32565.73	**-0.01**	18000		**0.00**
2011 April	32836.23	**0.02**	18002		**-0.04**
2011 March	32204.06	**0.00**	18750		**-0.10**
2011 February	32272.09	**0.03**	20845		**0.09**
2011 January	31398.75	**-0.02**	19111		**-0.06**
2010 December	32118.89	**0.06**	20400		**0.09**
2010 November	30266.4	**-0.01**	18723	99	**-0.04**
2010 October	30430.9	**0.03**	19550		**0.05**
2010 September	29456.04	**0.08**	18700		**0.08**
2010 August	27253.87	**-0.04**	17300		**-0.05**
2010 July	28355.21	**0.08**	18150		**0.11**
2010 June	26258.82	**-0.03**	16300		**-0.13**
2010 May	27145.36	**-0.05**	18817		**-0.13**
2010 April	28635.76	**0.00**	21582		**-0.05**
2010 March	28747.56	**0.07**	22625		**0.07**
2010 February	26764.61	**0.00**	21079		**-0.05**
2010 January	26675.95	**-0.04**	22150		**-0.05**
2009 December	27666.45	**0.03**	23200		**0.07**
2009 November	26894.74	**0.02**	21650		**0.12**
2009 October	26360.55	**0.06**	19250		**-0.04**
2009 September	24910.85	**0.00**	20001		**0.10**

2009 August	24929.42	**0.03**	18150		**0.01**
2009 July	24258.51	**0.10**	17900		**0.19**
2009 June	22049.42	**-0.03**	15050		**-0.18**
2009 May	22770.62	**0.10**	18370		**0.01**
2009 April	20647.03	**0.01**	18200		**-0.05**
2009 March	20363.91	**0.10**	19100		**0.35**
2009 February	18465.33	**-0.10**	14174		**0.13**
2009 January	20570.05	**-0.04**	12580		**-0.03**
2008 December	21509.2	**0.01**	13000		**0.00**
2008 November	21209.49	**0.01**	12999		**-0.30**
2008 October	20991.72	**-0.12**	18569		**-0.41**
2008 September	23835.97	**-0.14**	31300		**-0.35**
2008 August	27702.06	**0.00**	48440		**0.38**
2008 July	27719.67	**-0.09**	35000		**-0.29**
2008 June	30413.43	**-0.04**	49400		**-0.05**
2008 May	31841.27	**0.04**	51940	468	**0.12**
2008 April	30743.49	**0.04**	46975		**-0.05**
2008 March	29587.51	**-0.04**	49364		**-0.04**
2008 February	30673.74	**0.12**	51200		**0.22**
2008 January	27317.14	**-0.06**	41820		**0.02**
2007 December	28957.97	**-0.04**	41140	410	**-0.07**
2007 November	30307.8	**-0.03**	44800		**-0.04**
2007 October	31334.99	**0.05**	46457		**-0.08**
2007 September	29959.19	**0.05**	50450		**0.13**
2007 August	28660.35	**0.00**	44734		**-0.10**
2007 July	28561.81	**0.01**	49800		**-0.12**
2007 June	28337.22	**-0.01**	56760		**0.02**
2007 May	28627.79	**0.02**	55650	780	**0.21**
2007 April	28170.6	**0.03**	46799		**-0.01**
2007 March	27267.24	**0.06**	47080		**0.06**
2007 February	25795.99	**0.01**	44340		**0.05**
2007 January	25447.73	**0.02**	42200		**0.03**
2006 December	24915.2	**0.04**	41160		**-0.06**
2006 November	23949.95	**0.03**	43639	386	**0.09**
2006 October	23338.16	**0.04**	40300		**0.08**
2006 September	22374.58	**0.02**	37400		**0.01**
2006 August	21953.8	**0.05**	36960		**-0.02**
2006 July	20885.57	**-0.02**	37684		**0.01**
2006 June	21237.87	**0.03**	37150		**0.14**
2006 May	20565.46	**-0.03**	32575	336	**0.09**
2006 April	21135.51	**0.04**	30060		**0.05**
2006 March	20351.74	**0.07**	28600		**0.16**
2006 February	19085.35	**-0.03**	24660		**0.09**
2006 January	19745.16	**0.09**	22720		**0.28**
2005 December	18096.54	**0.08**	17750		**-0.02**

2005 November	16774.54	**0.02**	18101	266	**0.20**
2005 October	16433.1	**-0.03**	15325		**0.04**
2005 September	16875.65	**0.09**	14700		**0.07**
2005 August	15414.01	**0.02**	13700		**0.03**
2005 July	15143.64	**0.07**	13295		**0.06**
2005 June	14154.73	**0.03**	12500		**0.00**
2005 May	13787.02	**0.10**	12500	203	**0.14**
2005 April	12555.96	**-0.06**	11100		**-0.03**
2005 March	13298.58	**-0.01**	11500		**0.04**
2005 February	13476.59	**0.05**	11050		**0.03**
2005 January	12798.55	**0.01**	10700		**0.08**
2004 December	12656.86	**0.01**	9900	253	**-0.06**
2004 November	12490.79	**0.07**	10750	277	**-0.07**
2004 October	11655.31	**-0.01**	11800		**-0.10**
2004 September	11761	**0.05**	13040		**0.02**
2004 August	11160.44	**0.08**	12800		**0.16**
2004 July	10305.89	**0.02**	11000		**-0.03**
2004 June	10108.61	**-0.03**	11374		**0.01**
2004 May	10413.81	**0.00**	11300	188	**-0.05**
2004 April	10385.8	**-0.03**	12100		**-0.09**
2004 March	10692.56	**-0.02**	13300		**-0.11**
2004 February	10895.86	**0.00**	14950		**0.03**
2004 January	10849.25	**0.04**	14491		**0.11**
2003 December	10387.22	**0.07**	13000	278	**0.11**
2003 November	9729.6	**0.00**	11950		**0.01**
2003 October	9765.3	**0.09**	11825		**0.11**
2003 September	8925.69	**-0.03**	10650		**-0.01**
2003 August	9226.2	**0.05**	10749		**0.07**
2003 July	8809.63	**0.05**	10000		**0.03**
2003 June	8352.2	**-0.02**	9700		**-0.11**
2003 May	8564.33	**0.14**	10940	226	**0.39**
2003 April	7510.4	**-0.02**	8025		**-0.05**
2003 March	7679.88	**-0.09**	8480		**-0.16**
2003 February	8402.09	**-0.05**	10100		**-0.05**
2003 January	8798.35	**-0.05**	10600		**-0.12**
2002 December	9277.22	**-0.03**	12000		**-0.02**
2002 November	9563.74	**0.02**	12300	358	**-0.08**
2002 October	9376.23	**-0.01**	13750		**-0.02**
2002 September	9465.33	**-0.02**	14100		**0.00**
2002 August	9677.26	**0.05**	14100		**0.01**
2002 July	9239.02	**-0.13**	14000		**-0.23**
2002 June	10657.73	**-0.05**	18172		**0.07**
2002 May	11200.85	**0.02**	17010	302	**-0.04**
2002 April	11007.67	**0.00**	18000		**-0.07**
2002 March	11015.04	**0.01**	19380		**0.02**

2002 February	10875.09	**0.05**	19000		**0.02**
2002 January	10333.52	**-0.01**	18690.47619		**-0.10**
2001 December	10456.47	**0.11**	20833.33333	5763	**0.58**
2001 November	9404.06	**0.11**	16833.33333		**0.31**
2001 October	8473.51	**0.06**	12857.14286		**-0.01**
2001 September	7997.87	**-0.10**	12976.19048		**-0.03**
2001 August	8886.72	**0.05**	13309.52381		**0.10**
2001 July	8456.01	**-0.07**	12095.2381		**-0.12**
2001 June	9089.89	**-0.02**	13761.90476		**-0.02**
2001 May	9270.84	**0.04**	14095.2381		**0.08**
2001 April	8902.33	**0.10**	13095.2381		**0.09**
2001 March	8093.79	**-0.09**	12023.80952		**-0.13**
2001 February	8916.29	**0.00**	13809.52381		**-0.03**
2001 January	8942.37	**0.10**	14285.71429		**0.11**
2000 December	8164.29	**0.06**	12857.14286		**0.04**
2000 November	7687.08	**-0.04**	12380.95238	260	**0.17**
2000 October	8026.39	**-0.01**	10833.33333		**0.01**
2000 September	8146.75	**-0.03**	10773.80952		**0.03**
2000 August	8361.62	**0.10**	10476.19048		**0.01**
2000 July	7621.68	**0.01**	10333.33333		**0.13**
2000 June	7570.39	**0.05**	9166.66667	97	**0.20**
2000 May	7175.9	**-0.01**	7738.09524		**-0.07**
2000 April	7250.19	**-0.07**	8333.33333		**0.05**
2000 March	7765.41	**0.00**	7940.47619		**0.00**
2000 February	7733.24	**-0.06**	7976.19048		**-0.04**
2000 January	8249.35	**-0.01**	8321.42857	114	**0.13**
1999 December	8357.19	**0.13**	7440.47619		**0.12**
1999 November	7405.91	**0.07**	6666.66667		**-0.08**
1999 October	6948.86	**0.05**	7261.90476		**-0.02**
1999 September	6628.98	**-0.01**	7416.66667		**0.12**
1999 August	6673.17	**-0.02**	6642.85714		**-0.10**
1999 July	6822.68	**0.02**	7392.85714	75	**0.12**
1999 June	6721.15	**0.09**	6666.66667		**0.18**
1999 May	6146.74	**-0.08**	5654.7619		**-0.10**
1999 April	6678.44	**0.12**	6250		**0.17**
1999 March	5973.43	**0.08**	5357.14286		**0.12**
1999 February	5543.5	**0.02**	4785.71429		**0.20**
1999 January	5414.79	**0.08**	3988.09524	98	**0.07**
1998 December	5015.72	**-0.04**	3815.47619		**0.05**
1998 November	5200.18	**-0.03**	3619.04762		**-0.02**
1998 October	5350.76	**0.14**	3690.47619		**-0.02**
1998 September	4702.59	**0.05**	3750		**0.27**
1998 August	4479.85	**-0.29**	2952.38095		**-0.10**
1998 July	6350.31	**0.05**	3273.80952		**0.01**
1998 June	6035.63	**-0.11**	3238.09524	141	**0.13**

1998 May	6795.3	**-0.08**	2982.14286		**-0.31**
1998 April	7392.66	**0.10**	4333.33333		**-0.01**
1998 March	6749.22	**0.07**	4357.14286		**0.19**
1998 February	6283.14	**0.08**	3666.66667		**0.00**
1998 January	5830.29	**0.07**	3666.66667	14	**0.04**
1997 December	5465.6		3523.80952		

7.4 Input data for cost of equity using CAPM for AngloGold Ashanti

	JSE		Anglo Gold Ashanti Limited		
Date	**Close (ZAR cents)**	**Return**	**Close (ZAR cents)**	**Dividend (ZAR cents)**	**Return**
2012 December	39250.24	**0.03**	26234.00		**-0.06**
2012 November	38104.61	**0.03**	27808.00	42.5	**-0.03**
2012 October	37156.28	**0.04**	28847.00		**-0.01**
2012 September	35757.98	**0.01**	29242.00		**0.11**
2012 August	35389.45	**0.02**	26289.00	85	**-0.07**
2012 July	34596.9	**0.03**	28290.00		**0.01**
2012 June	33708.31	**0.02**	27900.00		**-0.10**
2012 May	33142.61	**-0.04**	30850.00	85	**0.17**
2012 April	34399.04	**0.03**	26458.00		**-0.06**
2012 March	33554.21	**-0.02**	28240.00		**-0.13**
2012 February	34296	**0.01**	32574.00	200	**-0.09**
2012 January	33792.48	**0.06**	35900.00		**0.05**
2011 December	31985.67	**-0.03**	34340.00		**-0.11**
2011 November	32812.64	**0.01**	38440.00	90	**0.07**
2011 October	32348.54	**0.09**	35850.00		**0.06**
2011 September	29674.2	**-0.04**	33890.00		**0.07**
2011 August	31005.5	**-0.01**	31800.00	90	**0.13**
2011 July	31208.04	**-0.02**	28100.00		**-0.02**
2011 June	31864.54	**-0.02**	28550.00		**-0.09**
2011 May	32565.73	**-0.01**	31400.00		**-0.06**
2011 April	32836.23	**0.02**	33278.00		**0.03**
2011 March	32204.06	**0.00**	32450.00		**-0.04**
2011 February	32272.09	**0.03**	33949.00	80	**0.11**
2011 January	31398.75	**-0.02**	30637.00		**-0.06**
2010 December	32118.89	**0.06**	32690.00		**0.00**
2010 November	30266.4	**-0.01**	32837.00		**0.01**
2010 October	30430.9	**0.03**	32649.00		**0.01**
2010 September	29456.04	**0.08**	32335.00		**0.02**
2010 August	27253.87	**-0.04**	31640.00	65	**0.08**
2010 July	28355.21	**0.08**	29480.00		**-0.11**
2010 June	26258.82	**-0.03**	33195.00		**0.01**
2010 May	27145.36	**-0.05**	32799.00		**0.05**
2010 April	28635.76	**0.00**	31149.00		**0.12**
2010 March	28747.56	**0.07**	27795.00		**0.00**
2010 February	26764.61	**0.00**	27699.00	70	**0.00**
2010 January	26675.95	**-0.04**	27895.00		**-0.09**
2009 December	27666.45	**0.03**	30629.00		**-0.05**
2009 November	26894.74	**0.02**	32401.00		**0.12**
2009 October	26360.55	**0.06**	28990.00		**-0.04**

2009 September	24910.85	**0.00**	30150.00		**0.01**
2009 August	24929.42	**0.03**	29805.00		**0.01**
2009 July	24258.51	**0.10**	29600.00	60	**0.05**
2009 June	22049.42	**-0.03**	28302.00		**-0.18**
2009 May	22770.62	**0.10**	34600.00		**0.32**
2009 April	20647.03	**0.01**	26180.00		**-0.24**
2009 March	20363.91	**0.10**	34500.00		**0.16**
2009 February	18465.33	**-0.10**	29750.00	50	**0.04**
2009 January	20570.05	**-0.04**	28625.00		**0.14**
2008 December	21509.2	**0.01**	25200.00		**0.15**
2008 November	21209.49	**0.01**	21900.00		**0.16**
2008 October	20991.72	**-0.12**	18849.00		**-0.02**
2008 September	23835.97	**-0.14**	19200.00		**-0.08**
2008 August	27702.06	**0.00**	20850.00	50	**-0.13**
2008 July	27719.67	**-0.09**	24125.00		**-0.10**
2008 June	30413.43	**-0.04**	26885.00		**-0.06**
2008 May	31841.27	**0.04**	28650.00		**0.13**
2008 April	30743.49	**0.04**	25300.00		**-0.07**
2008 March	29587.51	**-0.04**	27201.00		**-0.04**
2008 February	30673.74	**0.12**	28350.00	53	**-0.09**
2008 January	27317.14	**-0.06**	31190.00		**0.06**
2007 December	28957.97	**-0.04**	29300.00		**-0.13**
2007 November	30307.8	**-0.03**	33800.00		**0.11**
2007 October	31334.99	**0.05**	30399.00		**-0.07**
2007 September	29959.19	**0.05**	32620.00		**0.17**
2007 August	28660.35	**0.00**	27921.00		**-0.07**
2007 July	28561.81	**0.01**	30122.00	90	**0.13**
2007 June	28337.22	**-0.01**	26710.00		**-0.09**
2007 May	28627.79	**0.02**	29205.00		**-0.07**
2007 April	28170.6	**0.03**	31531.00		**-0.03**
2007 March	27267.24	**0.06**	32500.00		**0.03**
2007 February	25795.99	**0.01**	31500.00	240	**-0.07**
2007 January	25447.73	**0.02**	34200.00		**0.04**
2006 December	24915.2	**0.04**	32999.00		**-0.04**
2006 November	23949.95	**0.03**	34350.00		**0.10**
2006 October	23338.16	**0.04**	31260.00		**0.07**
2006 September	22374.58	**0.02**	29120.00		**-0.11**
2006 August	21953.8	**0.05**	32689.00		**-0.01**
2006 July	20885.57	**-0.02**	33175.00	210	**-0.06**
2006 June	21237.87	**0.03**	35499.00		**0.15**
2006 May	20565.46	**-0.03**	30900.00		**-0.05**
2006 April	21135.51	**0.04**	32601.00		**-0.01**
2006 March	20351.74	**0.07**	32800.00		**0.03**
2006 February	19085.35	**-0.03**	31801.00	62	**-0.14**
2006 January	19745.16	**0.09**	37100.00		**0.18**

2005 December	18096.54	**0.08**	31400.00		**0.13**
2005 November	16774.54	**0.02**	27845.00		**0.04**
2005 October	16433.1	**-0.03**	26750.00		**-0.03**
2005 September	16875.65	**0.09**	27590.00		**0.22**
2005 August	15414.01	**0.02**	22650.00		**0.00**
2005 July	15143.64	**0.07**	22703.00	170	**-0.04**
2005 June	14154.73	**0.03**	23950.00		**0.06**
2005 May	13787.02	**0.10**	22599.00		**0.16**
2005 April	12555.96	**-0.06**	19500.00		**-0.10**
2005 March	13298.58	**-0.01**	21600.00		**0.04**
2005 February	13476.59	**0.05**	20800.00		**0.06**
2005 January	12798.55	**0.01**	19569.00	180	**-0.01**
2004 December	12656.86	**0.01**	19901.00		**-0.15**
2004 November	12490.79	**0.07**	23345.00		**0.03**
2004 October	11655.31	**-0.01**	22650.00		**-0.09**
2004 September	11761	**0.05**	24922.00		**0.06**
2004 August	11160.44	**0.08**	23500.00		**0.14**
2004 July	10305.89	**0.02**	20660.00	170	**0.03**
2004 June	10108.61	**-0.03**	20249.00		**-0.11**
2004 May	10413.81	**0.00**	22800.00		**0.03**
2004 April	10385.8	**-0.03**	22100.00		**-0.18**
2004 March	10692.56	**-0.02**	26960.00		**-0.04**
2004 February	10895.86	**0.00**	28200.00		**-0.02**
2004 January	10849.25	**0.04**	28702.00	335	**-0.08**
2003 December	10387.22	**0.07**	31399.00		**0.02**
2003 November	9729.6	**0.00**	30639.00		**0.15**
2003 October	9765.3	**0.09**	26660.00		**-0.01**
2003 September	8925.69	**-0.03**	26900.00		**-0.05**
2003 August	9226.2	**0.05**	28400.00		**0.17**
2003 July	8809.63	**0.05**	24350.00	375	**0.04**
2003 June	8352.2	**-0.02**	23700.00		**0.04**
2003 May	8564.33	**0.14**	22710.00		**0.09**
2003 April	7510.4	**-0.02**	20750.00		**-0.12**
2003 March	7679.88	**-0.09**	23660.00		**-0.09**
2003 February	8402.09	**-0.05**	25869.00		**-0.14**
2003 January	8798.35	**-0.05**	30000.00	675	**0.06**
2002 December	9277.22	**-0.03**	29050.00		**0.19**
2002 November	9563.74	**0.02**	24472.36		**-0.07**
2002 October	9376.23	**-0.01**	26221.11		**-0.08**
2002 September	9465.33	**-0.02**	28628.14		**0.16**
2002 August	9677.26	**0.05**	24623.12		**0.11**
2002 July	9239.02	**-0.13**	22160.80	1350	**-0.15**
2002 June	10657.73	**-0.05**	27537.69		**-0.13**
2002 May	11200.85	**0.02**	31608.04		**0.09**
2002 April	11007.67	**0.00**	29045.23		**0.01**

2002 March	11015.04	**0.01**	28743.72		**0.07**
2002 February	10875.09	**0.05**	26783.92		**0.12**
2002 January	10333.52	**-0.01**	23869.35	1100	**0.18**
2001 December	10456.47	**0.11**	21206.03		**0.23**
2001 November	9404.06	**0.11**	17236.18		**0.08**
2001 October	8473.51	**0.06**	15989.95		**0.09**
2001 September	7997.87	**-0.10**	14673.37		**-0.02**
2001 August	8886.72	**0.05**	14924.62		**0.00**
2001 July	8456.01	**-0.07**	14924.62	700	**0.05**
2001 June	9089.89	**-0.02**	14924.62		**0.00**
2001 May	9270.84	**0.04**	14874.37		**0.04**
2001 April	8902.33	**0.10**	14321.61		**0.26**
2001 March	8093.79	**-0.09**	11356.78		**-0.09**
2001 February	8916.29	**0.00**	12512.56		**0.12**
2001 January	8942.37	**0.10**	11206.03	650	**0.07**
2000 December	8164.29	**0.06**	11105.53		**0.16**
2000 November	7687.08	**-0.04**	9547.74		**-0.12**
2000 October	8026.39	**-0.01**	10793.97		**-0.20**
2000 September	8146.75	**-0.03**	13467.34		**-0.01**
2000 August	8361.62	**0.10**	13668.34		**-0.01**
2000 July	7621.68	**0.01**	13849.25	750	**0.05**
2000 June	7570.39	**0.05**	13919.60		**0.00**
2000 May	7175.9	**-0.01**	13959.80		**0.08**
2000 April	7250.19	**-0.07**	12964.82		**-0.18**
2000 March	7765.41	**0.00**	15728.64		**-0.05**
2000 February	7733.24	**-0.06**	16532.66	1100	**0.15**
2000 January	8249.35	**-0.01**	15326.63		**-0.04**
1999 December	8357.19	**0.13**	15909.55		**0.01**
1999 November	7405.91	**0.07**	15829.15		**-0.09**
1999 October	6948.86	**0.05**	17437.19		**-0.08**
1999 September	6628.98	**-0.01**	18994.97		**0.24**
1999 August	6673.17	**-0.02**	15326.63	900	**0.23**
1999 July	6822.68	**0.02**	13216.08		**0.01**
1999 June	6721.15	**0.09**	13065.33		**0.06**
1999 May	6146.74	**-0.08**	12271.36		**-0.15**
1999 April	6678.44	**0.12**	14422.11		**0.16**
1999 March	5973.43	**0.08**	12462.31		**0.10**
1999 February	5543.5	**0.02**	11356.78	800	**-0.01**
1999 January	5414.79	**0.08**	12291.46		**0.07**
1998 December	5015.72	**-0.04**	11517.59		**-0.18**
1998 November	5200.18	**-0.03**	13969.85		**-0.02**
1998 October	5350.76	**0.14**	14321.61		**-0.07**
1998 September	4702.59	**0.05**	15477.39		**0.40**
1998 August	4479.85	**-0.29**	11055.28		**-0.15**
1998 July	6350.31	**0.05**	13015.08	750	**0.15**

1998 June	6035.63	**-0.11**	12010.05		**-0.07**
1998 May	6795.3	**-0.08**	12864.32		**-0.04**
1998 April	7392.66	**0.10**	13467.34		**0.28**
1998 March	6749.22	**0.07**	10482.41		**0.03**
1998 February	6283.14	**0.08**	10201.01		**-0.12**
1998 January	5830.29	**0.07**	11608.04	875	**0.27**
1997 December	5465.6		9798.99		

7.5 Input data for cost of equity using CAPM for Gold Fields

	JSE		Gold Fields Limited		
Date	**Close (ZAR cents)**	**Return**	**Close (ZAR cents)**	**Dividend (ZAR cents)**	**Return**
2012 December	39250	**0.03**	10375		-0.06
2012 November	38105	**0.03**	11021		0.03
2012 October	37156	**0.04**	10705		0.00
2012 September	35758	**0.01**	10675		0.06
2012 August	35389	**0.02**	10103	159	-0.04
2012 July	34597	**0.03**	10714		0.03
2012 June	33708	**0.02**	10385		-0.09
2012 May	33143	**-0.04**	11419		0.15
2012 April	34399	**0.03**	9890		-0.06
2012 March	33554	**-0.02**	10500		-0.12
2012 February	34296	**0.01**	11880	230	-0.06
2012 January	33792	**0.06**	12900		0.04
2011 December	31986	**-0.03**	12460		-0.09
2011 November	32813	**0.01**	13651		-0.01
2011 October	32349	**0.09**	13720		0.10
2011 September	29674	**-0.04**	12486		0.07
2011 August	31006	**-0.01**	11700	100	0.14
2011 July	31208	**-0.02**	10360		0.04
2011 June	31865	**-0.02**	9919		-0.12
2011 May	32566	**-0.01**	11300		-0.04
2011 April	32836	**0.02**	11728		-0.01
2011 March	32204	**0.00**	11845		-0.05
2011 February	32272	**0.03**	12479	70	0.11
2011 January	31399	**-0.02**	11284		-0.06
2010 December	32119	**0.06**	12060		0.04
2010 November	30266	**-0.01**	11566		0.06
2010 October	30431	**0.03**	10962		0.04
2010 September	29456	**0.08**	10560		0.00
2010 August	27254	**-0.04**	10600	70	0.08
2010 July	28355	**0.08**	9835		-0.05
2010 June	26259	**-0.03**	10380		-0.04
2010 May	27145	**-0.05**	10774		0.09
2010 April	28636	**0.00**	9868		0.07
2010 March	28748	**0.07**	9220		0.04
2010 February	26765	**0.00**	8885	50	0.00
2010 January	26676	**-0.04**	8905		-0.09

2009 December	27666	**0.03**	9798		-0.09
2009 November	26895	**0.02**	10810		0.08
2009 October	26361	**0.06**	10050		-0.01
2009 September	24911	**0.00**	10150		0.07
2009 August	24929	**0.03**	9473	80	0.03
2009 July	24259	**0.10**	9245		-0.01
2009 June	22049	**-0.03**	9352		-0.15
2009 May	22771	**0.10**	11001		0.25
2009 April	20647	**0.01**	8835		-0.15
2009 March	20364	**0.10**	10450		0.00
2009 February	18465	**-0.10**	10450		-0.04
2009 January	20570	**-0.04**	10839	30	0.18
2008 December	21509	**0.01**	9190		0.10
2008 November	21209	**0.01**	8370		0.21
2008 October	20992	**-0.12**	6900		-0.14
2008 September	23836	**-0.14**	8050		0.13
2008 August	27702	**0.00**	7100	120	-0.18
2008 July	27720	**-0.09**	8847		-0.11
2008 June	30413	**-0.04**	9950		0.02
2008 May	31841	**0.04**	9775	65	-0.02
2008 April	30743	**0.04**	10000		-0.13
2008 March	29588	**-0.04**	11500		0.05
2008 February	30674	**0.12**	10950		-0.02
2008 January	27317	**-0.06**	11219		0.13
2007 December	28958	**-0.04**	9900		-0.14
2007 November	30308	**-0.03**	11509		-0.02
2007 October	31335	**0.05**	11688		-0.06
2007 September	29959	**0.05**	12415		0.13
2007 August	28660	**0.00**	10950	95	-0.06
2007 July	28562	**0.01**	11739		0.07
2007 June	28337	**-0.01**	10940		-0.09
2007 May	28628	**0.02**	12052		-0.06
2007 April	28171	**0.03**	12801		-0.05
2007 March	27267	**0.06**	13450		0.08
2007 February	25796	**0.01**	12496		0.03
2007 January	25448	**0.02**	12121	90	-0.08
2006 December	24915	**0.04**	13275		0.00
2006 November	23950	**0.03**	13285		0.09
2006 October	23338	**0.04**	12200		-0.11
2006 September	22375	**0.02**	13749		-0.02
2006 August	21954	**0.05**	14000	110	-0.01
2006 July	20886	**-0.02**	14311		-0.12
2006 June	21238	**0.03**	16200		0.10

2006 May	20565	**-0.03**	14750		-0.02
2006 April	21136	**0.04**	15126		0.13
2006 March	20352	**0.07**	13439		0.00
2006 February	19085	**-0.03**	13500		-0.05
2006 January	19745	**0.09**	14200	40	0.27
2005 December	18097	**0.08**	11180		0.13
2005 November	16775	**0.02**	9925		0.10
2005 October	16433	**-0.03**	9030		-0.05
2005 September	16876	**0.09**	9532		0.29
2005 August	15414	**0.02**	7370	40	0.03
2005 July	15144	**0.07**	7199		-0.06
2005 June	14155	**0.03**	7620		0.03
2005 May	13787	**0.10**	7401		0.21
2005 April	12556	**-0.06**	6100		-0.16
2005 March	13299	**-0.01**	7250		0.05
2005 February	13477	**0.05**	6905	30	0.01
2005 January	12799	**0.01**	6840		-0.02
2004 December	12657	**0.01**	6950		-0.15
2004 November	12491	**0.07**	8220		-0.04
2004 October	11655	**-0.01**	8601		-0.02
2004 September	11761	**0.05**	8750		0.08
2004 August	11160	**0.08**	8075		0.25
2004 July	10306	**0.02**	6461	40	0.00
2004 June	10109	**-0.03**	6531		-0.15
2004 May	10414	**0.00**	7709		0.10
2004 April	10386	**-0.03**	7025		-0.17
2004 March	10693	**-0.02**	8425		0.03
2004 February	10896	**0.00**	8200		-0.10
2004 January	10849	**0.04**	9101	40	-0.04
2003 December	10387	**0.07**	9550		0.09
2003 November	9730	**0.00**	8800		-0.11
2003 October	9765	**0.09**	9851		-0.01
2003 September	8926	**-0.03**	9970		0.00
2003 August	9226	**0.05**	10000	100	0.13
2003 July	8810	**0.05**	8920		0.00
2003 June	8352	**-0.02**	8957		0.00
2003 May	8564	**0.14**	9000		0.22
2003 April	7510	**-0.02**	7390		-0.12
2003 March	7680	**-0.09**	8420		-0.17
2003 February	8402	**-0.05**	10100		-0.09
2003 January	8798	**-0.05**	11130	150	-0.06
2002 December	9277	**-0.03**	11990		0.21
2002 November	9564	**0.02**	9950		-0.13

2002 October	9376	**-0.01**	11461		-0.16
2002 September	9465	**-0.02**	13599		0.09
2002 August	9677	**0.05**	12520	220	0.17
2002 July	9239	**-0.13**	10900		-0.11
2002 June	10658	**-0.05**	12180		-0.06
2002 May	11201	**0.02**	12950		0.01
2002 April	11008	**0.00**	12820		0.08
2002 March	11015	**0.01**	11880		0.20
2002 February	10875	**0.05**	9880	90	0.38
2002 January	10334	**-0.01**	7240		0.26
2001 December	10456	**0.11**	5750		0.22
2001 November	9404	**0.11**	4720		0.10
2001 October	8474	**0.06**	4280		0.05
2001 September	7998	**-0.10**	4070		0.12
2001 August	8887	**0.05**	3620	40	0.09
2001 July	8456	**-0.07**	3370		-0.07
2001 June	9090	**-0.02**	3625		0.09
2001 May	9271	**0.04**	3340		-0.05
2001 April	8902	**0.10**	3505		0.12
2001 March	8094	**-0.09**	3120		-0.01
2001 February	8916	**0.00**	3150	105	0.11
2001 January	8942	**0.10**	2920		0.14
2000 December	8164	**0.06**	2570		0.18
2000 November	7687	**-0.04**	2180		-0.02
2000 October	8026	**-0.01**	2235		-0.02
2000 September	8147	**-0.03**	2290		-0.11
2000 August	8362	**0.10**	2570		0.06
2000 July	7622	**0.01**	2430		-0.09
2000 June	7570	**0.05**	2660		0.06
2000 May	7176	**-0.01**	2520		0.15
2000 April	7250	**-0.07**	2200		-0.04
2000 March	7765	**0.00**	2280		-0.22
2000 February	7733	**-0.06**	2940	20	0.15
2000 January	8249	**-0.01**	2580		-0.13
1999 December	8357	**0.13**	2975		0.07
1999 November	7406	**0.07**	2775		-0.06
1999 October	6949	**0.05**	2940		0.06
1999 September	6629	**-0.01**	2775		0.32
1999 August	6673	**-0.02**	2100	30	0.19
1999 July	6823	**0.02**	1785		-0.14
1999 June	6721	**0.09**	2070		0.06
1999 May	6147	**-0.08**	1960		-0.20
1999 April	6678	**0.12**	2450		0.02

1999 March	5973	**0.08**	2400		0.05
1999 February	5544	**0.02**	2290		-0.16
1999 January	5415	**0.08**	2725	75	0.19
1998 December	5016	**-0.04**	2350		-0.25
1998 November	5200	**-0.03**	3125		-0.10
1998 October	5351	**0.14**	3475		0.12
1998 September	4703	**0.05**	3100		0.24
1998 August	4480	**-0.29**	2500		-0.14
1998 July	6350	**0.05**	2905	60	-0.03
1998 June	6036	**-0.11**	3070		-0.07
1998 May	6795	**-0.08**	3310		-0.08
1998 April	7393	**0.10**	3585		0.10
1998 March	6749	**0.07**	3250		0.02
1998 February	6283	**0.08**	3175		-0.02
1998 January	5830	**0.07**	3225		-0.02
1997 December	5466		3300	30	

7.6 Input data for cost of equity using CAPM for Harmony

	JSE		Harmony Gold Mining Company Limited		
Date	**Close (ZAR cents)**	**Return**	**Close (ZAR cents)**	**Dividend (ZAR cents)**	**Return**
2012 December	39250	**0.03**	7400		**0.06**
2012 November	38105	**0.03**	6994		**-0.02**
2012 October	37156	**0.04**	7102		**0.02**
2012 September	35758	**0.01**	6983		**0.02**
2012 August	35389	**0.02**	6824	48	**-0.17**
2012 July	34597	**0.03**	8263		**0.08**
2012 June	33708	**0.02**	7650		**-0.09**
2012 May	33143	**-0.04**	8451		**0.12**
2012 April	34399	**0.03**	7564		**-0.09**
2012 March	33554	**-0.02**	8339		**-0.16**
2012 February	34296	**0.01**	9900	40	**0.05**
2012 January	33792	**0.06**	9511		**0.00**
2011 December	31986	**-0.03**	9500		**-0.17**
2011 November	32813	**0.01**	11437		**0.09**
2011 October	32349	**0.09**	10451		**0.10**
2011 September	29674	**-0.04**	9535		**0.00**
2011 August	31006	**-0.01**	9499	60	**0.05**
2011 July	31208	**-0.02**	9075		**0.01**
2011 June	31865	**-0.02**	8995		**-0.05**
2011 May	32566	**-0.01**	9475		**-0.04**
2011 April	32836	**0.02**	9915		**0.00**
2011 March	32204	**0.00**	9929		**0.22**
2011 February	32272	**0.03**	8123		**0.04**
2011 January	31399	**-0.02**	7800		**-0.06**
2010 December	32119	**0.06**	8300		**0.05**
2010 November	30266	**-0.01**	7895		**-0.02**
2010 October	30431	**0.03**	8020		**0.03**
2010 September	29456	**0.08**	7800		**0.02**
2010 August	27254	**-0.04**	7646	50	**0.05**
2010 July	28355	**0.08**	7305		**-0.10**
2010 June	26259	**-0.03**	8140		**0.06**
2010 May	27145	**-0.05**	7709		**0.07**
2010 April	28636	**0.00**	7210		**0.05**
2010 March	28748	**0.07**	6880		**0.00**
2010 February	26765	**0.00**	6905		**-0.04**

2010 January	26676	**-0.04**	7200		**-0.05**
2009 December	27666	**0.03**	7579		**-0.08**
2009 November	26895	**0.02**	8200		**0.04**
2009 October	26361	**0.06**	7850		**-0.02**
2009 September	24911	**0.00**	8000		**0.10**
2009 August	24929	**0.03**	7299	50	**0.05**
2009 July	24259	**0.10**	7020		**-0.12**
2009 June	22049	**-0.03**	8000		**-0.18**
2009 May	22771	**0.10**	9719		**0.23**
2009 April	20647	**0.01**	7901		**-0.21**
2009 March	20364	**0.10**	10041		**-0.18**
2009 February	18465	**-0.10**	12275		**0.02**
2009 January	20570	**-0.04**	12045		**0.23**
2008 December	21509	**0.01**	9770		**0.14**
2008 November	21209	**0.01**	8600		**0.17**
2008 October	20992	**-0.12**	7370		**-0.11**
2008 September	23836	**-0.14**	8275		**0.23**
2008 August	27702	**0.00**	6750		**-0.16**
2008 July	27720	**-0.09**	8025		**-0.16**
2008 June	30413	**-0.04**	9500		**0.05**
2008 May	31841	**0.04**	9050		**0.05**
2008 April	30743	**0.04**	8630		**-0.11**
2008 March	29588	**-0.04**	9725		**0.01**
2008 February	30674	**0.12**	9620		**0.29**
2008 January	27317	**-0.06**	7450		**0.06**
2007 December	28958	**-0.04**	7046		**-0.03**
2007 November	30308	**-0.03**	7300		**-0.01**
2007 October	31335	**0.05**	7355		**-0.10**
2007 September	29959	**0.05**	8159		**0.27**
2007 August	28660	**0.00**	6410		**-0.35**
2007 July	28562	**0.01**	9825		**-0.02**
2007 June	28337	**-0.01**	10027		**-0.03**
2007 May	28628	**0.02**	10388		**-0.08**
2007 April	28171	**0.03**	11297		**0.12**
2007 March	27267	**0.06**	10125		**0.05**
2007 February	25796	**0.01**	9679		**-0.01**
2007 January	25448	**0.02**	9797		**-0.12**
2006 December	24915	**0.04**	11120		**-0.08**
2006 November	23950	**0.03**	12126		**0.09**
2006 October	23338	**0.04**	11169		**0.11**
2006 September	22375	**0.02**	10059		**0.03**
2006 August	21954	**0.05**	9800		**-0.01**
2006 July	20886	**-0.02**	9850		**-0.14**

2006 June	21238	**0.03**	11410		**0.21**
2006 May	20565	**-0.03**	9420		**-0.05**
2006 April	21136	**0.04**	9900		**-0.01**
2006 March	20352	**0.07**	10000		**0.18**
2006 February	19085	**-0.03**	8445		**-0.24**
2006 January	19745	**0.09**	11075		**0.30**
2005 December	18097	**0.08**	8490		**0.06**
2005 November	16775	**0.02**	7985		**0.12**
2005 October	16433	**-0.03**	7120		**0.00**
2005 September	16876	**0.09**	7150		**0.51**
2005 August	15414	**0.02**	4730		**-0.14**
2005 July	15144	**0.07**	5500		**-0.06**
2005 June	14155	**0.03**	5825		**0.17**
2005 May	13787	**0.10**	4970		**0.28**
2005 April	12556	**-0.06**	3880		**-0.22**
2005 March	13299	**-0.01**	4970		**-0.01**
2005 February	13477	**0.05**	5000		**0.01**
2005 January	12799	**0.01**	4930		**-0.04**
2004 December	12657	**0.01**	5120		**-0.17**
2004 November	12491	**0.07**	6200		**-0.13**
2004 October	11655	**-0.01**	7145		**-0.19**
2004 September	11761	**0.05**	8810		**0.07**
2004 August	11160	**0.08**	8198	30	**0.19**
2004 July	10306	**0.02**	6900		**0.06**
2004 June	10109	**-0.03**	6525		**-0.17**
2004 May	10414	**0.00**	7850		**0.02**
2004 April	10386	**-0.03**	7705		**-0.22**
2004 March	10693	**-0.02**	9860		**-0.03**
2004 February	10896	**0.00**	10130		**-0.07**
2004 January	10849	**0.04**	10901	40	**0.01**
2003 December	10387	**0.07**	10850		**0.07**
2003 November	9729.6	**0.00**	10120		**-0.05**
2003 October	9765.3	**0.09**	10600		**0.07**
2003 September	8925.7	**-0.03**	9950		**-0.05**
2003 August	9226.2	**0.05**	10445	150	**0.15**
2003 July	8809.6	**0.05**	9239		**-0.06**
2003 June	8352.2	**-0.02**	9850		**-0.07**
2003 May	8564.3	**0.14**	10539		**0.37**
2003 April	7510.4	**-0.02**	7700		**-0.21**
2003 March	7679.9	**-0.09**	9760		**-0.12**
2003 February	8402.1	**-0.05**	11050		**-0.16**
2003 January	8798.4	**-0.05**	13100	125	**-0.10**
2002 December	9277.2	**-0.03**	14700		**0.25**

2002 November	9563.7	**0.02**	11799		**-0.13**
2002 October	9376.2	**-0.01**	13500		**-0.19**
2002 September	9465.3	**-0.02**	16700		**0.12**
2002 August	9677.3	**0.05**	14850	425	**0.29**
2002 July	9239	**-0.13**	11810		**-0.17**
2002 June	10658	**-0.05**	14200		**-0.08**
2002 May	11201	**0.02**	15400		**0.13**
2002 April	11008	**0.00**	13680		**0.07**
2002 March	11015	**0.01**	12740		**0.07**
2002 February	10875	**0.05**	11960		**0.34**
2002 January	10334	**-0.01**	8910	75	**0.14**
2001 December	10456	**0.11**	7850		**0.34**
2001 November	9404.1	**0.11**	5850		**0.07**
2001 October	8473.5	**0.06**	5490		**0.12**
2001 September	7997.9	**-0.10**	4900		**0.23**
2001 August	8886.7	**0.05**	4000	70	**0.02**
2001 July	8456	**-0.07**	4000		**-0.15**
2001 June	9089.9	**-0.02**	4690		**0.15**
2001 May	9270.8	**0.04**	4095		**0.04**
2001 April	8902.3	**0.10**	3950		**0.02**
2001 March	8093.8	**-0.09**	3860		**0.00**
2001 February	8916.3	**0.00**	3850		**0.09**
2001 January	8942.4	**0.10**	3535	50	**0.02**
2000 December	8164.3	**0.06**	3525		**0.23**
2000 November	7687.1	**-0.04**	2870		**-0.01**
2000 October	8026.4	**-0.01**	2885		**-0.21**
2000 September	8146.8	**-0.03**	3670		**-0.01**
2000 August	8361.6	**0.10**	3720		**0.04**
2000 July	7621.7	**0.01**	3575	70	**-0.03**
2000 June	7570.4	**0.05**	3750		**0.10**
2000 May	7175.9	**-0.01**	3400		**0.02**
2000 April	7250.2	**-0.07**	3330		**-0.12**
2000 March	7765.4	**0.00**	3800		**-0.04**
2000 February	7733.2	**-0.06**	3950		**0.12**
2000 January	8249.4	**-0.01**	3540	50	**-0.09**
1999 December	8357.2	**0.13**	3950		**-0.01**
1999 November	7405.9	**0.07**	4000		**-0.01**
1999 October	6948.9	**0.05**	4025		**0.11**
1999 September	6629	**-0.01**	3615		**0.45**
1999 August	6673.2	**-0.02**	2500		**0.01**
1999 July	6822.7	**0.02**	2475	60	**-0.11**
1999 June	6721.2	**0.09**	2840		**-0.06**
1999 May	6146.7	**-0.08**	3020		**-0.14**

1999 April	6678.4	**0.12**	3500		**0.21**
1999 March	5973.4	**0.08**	2890		**0.05**
1999 February	5543.5	**0.02**	2760		**0.02**
1999 January	5414.8	**0.08**	2710	50	**-0.06**
1998 December	5015.7	**-0.04**	2945		**0.03**
1998 November	5200.2	**-0.03**	2850		**0.01**
1998 October	5350.8	**0.14**	2825		**0.02**
1998 September	4702.6	**0.05**	2775		**0.28**
1998 August	4479.9	**-0.29**	2170		**-0.16**
1998 July	6350.3	**0.05**	2575		**0.05**
1998 June	6035.6	**-0.11**	2450		**0.14**
1998 May	6795.3	**-0.08**	2150		**-0.28**
1998 April	7392.7	**0.10**	3000		**0.74**
1998 March	6749.2	**0.07**	1725		**0.05**
1998 February	6283.1	**0.08**	1650		**0.03**
1998 January	5830.3	**0.07**	1600		**0.34**
1997 December	5465.6		1190		

7.7 Beta coefficients and discount rates for mining companies

7.7.1 Platinum mining companies

Period	1998-2002	1999-2003	2000-2004	2001-2005	2002-2006	2003-2007	2004-2008	2005-2009	2006-2010	2007-2011	2008-2012
Platinum mining companies											
Anglo American Platinum											
Beta	0,96	1,57	1,83	1,83	1,66	1,71	1,68	1,65	1,61	1,54	1,49
Adjusted beta	0,99	1,40	1,58	1,58	1,47	1,50	1,48	1,46	1,43	1,39	1,35
Risk free rate (%)	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40
ERP (%)	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80
Cost of equity (%)	13,13	15,95	17,18	17,16	16,36	16,60	16,47	16,32	16,15	15,84	15,61
Impala Platinum											
Beta	0,96	1,81	2,26	1,94	1,59	1,42	1,37	1,34	1,46	1,61	1,64
Adjusted beta	0,99	1,57	1,88	1,66	1,42	1,30	1,27	1,25	1,33	1,43	1,46
Risk free rate (%)	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40
ERP (%)	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80
Cost of equity (%)	13,16	17,08	19,15	17,66	16,04	15,26	15,03	14,91	15,44	16,16	16,30
Lonmin											
Beta	0,87	1,41	1,50	1,58	1,39	1,40	1,64	1,48	1,65	1,67	1,66
Adjusted beta	0,93	1,30	1,36	1,41	1,28	1,29	1,45	1,35	1,46	1,47	1,47
Risk free rate (%)	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40
ERP (%)	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80
Cost of equity (%)	12,74	15,22	15,64	16,00	15,12	15,19	16,27	15,57	16,33	16,43	16,39

7.7.2 Gold mining companies

Period	1998-2002	1999-2003	2000-2004	2001-2005	2002-2006	2003-2007	2004-2008	2005-2009	2006-2010	2007-2011	2008-2012
Gold mining companies											
AngloGold Ashanti											
Beta	0,73	0,73	0,90	0,99	1,08	1,19	0,88	0,81	0,50	0,42	0,33
Adjusted beta	0,84	0,83	0,95	1,02	1,08	1,15	0,94	0,89	0,68	0,63	0,57
Risk free rate (%)	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40
ERP (%)	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80
Cost of equity (%)	12,10	12,08	12,89	13,31	13,72	14,22	12,79	12,47	11,04	10,67	10,27
Gold Fields											
Beta	0,66	0,78	0,95	1,12	1,41	0,00	0,84	0,64	0,30	0,21	0,11
Adjusted beta	0,79	0,87	0,99	1,10	1,30	0,34	0,91	0,78	0,54	0,49	0,42
Risk free rate (%)	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40
ERP (%)	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80
Cost of equity (%)	11,76	12,31	13,13	13,88	15,22	8,73	12,59	11,69	10,10	9,71	9,23
Harmony											
Beta	0,81	0,91	1,17	1,40	2,04	2,29	1,36	0,88	0,37	0,15	0,06
Adjusted beta	0,89	0,96	1,13	1,29	1,72	1,89	1,27	0,94	0,60	0,44	0,38
Risk free rate (%)	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40	6,40
ERP (%)	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80	6,80
Cost of equity (%)	12,44	12,93	14,12	15,20	18,13	19,28	15,02	12,77	10,45	9,42	9,01

7.8 Summary of the descriptive statistics for mining companies

7.8.1 Platinum mining companies

Measure	Mean	Standard Error	Median	Standard Deviation	Sample Variance	Kurtosis	Skewness	Range	Minimum	Maximum	Sum	Count
Platinum mining companies												
Anglo American Platinum												
Equity component of WACC	12,43%	1,38%	12,53%	4,59%	0,002	3,304	1,484	16,67%	7,11%	23,78%	136,78%	11
CAPM	16,07%	0,33%	16,32%	1,09%	0,000	5,845	-2,119	4,05%	13,13%	17,18%	176,77%	11
Gordon's Wealth Growth Model	13,78%	1,01%	13,01%	3,36%	0,001	-0,040	0,786	11,01%	9,62%	20,63%	151,61%	11
Impala Platinum												
Equity component of WACC	13,96%	1,62%	13,55%	5,36%	0,003	-1,455	0,284	14,37%	7,60%	21,97%	153,56%	11
CAPM	16,02%	0,48%	16,04%	1,58%	0,000	0,952	0,313	6,00%	13,16%	19,15%	176,18%	11
Gordon's Wealth Growth Model	14,20%	0,82%	13,34%	2,73%	0,001	-2,076	0,182	6,46%	11,12%	17,58%	156,19%	11
Lonmin												
Equity component of WACC	12,85%	1,25%	12,57%	4,13%	0,002	-0,902	0,213	12,55%	7,38%	19,93%	141,32%	11
CAPM	15,54%	0,32%	15,64%	1,06%	0,000	5,164	-2,047	3,69%	12,74%	16,43%	170,90%	11
Gordon's Wealth Growth Model	12,98%	0,72%	12,46%	2,40%	0,001	-1,480	0,250	6,69%	9,62%	16,31%	142,78%	11

7.8.2 Gold mining companies

Measure	Mean	Standard Error	Median	Standard Deviation	Sample Variance	Kurtosis	Skewness	Range	Minimum	Maximum	Sum	Count
Gold mining companies												
AngloGold Ashanti												
Equity component of WACC	10,40%	0,88%	11,37%	2,93%	0,001	-0,700	-0,558	8,80%	5,63%	14,43%	114,41%	11
CAPM	12,32%	0,38%	12,47%	1,26%	0,000	-0,797	-0,279	3,95%	10,27%	14,22%	135,56%	11
Gordon's Wealth Growth Model	11,36%	0,47%	10,84%	1,55%	0,000	-0,374	1,034	4,35%	9,98%	14,33%	124,96%	11
Gold Fields												
Equity component of WACC	11,59%	1,51%	12,07%	5,02%	0,003	-0,810	0,261	15,86%	4,56%	20,42%	127,44%	11
CAPM	11,67%	0,62%	11,76%	2,04%	0,000	-0,816	0,123	6,49%	8,73%	15,22%	128,35%	11
Gordon's Wealth Growth Model	10,62%	1,11%	11,28%	3,68%	0,001	8,245	-2,707	13,45%	0,11%	13,56%	116,81%	11
Harmony												
Equity component of WACC	11,72%	1,36%	12,48%	4,52%	0,002	-1,331	-0,475	12,85%	4,47%	17,32%	128,96%	11
CAPM	13,52%	0,99%	12,93%	3,29%	0,001	-0,507	0,357	10,27%	9,01%	19,28%	148,77%	11
Gordon's Wealth Growth Model	10,97%	0,63%	10,28%	2,08%	0,000	1,957	1,808	5,89%	9,62%	15,51%	120,67%	11

7.9 Input data of box and whisker plot for mining companies

7.9.1 Platinum mining companies

Period	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Minimum	Quartile 1	Median	Quartile 3	Maximum	Interquartile Range
Platinum mining companies																	
Anglo American Platinum																	
Equity component of WACC	0,087	0,071	0,079	0,125	0,110	0,128	0,150	0,136	0,238	0,143	0,101	0,071	0,094	0,125	0,140	0,238	0,046
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,071	0,023	0,031	0,014	0,098	N/A
CAPM	0,131	0,160	0,172	0,172	0,164	0,166	0,165	0,163	0,162	0,158	0,156	0,131	0,159	0,163	0,165	0,172	0,006
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,131	0,028	0,004	0,002	0,006	N/A
Gordon's Wealth Growth Model	0,173	0,164	0,130	0,114	0,111	0,154	0,206	0,145	0,096	0,110	0,113	0,096	0,112	0,130	0,159	0,206	0,046
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,096	0,016	0,018	0,029	0,048	N/A
Impala Platinum																	
Equity component of WACC	0,096	0,076	0,076	0,090	0,116	0,152	0,169	0,193	0,220	0,213	0,136	0,076	0,093	0,136	0,181	0,217	0,088
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,076	0,017	0,043	0,045	0,036	N/A
CAPM	0,132	0,171	0,192	0,177	0,160	0,153	0,150	0,149	0,154	0,162	0,163	0,132	0,151	0,160	0,167	0,192	0,015
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,087	0,132	0,020	0,009	0,006	0,025
Gordon's Wealth Growth Model	0,173	0,166	0,157	0,121	0,113	0,115	0,175	0,176	0,111	0,122	0,133	0,111	0,118	0,133	0,169	0,176	0,052
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,111	0,007	0,016	0,036	0,006	N/A
Lonmin																	
Equity component of WACC	0,083	0,074	0,078	0,119	0,133	0,126	0,156	0,110	0,199	0,177	0,158	0,074	0,097	0,126	0,157	0,199	0,060
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,074	0,023	0,029	0,031	0,042	N/A
CAPM	0,127	0,152	0,156	0,160	0,151	0,152	0,163	0,156	0,163	0,164	0,164	0,127	0,152	0,156	0,163	0,164	0,011
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,127	0,025	0,004	0,007	0,001	N/A
Gordon's Wealth Growth Model	0,163	0,152	0,152	0,125	0,109	0,115	0,163	0,118	0,096	0,105	0,130	0,096	0,112	0,125	0,152	0,163	0,040
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,096	0,016	0,013	0,027	0,011	N/A

7.9.2 Gold mining companies

Period	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Minimum	Quartile 1	Median	Quartile 3	Maximum	Interquartile Range
Gold mining companies																	
AngloGold Ashanti																	
Equity component of WACC	0,058	0,056	0,080	0,114	0,104	0,118	0,135	0,124	0,144	0,118	0,094	0,056	0,087	0,114	0,121	0,144	0,034
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,056	0,030	0,027	0,007	0,023	N/A
CAPM	0,121	0,121	0,129	0,133	0,137	0,142	0,128	0,125	0,110	0,107	0,103	0,103	0,116	0,125	0,131	0,142	0,015
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,103	0,013	0,009	0,006	0,011	N/A
Gordon's Wealth Growth Model	0,130	0,143	0,135	0,108	0,104	0,113	0,102	0,100	0,101	0,101	0,112	0,100	0,102	0,108	0,122	0,143	0,020
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,100	0,002	0,007	0,013	0,022	N/A
Gold Fields																	
Equity component of WACC	0,070	0,046	0,057	0,087	0,121	0,152	0,146	0,173	0,204	0,124	0,095	0,046	0,078	0,121	0,149	0,204	0,070
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,046	0,033	0,042	0,028	0,055	N/A
CAPM	0,118	0,123	0,131	0,139	0,152	0,087	0,126	0,117	0,101	0,097	0,092	0,087	0,099	0,118	0,129	0,152	0,030
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,087	0,012	0,019	0,011	0,024	N/A
Gordon's Wealth Growth Model	0,109	0,132	0,136	0,104	0,102	0,113	0,118	0,117	0,106	0,109	0,131	0,102	0,107	0,113	0,125	0,136	0,017
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,102	0,005	0,005	0,012	0,011	N/A
Harmony																	
Equity component of WACC	0,067	0,045	0,057	0,095	0,125	0,156	0,147	0,153	0,173	0,158	0,113	0,045	0,081	0,125	0,155	0,173	0,074
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,045	0,036	0,044	0,030	0,019	N/A
CAPM	0,124	0,129	0,141	0,152	0,181	0,193	0,150	0,128	0,105	0,094	0,090	0,090	0,114	0,129	0,151	0,193	0,037
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,090	0,024	0,015	0,022	0,042	N/A
Gordon's Wealth Growth Model	0,105	0,147	0,155	0,105	0,096	0,096	0,096	0,096	0,103	0,102	0,105	0,096	0,096	0,103	0,105	0,155	0,009
Difference	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0,096	0,000	0,007	0,002	0,050	N/A

7.10 Input data for cost of equity using Gordon's Wealth Growth Model and WACC values

7.10.1 Platinum mining companies

Financial year (FY)	**FY2012**	**FY2011**	**FY2010**	**FY2009**	**FY2008**	**FY2007**	**FY2006**	**FY2005**	**FY2004**	**FY2003**	**FY2002**	**FY2001**	**FY2000**	**FY1999**	**FY1998**	**FY1997**
Period	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	
Average Inflation 1993-2013 of 6.26%																
Growth Rate	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	
Anglo American Platinum																
Dividends per share (cents)	0	700	683	0	3500	5200	5300	1180	735	640	1800	2200	1810	700	385	155
Curent Price (cents)	44633	53200	69413	79250	51760	101005	85603	45700	20700	29150	31600	44680	35200	18700	8070	6500
Cost of Equity	11,34%	11,03%	9,62%	14,46%	20,63%	15,37%	11,13%	11,38%	13,01%	16,39%	17,25%	14,06%	11,80%	11,87%	11,72%	
Impala Platinum																
Dividends per share (cents)	195	570	390	320	1475	975	400	288	263	331	463	475	220	110	44	14
Curent Price (in cents)	16770	16735	23296	20299	13500	23725	18400	11650	5988	7250	6813	7030	4823	3113	1000	581
Cost of Equity	13,34%	12,17%	11,12%	17,58%	17,53%	11,47%	11,33%	12,09%	15,68%	16,61%	17,26%	13,05%	12,12%	11,16%	11,13%	
Lonmin																
Dividends per share (cents)	0	118	99	0	468	792	722	469	460	505	660	733	376	172	0	0
Curent Price (in cents)	3891	12200	20400	23200	13000	41140	41160	17750	9900	13000	12000	20825	12852	7438	3814	4143
Cost of Equity	12,95%	10,51%	9,62%	11,83%	16,30%	11,54%	10,87%	12,46%	15,21%	15,18%	16,31%	11,60%	11,09%	9,62%	9,62%	

7.10.2 Gold mining companies

Financial year (FY)	**FY2012**	**FY2011**	**FY2010**	**FY2009**	**FY2008**	**FY2007**	**FY2006**	**FY2005**	**FY2004**	**FY2003**	**FY2002**	**FY2001**	**FY2000**	**FY1999**	**FY1998**	**FY1997**
Period	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	
Average Inflation 1993-2013 of 6.26%																
Growth Rate	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	9,62%	
AngloGold Ashanti																
Dividends per share (cents)	300	380	145	130	100	143	450	232	350	710	1350	900	700	1000	775	815
Curent Price (in cents)	26234	34340	32690	30629	25200	29300	32999	31400	19901	31399	29050	21100	11050	15830	11460	9750
Cost of Equity	11,21%	10,08%	10,05%	9,98%	10,24%	11,30%	10,39%	10,84%	13,53%	14,33%	13,01%	13,25%	19,54%	14,98%	17,41%	
Gold Fields																
Dividends per share (cents)	235	330	140	110	185	185	150	70	80	250	310	145	20	80	90	150
Curent Price (in cents)	10375	12460	12060	9798	9190	9900	13275	11180	6950	9550	11990	5750	2570	2975	2350	
Cost of Equity	13,10%	10,85%	10,62%	11,69%	11,82%	11,28%	10,20%	10,40%	13,56%	13,18%	10,94%	10,00%	13,03%	12,93%	16,61%	
Harmony																
Dividends per share (cents)	90	60	50	50	0	0	0	0	70	275	500	120	120	110	0	0
Curent Price (cents)	7400	9500	8300	7579	9770	7046	11120	8490	5120	10850	14700	7850	3525	3950	2945	1190
Cost of Equity	10,51%	10,19%	10,28%	9,62%	9,62%	9,62%	9,62%	10,52%	15,51%	14,67%	10,51%	11,29%	13,04%	9,62%	9,62%	