Investigating the relationship between intrinsic value and the price of industrials on the JSE

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It all starts here ™

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ABSTRACT

Given the lacklustre domestic growth forecasts and a slowing global economy, fund managers and investors need to focus on and understand what it is that drives the local stock market prices and find measures to evaluate investment opportunities. The availability of various financial measures complicates investor decisions even further as the debate on which metrics are most important continues. This study compares the frequently used price-earnings-to-growth (PEG) valuation with well documented value-based metrics, Economic Value Added (EVA™) and Residual Income Model (RIM), in their ability to identify over/under priced stock in the different stages of a bull market and a bear market for industrial companies listed on the Johannesburg Securities Exchange (JSE). A quantitative research approach was used to indicate whether or not relationships exists between EVA™, RIM and PEG valuation multiples and 1-year forward share price growth during different market periods. Overall, the evidence suggest that EVA™ does not perform well in identifying mispriced stock during any of the market periods. Furthermore it suggests that during a bear market and the first couple of years of a bull market, fundamental valuation models such as RIM outperforms heuristic models such as PEG in identifying mispriced stock, whilst in the latter parts of a bull market the contrary is true. Result also indicate that using EVA™, RIM and PEG multiples to make investment decisions could assist fund managers to outperform the market.

Keywords: Economic Value Added (EVA™), Residual Income Model, PEG Ratio, Bull Markets, Bear Markets, Capital Asset Pricing Model, Weighted Average Cost of Capital

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CHAPTER 1

NATURE AND SCOPE OF THE STUDY

1.1. INTRODUCTION

The South African Economy has been facing some real challenges of late. Interest rates are at the bottom end of the cycle, the current account deficit is at record levels, a weakening rand and multiple credit-rating downgrades are constricting the country's fiscal flexibility. Thus slow growth going forward cannot be remedied by cutting interest rates, expanding government expenditure and allowing credit growth to boost demand (Hart, 2014). Despite all the negative news and bleak economic forecasts, the Johannesburg Securities Exchange (JSE) All-Share has reached record highs over the recent period. This begs the questions: How and why does the JSE All-Share continue to reach record highs if investors generally expect economic growth to be a key driver of the markets; and how long can this trend continue? According to Fabian de Beer (2014), Chief Investment Officer at Mergence Investment Managers, this anomaly can partly be explained by the changing nature of the JSE, especially influenced by changes in company earnings sources. Globalisation has lead South African companies to derive earnings beyond the country's borders and this trend is likely to persist as organisations continue to explore value adding growth opportunities abroad. Although an increase in international earnings explain a portion of the exceptional growth experienced on the JSE, Schalk Louw (2015), portfolio manager at PSG Wealth, indicates that the price of the JSE Top 40 shares are increasing much faster than the earnings. Over the past five years the Top 40 shares increased by 109%, whilst earnings rose by only 74%. Louw (2015) further explains that the share price of a company should be priced on the company's ability to generate future profits; in other words its capacity to generate future earnings. He compares the relationship between share price and earnings to water skiing. The boat pulls the skier in same direction as the boat. Sometimes the skier moves behind the boat and sometimes he gains momentum and slingshots around to overtake the boat. The most important factor of water skiing however remains the boat. It determines whether the skier moves and in which direction the skier moves. Similarly, a company's earnings capacity steers the direction of the share price in the long-term.

According to Lee (2006) stock returns display short to medium term momentum, but tends to revert back to mean in the long term. This phenomena gets referred to as the mean-reversion of stock market prices. Despite the occurrence of mean-reversion, Bradshaw's

(2004) findings suggest that analysts rarely provide valuation recommendations derived from value-based fundamental models, but rather support their recommendations with heuristic valuation models such as price-earnings-to-growth (PEG) and long-term growth (LTG) forecasts. Gleason et al. (2007) found consistent results indicating the use of simple heuristics rather than value-based fundamental models. Is this behaviour contradictory to what is expected of equity analysts or are there particular circumstances where simple heuristics simply outperform fundamentals? Surprisingly, Barniv et al. (2009) finds that although residual income valuations are positively associated with future stock returns, it is unrelated or negatively related to analysts' recommendations based on simple heuristic models.

Given the lacklustre domestic growth forecasts and a slowing global economy, fund managers and investors need to focus on and understand what it is that drives the local stock market prices and find measures to evaluate investment opportunities. The availability of various financial measures complicates investor decisions even further as the debate on which metrics are most important continues. Value-based metrics (VBM) are financial measured which were predominantly developed from corporate finance and assist managers and investors to determine if an organisation is creating or destroying wealth (Grant & Fabozzi, 2008). VBM fundamental analysis recognises and accounts for the overall cost of capital or cost of equity in estimating an intrinsic company value. Economic Value Added (EVA™) and Residual Income Model (RIM) are two value-based metrics often used to estimate a company's intrinsic value. Alternatively investors and analysts often turn to simple heuristics such as price multiples to estimate at what level a stock should be trading. Price-earnings-to-growth are often used in practice where plotting price-to-earnings (P/E) ratios against earnings growth rates could indicate over or undervalued stock (Grant & Fabozzi, 2008).

There are extended periods where equity prices increase and fall, referred to as bull and bear markets respectively (Pagan & Sossounov, 2003). This is a feature of the JSE which has received much speculation as to when or at what level one can expect a turning point in a market. A study conducted by Barniv et al. (2009) concluded that bull markets contribute positively towards analyst recommendations, partly explaining the continuation or momentum of stock price movement away from its intrinsic value in a bull market. Although recommendations based on simple heuristics might produce acceptable result when the bull market has momentum, questions of real interest to investors must be: To what level can

heuristic and fundamental valuation models identify over/under priced stock and how does this change during different periods in a bull and bear market?

1.2. PROBLEM STATEMENT

According to Hart (2014), chief strategist at Investment Solutions, South Africa is one of the few emerging markets with an increasing unemployment rate, over indebted households and an increasing current account deficit coupled with low GDP growth. Despite the bleak economic outlook for the country, the JSE All share is trading at record highs. In March 2009, the end of the previous bear market, the JSE All share index was around 18000 and after a 6 year bull market with a compound annual growth rate of approximately 20.4%, the index was trading around the 55000 mark in May 2015. With numerous analysts and investors fearing that the market might be overpriced and the bull momentum might be lost (de Beer, 2014; Hart, 2014.), an important question must be how the market will react from here? Will the market stabilize at these levels or can one expect the market to revert back to a certain value based on intrinsic value estimates? The objective of this study is compare the frequently used PEG valuation with well documented value-based metrics (EVA™ and RIM) in their ability to identify over/under priced stock in the different stages of a bull market and a bear market respectively.

EVA™ gets marketed as a management tool that creates value for an organisation. Stern Stuart, New York believes that EVA™ is the financial performance measure which comes closest to capturing and reporting the true economic profits of an organisation (Nagan, 2008). According to Ferguson et al. (2005) EVA™ is directly linked to shareholder wealth creation over time. The discounted residual income model (RIM) is another value-based metric which has gained popularity after its formalisation by Feltham & Ohlson (1995). The RIM upholds that the current stock price of a company is equal to the current book value of equity plus the present value of the expected future residual income (Jiang & Lee, 2005). According to Lee et al. (1999), RIM outperforms other market multiples when it comes to tracking ability and predictive power. In a study conducted by Francis et al. (2000), findings suggest that RIM (also known as abnormal earnings) estimates dominate the estimates derived from the free cash flow and dividend discount models in terms of predicting share price.

Although numerous studies have been conducted on the predictive power of EVA™, RIM and PEG valuations (Abdoli et al., 2012; Bradshaw, 2004; Easton, 2004; Feltham & Ohlson,

1995; Francis et al., 2000; Herzberg, 1998; Pruthy & Hara, 2014; Stern et al., 1994), less research has been conducted on their ability to indicate over/under priced stock in different periods of a bull and a bear market. Lee (2006) concludes that short to medium term momentum exists on the market and Fama & French (1988) found that substantial mean-reversion exists in stock market prices in the long-term (3-5 years). With uncertainty regarding the impact of the weak South African economy going forward and an arguably overpriced JSE All Share, valuation models such as EVA™ and RIM might provide investors with a tool to successfully identify mispriced stock. Thus the questions are to what extent can EVA™, RIM and PEG valuations correctly identify mispriced investment opportunities during different periods of bull markets and bear markets; and how well the gap between valuation estimates and current share price correlates with future share price growth. The fundamental values of the JSE Indi 25 shares will be calculated for a seven year period, January 2008 until January 2015, to empirically evaluate the ability of EVA™, RIM and PEG valuation models to explain the dynamics of share price growth in both a bull and a bear market environment.

As stated earlier, Bradshaw's (2004) findings suggest that analysts rarely provide valuation recommendations derived from value-based fundamental models, but rather support their recommendations with heuristic valuation models such as price-earnings-to-growth (PEG). Thus, further to the ability of the selected valuation metrics to identify mispriced stocks, this study will test the success of buy/hold/sell recommendations derived from PEG, EVA™ and RIM by comparing these with 1-year forward share price growth for different periods of bull markets and bear markets.

1.3. OBJECTIVES

The research objectives are divided into primary and secondary objectives.

1.3.1. Main Objectives

The main objective of this study is to ascertain to what extent selected valuation metrics are able to correctly identify mispriced stock in different periods of a bull market and a bear market for selected industrial companies listed on the JSE.

1.3.2. Secondary Objectives

The secondary objectives of this study are:

1) To ascertain to what extent individual valuation metrics can be utilized to make successful buy, hold or sell recommendations; and
2) To ascertain to what extent the selected valuation metrics used together can be used to make successful buy, hold or sell recommendations.

1.4. RESEARCH DESIGN/METHOD

This research is based on the predictive power of value-based metrics (EVA™ and RIM) and simple heuristics (PEG) for the industrial sector in bull markets and in bear markets.

The research will include literature which has been studied on the above mentioned constructs. These constructs and the relationship between them will be conceptualised as found in the literature. The research will also include an empirical study on EVA™, RIM, PEG and other variables identified in the literature review.

1.4.1. Literature review:

Various publications on EVA™, RIM and PEG will be reviewed during the completion of the literature review. These will include text books related to the field of Value Based Metrics.

In addition, literature on the constructs of and all aspects relating to EVA™, RIM, PEG, Capital Asset Pricing Model (CAPM), Johannesburg Stock Exchange (JSE), Weighted Average Cost of Capital (WACC), Interest Rates, Earnings per Share (EPS), Margin of Safety etc. will be reviewed. Journals and websites will also be accessed including, International Journal of Value Based Management and Journal of Applied Finance amongst others.

Through access provided by the NWU, the following sources will be consulted to obtain a broad overview of the topic:

- Written publications,
- Previous unpublished dissertations,
- Internal organisation publications,
- Scientific journals,
- Internet articles; and
- Database web access.

1.4.2. Research Design:

The research will compare EVA™, RIM and PEG valuation factors of the JSE industrials top 25 companies to the actual share price growth over pre-defined periods within bull and bear market. A quantitative research approach will be required for this study to

indicate whether or not relationships exists between EVA™, RIM and PEG valuations factors and share price growth for different periods in bull markets and in bear markets.

1.4.3. Empirical research:

The population of relevance include companies listed under the industrial sector of JSE. Data was retrieved from the INET BFA database. Standardized annual financial statements and supporting financial statements for the sample of industrial companies was drawn to do the necessary calculations. According to Givoly et al. (2009) analysts' earnings forecasts represents a good surrogate for market earnings expectations. Furthermore Barniv et al. (2009) states that analysts do comprehensive firm-, industry- and economy-specific research when generating forecasts. Thus consensus analyst forecasts was used in calculating valuation estimates.

1.5. SCOPE OF THE STUDY

This section endeavours to give an overview of the where the study will be done.

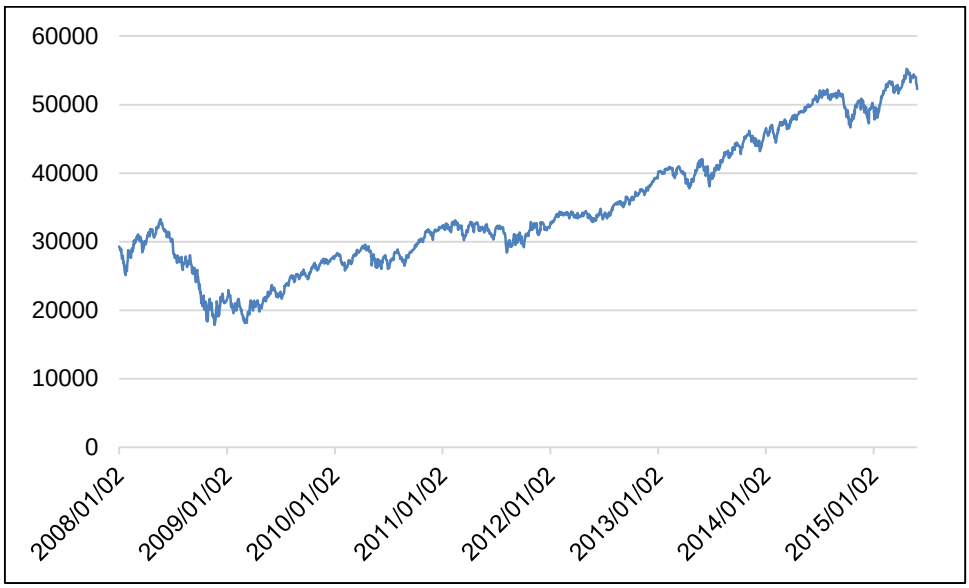
1.5.1. Field of study

The field of this study falls within the subject discipline of Value Based Management with specific reference to Economic Value Added (EVA™), Residual Income Model (RIM) and Price-Earnings-to-Growth (PEG) for the industrial sector on the Johannesburg Stock Exchange (JSE).

1.5.2. The geographical demarcation

The study will be conducted on the industrial sector of the JSE. The time period of the study has been specifically chosen to include a bull market period and a bear market period. Data has been collected for the period between January 2007 and January 2015. The performance of the JSE All Share (J203) during this period is depicted in Figure 2 below:

Figure 1: JSE All Share (J203) Historic Performance



Data source: INET BFA, 31 Aug. 2015

According to Figure 1, data have been demarcated into a definitive bear market period and bull market periods: the bear market period includes January 2008 – January 2009; the bull market periods stretch from January 2009 – January 2015 and are further demarcated into six twelve month periods: Bull1 refers to the first year of the bull market and includes January 2009 – January 2010; Bull2 refers to the second year of the bull market and includes January 2010 – January 2011. Continuing this trends I have identified six bull market periods, Bull1 – Bull6, with Bull6 referring to the sixth year of the bull market period which stretches from January 2014 – January 2015.

The identified bear market period resulted in a 46.4% decrease in the overall value of the JSE All Share at the time. The bull market period under investigation lasted approximately 74 months (6 years) and resulted in a 204% increase in the overall value of the JSE All Share during that period. This translates to a compound annual growth rate of approximately 20.4% over the bull period. Combining the effects of the bear and bull market between 2008 and 2015 yields a compound annual growth rate of approximately 7.5% on the JSE All Share. This yields a much less appealing return on investment than considering the bull market in isolation. Hence the importance of the ability to correctly identify mispriced stock during the different market periods.

1.6. LIMITATIONS

The trade volume for the sample of companies under the Indi 25 sector of the JSE is extremely high in relation to some other shares listed on the securities exchange. Furthermore the Indi 25 includes the 25 top companies of the industrial sector rated according to their market capitalization. Thus results from this study might not be applicable to all shares listed within the Industrials sector of the JSE. EVA™ calculations are also dependent on numerous adjustments which needs to be made. Thus financial information from companies listed under the industrial sector of the JSE must be adjusted perfectly to ensure the reliability of the information and results. Only basic statistic like correlation coefficients and relative frequency distribution tables are used for this study, which means the results does not imply causation.

1.7. STUDY LAYOUT

A high-level chapter layout for this dissertation will be as follows:

Chapter 1 – Problem Statement

The first chapter will include the title, an overview of the research area, the problem statement/s and the goals for the study.

Chapter 2 – Theory and Literature review

In this chapter I will conduct a comprehensive literature review including:

- EVA™, RIM and PEG,
- The calculations, implementation and limitations of EVA™, RIM and PEG,
- The relationship between EVA™, RIM and PEG and Share price growth,
- The industrial sector of JSE listed companies; and
- A short conclusion to bind it all together.

Chapter 3 – Research Methodology

This chapter will include detailed descriptions on the following sections:

- Research design,
- The study population,
- The sampling method and size,
- The data collection process; and
- The data analysis.

Chapter 4 – Results and Discussions

In this chapter all the results from the statistical analyses will be revealed and discussed in detail. All statistical results will be included under this section.

Chapter 5 – Conclusion and Recommendations

In the final chapter inferences and conclusions will be made on possible relationships between the different valuation models and market periods. This should lead to meaningful recommendations based on the findings as well as possible future research suggestions.

CHAPTER 2

THEORY AND LITERATURE REVIEW

2.1. STOCK VALUATION

According to Ward & Price (2006) the ultimate measure of business success is whether the business is creating or destroying shareholder value. Value creation from a shareholder's point of view is an economic rather than an accounting concept, and therefore changes in a company's share price should be taken into consideration (Nagan, 2008). Shareholder's wealth is measured as the return received on the investment; in the form of dividends, capital gains, or both (Sharma & Kumar, 2010). Although accounting income is considered one of the most important traditional performance evaluation criteria, it contains certain deficiencies (Abdoli et al., 2012). Accounting income can be manipulated through various methods of evaluating and accounting for depreciation, research and development, inventory and supplies. Also, the cost of capital considered in accounting income only includes financing cost (the cost of liabilities), but omits the cost of equity. The current belief amongst analysts is that for a company to create value, it should generate turnover which exceeds its total cost of capital; liabilities and equity (Abdoli et al., 2012). According to Grant & Fabozzi (2008) the Value-based Management (VBM) approach to fundamental analysis is to identity companies which consistently generate return on capital exceeding the weighted average cost of capital (WACC). This concept has become operational through the use of value-based fundamental models such as EVA™ and RIM.

In a study conducted by Bradshaw (2004), the findings suggest a stronger correlation exists between analysts' recommendations and heuristic valuation models than with analysts' recommendations and fundamental intrinsic value models. Furthermore the results revealed that long-term investors would realise higher returns relying on fundamental valuation models incorporating analysts' earnings forecasts than on analysts' recommendations. According to Manzan (2003) fundamental models tend to explain long-run behaviour in share prices, but are unable to explain the short-run dynamics. Supporters of the PEG heuristic argue that it accounts for variances in short-run earnings growth providing investors with a superior ranking tool (Easton, 2004). Although the PEG ratio is widely used to support analyst recommendations, many believe it is too simplistic in its assumption that short-run growth forecasts sufficiently captures long-run forecasts.

2.2. CALCULATION OF EVA

According to Stern et al. (1994) Economic Value Added (EVA™) is a performance metric providing fund managers a tool to compute fundamental values of publicly traded shares. It calculates shareholder value-creation and has been widely adopted as a management tool to assist with decision making (Nagan, 2008). EVA™ is also regularly used by analysts and investors as a company performance measure when deciding which shares to invest in. According to Pruthy & Hara (2014), EVA™ is an estimate of the value a company creates in excess of the return required by the company's shareholders and debt holders; in other words the company's economic profit. According to Herzberg (1998) EVA proves to be very successful in identifying companies whose shares are under-priced when considered together with strong earnings and growth expectations.

EVA™ is based on the principle that shareholders will only receive value if invested money earns a higher return than the cost of money to them. Thus, EVA™ is the net operating profit of the company minus an appropriate charge for the opportunity cost of total capital invested in the company (Sharma & Kumar, 2010). EVA™ is calculated as follows:

$$EVA = NOPAT - (WACC \times TCE) \quad (1)$$

$$EVA = EBIT(1-t) - (WACC \times TCE) \quad (2)$$

Where:
NOPAT = net operating profit after tax,
TCE = total capital employed,
WACC = weighted average cost of capital,
EBIT = earnings before interest and tax; and
t = corporate tax rate.

Total capital employed is the sum of shareholders' funds and interest bearing loans. In calculating WACC, the cost of debt is after tax cost and the cost of equity is measured by using the Capital Asset Pricing Model (CAPM). WACC is calculated as follows:

$$WACC = \frac{E}{D+E}(r_e) + \frac{D}{D+E}(r_d)(1-t) \quad (3)$$

Where:

E = market value of equity,

D = market value of debt,

r_e = cost of equity,

r_d = cost of debt; and

t = corporate tax rate.

Grant & Fabozzi (2008) present two controversies regarding challenges in estimating WACC in the real-wold. The first issue pertains to the firm's debt-equity ratio and how leverage-induced earnings per share (EPS) affects fair value calculations. The second issue has to do with the method of calculating the investor's required rate of return (cost of equity).

The question regarding the preferred or optimal capital structure has been a long-standing debate in the corporate finance domain. From a conventional viewpoint, as the debt ratio of an unleveraged company increases from zero to a certain level, the share price rises due to an increase in return on equity (ROE) and earnings per share (EPS) perceived desirable in relation to the increase in equity risk. If the debt ratio goes beyond a certain level though, the share price falls as rising fixed obligations offset the leverage-induced ROE and EPS benefits (Grant & Fabozzi, 2008). From this point of view a firm's share price should decline with any sizeable movement below or above its optimal capital structure. In practice debt is secured against securities resulting in lower risk; lower risk is associated with lower returns, hence lower cost of debt. On the contrary equity is not secured which results in higher risk of loss for the equity holders. According to generally accepted financial theory higher risk is associated with higher returns, hence higher cost of equity. Thus the higher a firm's debt ratio, the lower its WACC and the higher its EVA™. This conventional way of thinking suggests that beyond a certain optimal capital structure, a firm's EVA™ would be negatively associated with its share price.

There is however a special case of the VBM approach on the interpretation and application of this capital structure issue; the original theory by Modigliani and Miller (MM). According to Modigliani & Miller (1959), the increase in ROE and EPS due to higher corporate leverage is entirely offset by a rise in the rate of return required by the equity holders. Consequently share price will react indifferently to a debt-induced rise in EPS and ROE. Thus firm value and share price are impacted only by real investment opportunities; not leverage policies which in the conventional realm give investors an illusion of value creation (Grant & Fabozzi,

2008). In this study the target capital structure mix of debt and equity financing which is likely to be achieved over the long term will be used in calculating WACC.

One of the most popular methods of estimating a firm's cost of equity is the Capital Asset Pricing Model (CAPM). It was developed in the 1960s by Sharpe (1964) and Lintner (1965) to address the inability of the capital market theory and portfolio theory to quantify risk. The CAPM expresses the relationship between the required return and the risk of an investment as follows:

$$E(R) = R_f + \beta[E(R_m) - R_f] \quad (4)$$

Where:
$E(R)$ = required return on investment = r_e = cost of equity,
R_f = risk free return,
R_m = market return; and
β = the coefficient for the risk premium, $[E(R_m) - R_f]$.

The Beta quantifies the systematic (undiversifiable) risk of the investment and thus under CAPM investors are only rewarded or compensated for systematic risk (Sharpe, 1964 and Lintner, 1965). Beta (β) is computed as follows:

$$\beta = \frac{\sigma_{r,m}}{\sigma_m^2} \quad (5)$$

Where:
$\sigma_{r,m}$ = the covariance of the stock's returns with the market; and
σ^2_m = the variance of the market returns.

The CAPM holds numerous empirical challenges suggesting that the model does not reflect real world findings in terms of the relationship between average returns and risk as specified by the beta factor (Grant & Fabozzi, 2008). According to empirical work by Fama & French (2003), the relation between beta and average return as predicted by the CAPM is much flatter in practice; in other words returns predicted by CAPM for low beta stock is higher in practice, and returns predicted by CAPM for high beta stock is lower in practice. Black et al. (1972) criticizes CAPM for using only a single factor to determine asset returns. Despite

these and numerous other findings challenging the explanatory power of the CAPM's beta coefficient, Pereira (2006) found that CAPM is the most commonly used asset pricing model to discount cash flows. In a field study conducted by Nel (2011), it was found that the majority of investment and accounting practitioners in South Africa indicated that they use CAPM on a regular basis. The study further revealed that both practitioners and academics are of the opinion that CAPM is still the best approach to calculate cost of equity. According to Palliam (2006), the current increase in support for the beta coefficient in the literature and recent progress in terms of the accuracy of beta estimates, justifies the use of beta coefficients in the calculation of EVA™. Thus in the absence of other simplified asset pricing models and for the purpose of this study, CAPM is used for the estimation of the cost of equity (r_e).

According to Worthington & West (2004) the calculation of EVA™ can be divided into two separate but related steps. The first step involves assigning a capital charge to account for the opportunity cost of the capital and subtracting it from NOPAT to get to an economic profit. This step is explained in detail above. The second step involves a number of adjustments to the accounting figures in order to eliminate possible distortions created by accounting rules. Accounting profit differs from economic profit, hence some adjustments must be done as EVA™ attempts to measure true economic performance. The literature suggests some 120 to 150 possible adjustments, but according to Worthington & West (2001) companies generally make less than fifteen. Young (1999) notes that the number of EVA adjustments applied in practice has dropped even lower. Worthington & West (2001) defines six major adjustments.

1) The first adjustment relates to "successful-efforts accounting" and addresses the practice of only capitalising successful investments to the balance sheet. The argument is that unsuccessful investments should be included on the balance sheet under intangible assets rather than being written off, allowing for the loss to be recognised gradually in the form of a higher cost of capital. Thus the adjustment becomes capitalising unsuccessful investments to intangible assets and adding back "intangible assets written off" to NOPAT.

2) Secondly, research and development (R&D) are expensed under conventional accounting practices, even though it is viewed as an investment. According to Young (1999) by allowing R&D to be expensed, management might be tempted to underspend on R&D as a way to increase profit related accounting performance

measures. Although expensing R&D causes an increase in short-term profits, it reduces the realisation of possible future benefits due to R&D investment. The adjustment is to add R&D costs back to NOPAT and shareholder's equity.

3) Another proposed adjustment has to do with the deferred taxes. Deferred tax assets arise due to provisions made for future costs, serving to reduce current book income. Deferred tax liabilities arise from timing differences between taxable income and book income, mostly due to the acceleration of depreciation for tax purposes. The adjustment entails adding/subtracting the net change in deferred tax to more accurately reflect the actual cash flows. According to Worthington & West (2001) this focus on cash flows is considered to be the most useful component of EVA™ calculations.

4) For the calculation of EVA™, goodwill is not automatically written off. Young (1999) argues that by writing off goodwill, one removes a portion of the buyer's investment from the balance sheet which reduces management's burden in terms of target return on investment. The proposed adjustment entails reversing any amortization of goodwill back to invested capital. For the sake of consistency, goodwill amortization must also be added back to NOPAT. There is however a counter-argument to this which states: "the present value of charges to the future results from the acquisition of goodwill will be the same" (Young, 1999). Thus this adjustment becomes irrelevant.

5) According to Stewart (1994) the straight-line depreciation method causes an understatement of the true internal rates of return in the early years of an asset's life, and an overstatement in the later years. EVA proponents however argue that EVA must remain constant over the asset's life and proposes depreciation methods similar to the way a bank loan is amortised. In practice analysts ignore this adjustment because depreciation amounts under the annuity method and under the straight-line methods tend to be very close (Young, 1999).

6) The sixth adjustment relates to the cost of restructuring. Restructuring actions are taken to generate future returns, hence the cost of restructuring should be capitalised and not expensed (Worthington & West, 2001).

According to Young (1999) some of these adjustments are difficult, if not impossible, to replicate for the security analysts. For the purpose of this study EVA™ adjustments will be standardised according to the availability of the relevant data.

In order to calculate intrinsic value based on EVA™, the valuation metric is extended to multiple periods. Since firm value incorporates both invested capital and expected future activities, intrinsic value is represented as follows:

$$Intrinsic\ Value_t = Book\ Value_t + PV\ of\ all\ future\ EVAs \quad (6)$$

This equation holds for accounting systems which satisfies the clean surplus relation, namely:

$$B_t = B_{t-1} + NI_t - D_t \quad (7)$$

Where:
B_t = book value at time t,
B_{t-1} = book value at time t-1,
NI_t = net income at time t; and
D_t = Dividends at time t.

Wilson (2008) suggests that EVA's true merit lies in the fact that when forecasted into the future, it can be used as a method for corporate valuation. According the Stern Stewart & Co. the present value of all future EVAs is also known as the Market Value Added (MVA) of a firm. The first valuation method which can be used which includes future EVAs (or MVA), is the constant growth model or Gordon growth model. This model represents the simplest way to calculate the intrinsic value using EVA™. Substituting MVA into Eq. (6) yields:

$$Intrinsic\ Value_t = Book\ Value_t + MVA \quad (8)$$

The equation for the EVA incorporated Gordon growth model is:

$$MVA = \frac{EVA_1}{(WACC - g)} \quad (9)$$

Where:

MVA = market value added,

EVA_1 = 1 year forecasted economic value added,

WACC = weighted average cost of capital; and

g = EVA's sustainable growth rate.

Thus, substituting Eq. (9) into Eq. (8) yields:

$$Intrinsic\ Value_t = Book\ Value_t + \frac{EVA_1}{(WACC - g)} \tag{10}$$

The Gordon growth model is subject to the following two assumptions when coupled with EVA™ to calculate a firm's intrinsic value:

1) The firm's EVA will have a constant growth rate into perpetuity
2) The average cost of capital exceeds the EVA growth rate

As much as the constant growth EVA model can be commended for its simplicity, it presents serious limitations when a firm's EVAs does not increase at a constant growth rate (Wilson, 2008). Thus a second valuation method is presented as the variable growth EVA model; a more accurate variation of the Gordon growth model which presents two stages of growth within a firm. According to this model a company can expect a period of higher EVA growth in the early stages before converting into a more mature, constant EVA growth going forward. The MVA for the variable growth model are presented as follows:

$$MVA_0 = \sum_{t=1}^{n} \frac{EVA_t}{(1 + WACC)^t} + \frac{EVA_t(1 + g)}{(1 + WACC)^{n+1}(WACC - g)} \tag{11}$$

Thus, substituting Eq. (11) into Eq. (8) yields:

$$Intrinsic\ Value_t = B_t + \sum_{t=1}^{n} \frac{EVA_t}{(1 + WACC)^t} + \frac{EVA_t(1 + g)}{(1 + WACC)^{n+1}(WACC - g)} \tag{12}$$

Where:

B_t = book value at time t,

EVA_t = forecasted economic value added at time t,

WACC = weighted average cost of capital; and

g = EVA's sustainable growth rate.

The concept of discounting future values back to present value is widely used in different valuation methods as a means to calculate the intrinsic value of a company. A three-year forecast period corresponds with the horizon of analysts' long-term forecasts (Bradshaw, 2004), hence calculations of intrinsic value according to the variable growth EVA model are empirically estimated as the present value of the three-year forecasted EVAs, plus a terminal value. The intrinsic value is then divided by the number of shares outstanding to get to the value per share. Although application of the variable growth Gordon growth model is simplistic and clear in its application, it is highly sensitive to the denominator (WACC-g). Thus the correct estimation of the long term growth rate (g) and the weighted average cost of capital (WACC) is essential.

2.3. CALCULATION OF RIM

Another Value-based metric which is widely used in practice is the Residual Income Model (RIM), also known as the Abnormal Earnings Model. Although the concept of the RIM dates way back to the work of Preinreich (1938) and Edwards & Bell (1961), it was only formalised more recently by Ohlson (1995) and Feltham & Ohlson (1995). A study conducted by Francis et al. (2000) concluded that the RIM dominates the free cash flow and dividend discount model in terms of estimating the intrinsic value of a firm. Research by Frankel & Lee (1998) demonstrates that the RIM valuations incorporating analysts' earnings and growth forecasts reliably predicts future cross-sectional returns. In other words it can be used to identify mispriced shares.

According to Bradshaw (2004) residual income reflects a firm's earnings in excess of a certain benchmark; the required return on the invested capital or book value. The required rate of return is derived from the CAPM, as per Eq. (4) above. The residual income equation is presented as follows:

$$RI = NI - r \times BV \tag{13}$$

Where:
RI = residual income,
NI = Net Income,
r = equity cost of capital; and
BV = book value.

The RIM also applies the clean surplus relation through the extrapolation of historical book values to future book values as indicated in Eq. (7) above (Bradshaw, 2004). Equation (7) can also be presented on a per share basis as follows:

$$BVPS_t = BVPS_{t-1} + EPS_t - DPS_t \quad (14)$$

Where:
$BVPS_t$ = book value per share at time *t*,
$BVPS_{t-1}$ = book value per share at time *t-1*,
EPS_t = earnings per share at time *t*; and
DPS_t = dividends per share at time *t*.

Using the same logic as applied to Eq. (6), the intrinsic value of a firm under the RIM becomes:

$$Intrinsic\ Value_t = Book\ Value_t + PV\ of\ all\ future\ RIs \quad (15)$$

The application of the RIM is restricted to a finite forecast period (Bradshaw, 2004). Thus the present value all future RIs can either be calculated through application of the Gordon growth model or the variable growth model. As stipulated above, a constant growth assumption is flawed in its simplicity, hence I will apply the variable growth model as follows:

$$PV\ of\ all\ future\ RIs = \sum_{t=1}^{n} \frac{RI_t}{(1+r)^t} + \frac{RI_t(1+g)}{(1+r)^{n+1}(r-g)} \quad (16)$$

Where:
RI_t = residual income at time *t,*
r = equity cost of capital; and
g = sustainable growth rate of RI.

Substituting Eq. (16) into Eq. (15) yields:

$$Intrinsic\ Value_t = Book\ Value_t + \sum_{t=1}^{n} \frac{RI_t}{(1+r)^t} + \frac{RI_t(1+g)}{(1+r)^{n+1}(r-g)} \qquad (17)$$

Thus, according to Eq. (17) the intrinsic value of a firm can be derived by calculating the present value of expected RIs for a specified forecast period, calculating a terminal value into perpetuity, and adding both to the firm's current book value. Although Bradshaw (2004) presents a variation to this model - the Residual Income Valuation with a fading growth rate assumption - the Residual Income Valuation with a perpetuity growth rate assumption as presented in Eq. (17) is used for this study. In order to derive the intrinsic value per share, the intrinsic value is divided by the number of shares outstanding. As indicated earlier, the value estimate is very sensitive to the equity cost of capital (r) and perpetuity growth rate (g) calculations/assumptions.

2.4. EVA vs. RIM

General financial practice stipulates that in order for a company to create value it must produce turnover in excess of its cost of capital. The use of valuation models such as EVA™ and RIM has operationalised this concept (Abdoli et al., 2012). Both methods are used in practice to evaluate investment opportunities. The literature review clearly indicates that EVA and RIM are very similar. Economic Value-Added (EVA™) - trademarked by Stern Stewart & Co. – is in fact a variation of the Residual Income Model (Worthington & West, 2004). According to Abdoli et al. (2012), many perceive EVA to be superior over traditional performance measurement tools. On the other hand the RIM has grown in popularity due to its proven tracking ability and predictive power (Jiang & Lee, 2005).When comparing the two models previously discussed, there are two differences between EVA™ and RIM which yields different results in different scenarios.

1) The first difference between the two methods depends on the calculation of forecasted revenues. With the RIM the accounting-based NOPAT or NI is used, whilst with EVA a number of adjustments are made to NOPAT to get to a more undistorted figure for projected revenues.
2) The second difference relates to the required return. With the RIM the minimum required return is derived by using the CAPM, while for EVA the required return

incorporates both the cost of equity (through CAPM) and the cost of debt by applying the WACC.

A study testing the relationship between EVA™ and RIM and created share value conducted by Abdoli et al. (2012), revealed that both models showed a significant relationship with share value. Hence, both fundamental valuation models' ability to accurately predict share price are tested in this study.

2.5. CALCULATION OF PEG

The price-earnings-to-growth (PEG) ratio is the company's share price divided by its earnings per share, divided by the earnings growth rate. Although a simple calculation, many variation of the PEG ratio is possible. The form of the price-earnings ratio varies between price-to-trailing earning and price-to-forward earnings, while the choice of earnings growth varies between historical growth rates or predicted future growth rates (Easton, 2004). According to Bradshaw (2004) the prevalent variation of the PEG ratio in the investment community is defined as:

$$PEG = \frac{P/E}{LTG} \tag{18}$$

Where:
P/E = forward price-to-earnings ratio; and
LTG = analysts' forecasted earnings growth rate.

As a rule-of-thumb, a PEG ratio around 1 indicates a fairly priced stock and supports a hold decision, a PEG ratio below 1 indicates an under-priced stock and a potential buy, and a PEG ratio above 1 indicates an over-priced stock and a potential sell (Bradshaw, 2004). Thus, by assuming the share price is at equilibrium (i.e. PEG = 1), Eq. (18) can be rearranged to obtain the heuristic valuation model:

$$V_{PEG} = E[EPS] \times LTG \times 100 \tag{19}$$

Where:
E[EPS] = 1 year forward earnings per share; and
LTG = analysts' forecasted earnings growth rate.

Although the PEG ratio has gained in popularity as a basis for stock recommendations, many argue it to be too simplistic in its assumption that earnings growth forecasts sufficiently captures the long-term future (Easton, 2004). Despite this shortcoming, analysts rarely provide valuation recommendations derived from value-based fundamental models, but rather support their recommendations with heuristic valuation models such as price-earnings-to-growth (Bradshaw, 2004). Gleason et al. (2007) found consistent results indicating the use of simple heuristics rather than value-based fundamental models. A survey conducted by Block (1999) indicates that present value techniques are less prominently used by financial analysts in practice than in theory. Thus, the PEG valuation model's ability to identify mispriced stock is also tested in this study and the results are compared with the fundamental valuation models - EVA and RIM.

2.6. MARGIN OF SAFETY

In accounting break-even analysis the margin of safety is defined as the revenue above (below) the break-even sales volume (Mowen et al., 2014). A positive margin of safety (Revenue > Break-even sales) indicates a profitable company, whilst a negative margin of safety (Revenue < Break-even sales) indicates that the company is making a loss. Thus it is clear that the larger the margin of safety, the lower the risk for a company to make a loss.

Although the concept is often used in accounting, it is also applicable in many other areas. Margin of safety as a concept in value investing was popularized by Benjamin Graham and supported by Warren Buffet. According to Graham (2005), margin of safety can be defined as the difference between the intrinsic value and the price of a stock. The margin of safety equation is presented as follows:

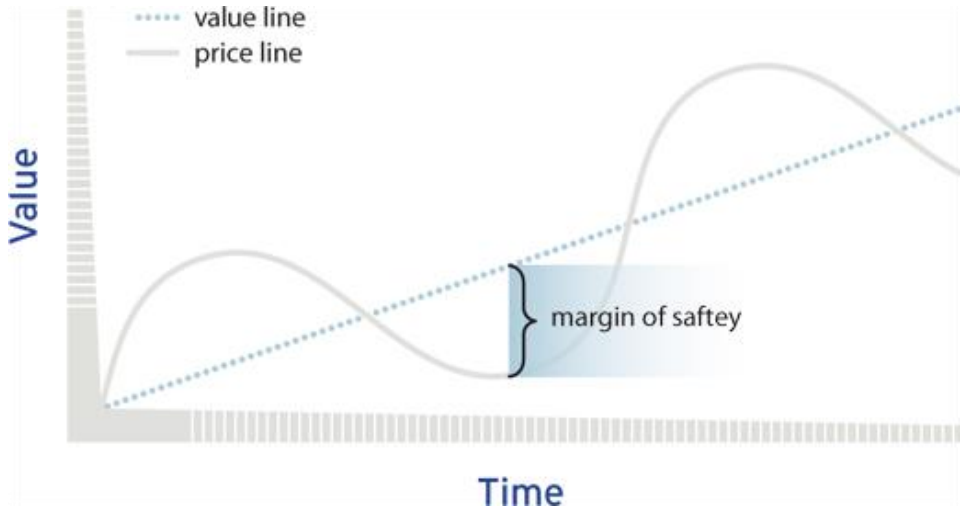
$$Margin\ of\ Safety = Intrinsic\ Value\ per\ Share - \ Share\ Price \tag{20}$$

Margin of safety can also be presented as a percentage. The equation for the margin of safety percentage is presented as follows:

$$Margin\ of\ Safety\ \% = 1 - \frac{Share\ Price}{Intrinsic\ Value\ per\ Share} \tag{21}$$

In investing, Graham (2005) proposes to only purchase shares in a company if the market value of the shares is below the intrinsic value; in other words if the margin of safety is positive. Please refer to Figure 2 below:

Figure 2 - Margin of Safety



Data source: Manitou, 31 Aug. 2015

Although a positive margin of safety does nog guarantee investment success, it has become a popular tool to identify mispriced stock. For this study the margin of safety percentages was calculated with the intrinsic value estimates derived from EVA™, RIM and PEG. In order to test to what extent these valuation metrics are able to correctly identify mispriced stock during different periods of a bull market and a bear market, the research will investigate the correlation coefficients between margin of safety percentage and the 1-year forward share price growth.

2.7. PRICE MULTIPLES

The PEG ratio has become a widely used method of combining share price and a forecasted value estimate into a multiple used for stock recommendations (Easton, 2004). A rule-of-thumb exists in practice whereby stock with a PEG ratio below 0.85 are identified as Buys, between 0.85 and 1.15 are Holds, and above 1.15 are Sells. The simple rationale behind this is founded in Benjamin Graham's concept for value investing: only purchase shares in a company if the market value of the shares is below the underlying value. A multiple of 0.85 indicates that the market price of the stock is only 85% of the underlying value and should

thus be purchased; a multiple of 1.15 indicates that the market price of the stock is 115% of the underlying value and should thus be sold.

By dividing share price with intrinsic value for the selected valuation metrics, the same logic can be applied. The equation becomes:

$$Fundamental\ Price\ Multiple = \frac{Share\ Price}{Intrinsic\ Value\ per\ Share} \quad (22)$$

Using the intrinsic values per share calculated through EVA™, RIM and PEG models, Eq. (22) yields comparable multiples for EVA™, RIM and PEG. These will be used in this research to investigate the success of these models to identify mispriced stock. Thus a Price/EVA and Price/RIM multiple below 0.85 can be identified as Buys, between 0.85 and 1.15 are Holds, and above 1.15 are Sells for the purpose of this study.

2.8. THE JSE INDI 25

The Johannesburg Securities Exchange (JSE) classifies all listed companies into different sectors according to the company's core business activities and general industrial and economic themes. According to the JSE website, the three high-level sectors are: Resources, Financials and Industrials. The SA Resources sector (J258) includes all JSE listed companies belonging to the Industry Classification Benchmark (ICB) sectors “Oil & Gas Producers” and “Mining”. The SA Financials sector (J580) includes all JSE listed companies belonging to the ICB sector “Financials”. The SA Industrials sector (J257) includes all remaining companies not listed under SA Resources or SA Financials, hence it represents the majority of the companies listed on the JSE.

Under the SA Industrials sector, various criteria is used to narrow hundreds of industrial shares down to the Industrial 25 index (J211). The main factor determining whether a particular share is included in this index is market capitalisation. A company’s market capitalisation is calculated by multiplying share price at a certain point in time with the number of shares the company has in issue at that time. It therefore represents the total market value of the company at a certain point in time. Thus the Industrials 25 index includes the 25 largest companies listed under the Industrials sector on the JSE at any given time. The market capitalisation of companies change as their share prices fluctuate and companies will move in and out of the Industrials 25 index. The sample group consists of

the 25 companies included in the Industrials 25 index at the start of 2015. These are included in Table 1 below:

Table 1 - Industrials 25 Index sample group

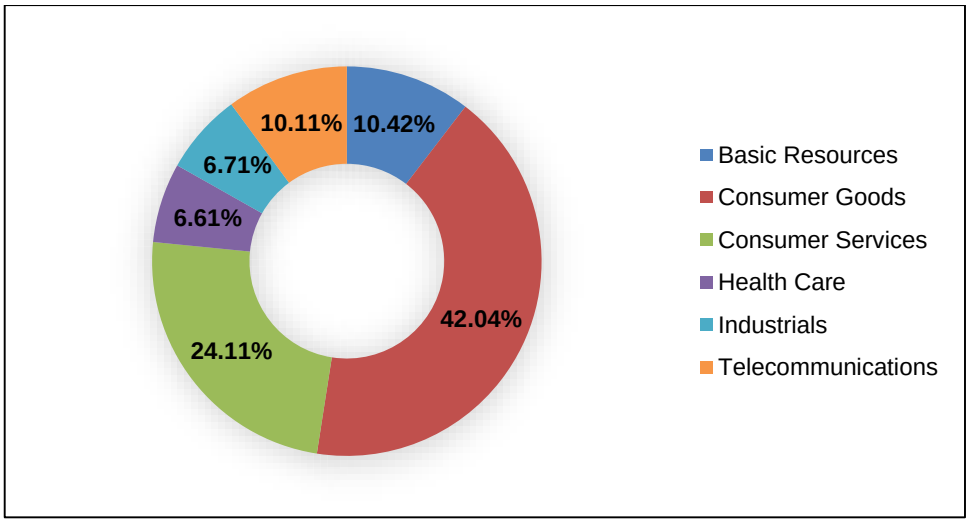
Ticker Code	Share name	Industry	Weight
APN	Aspen Pharmacare Hldgs L	Health Care	2.69%
BTI	British American Tob plc	Consumer Goods	5.69%
BVT	Bidvest Ltd	Industrials	2.62%
CFR	Compagnie Fin Richemont	Consumer Goods	13.37%
IPL	Imperial Holdings Ltd	Industrials	0.85%
KIO	Kumba Iron Ore Ltd	Basic Materials	0.14%
LHC	Life Healthc Grp Hldgs L	Health Care	0.98%
MDC	Mediclinic Internat Ltd	Health Care	1.37%
MND	Mondi Ltd	Basic Materials	0.95%
MNP	Mondi plc	Basic Materials	2.94%
MPC	Mr Price Group Ltd	Consumer Services	1.46%
MTN	MTN Group Ltd	Telecommunications	8.35%
NPN	Naspers Ltd -N-	Consumer Services	16.72%
NTC	Netcare Limited	Health Care	1.57%
PFG	Pioneer Foods Group Ltd	Consumer Goods	0.70%
REM	Remgro Ltd	Industrials	3.24%
SAB	SABMiller plc	Consumer Goods	16.02%
SHF	Steinhoff Int Hldgs Ltd	Consumer Goods	4.99%
SHP	Shoprite Holdings Ltd	Consumer Services	1.91%
SOL	Sasol Limited	Basic Materials	6.39%
TBS	Tiger Brands Ltd	Consumer Goods	1.27%
TFG	The Foschini Group Limit	Consumer Services	0.72%
TKG	Telkom SA SOC Ltd	Telecommunications	0.53%
TRU	Truworths Int Ltd	Consumer Services	1.00%
VOD	Vodacom Group Ltd	Telecommunications	1.23%
WHL	Woolworths Holdings Ltd	Consumer Services	2.30%

Data source: Satrix, 31 Jan. 2015

According to Brown (2012), South African investors and fund managers generally refer to the JSE Top 40 index as an investment performance benchmark, despite its inherent shortcomings. The JSE Top 40 index's distribution is skewed towards resources and financial shares due to the constituent weightings of the index; industrials only receives a weighting of approximately 5% in the top 40 index. With growth projections in the resource

sector looking bleak, investors and fund managers are turning to different sectors when seeking for investment opportunities. The Industrial 25 index assigns only 10.4% of its weighting to basic resources and distributes the rest of the index weighting towards telecommunications, industrials, health care, consumer goods and consumer services, which makes it a very good alternative to the JSE Top 40. Refer to Figure 1 below for the index weightings:

Figure 3: Industrials 25 index weightings



Data source: Satrix, 31 Aug. 2015

It is important to note that large firms with significant offshore earnings dominate the Industrial 25 index. Naspers, SAB Miller, Richemont, MTN, British American Tobacco, Steinhoff and Aspen account for approximately 68% of the index. Mediclinic (1.37% weighting) is another Industrials 25 index share which offers some currency exposure due to increasing international operations. Thus, due to the large currency exposure of the Industrials 25 index and the continued volatility of the South African Rand, the Indi 25 offers investors with a potential currency hedge.

The Industrials 25 index is also heavily weighted (more than 66%) in the consumer sector of the SA economy. Although it is well known that the consumer market is greatly influenced by interest rate cycles and inflationary pressures, these variables are already accounted for in analysts' forecasts and cost of capital calculations.

2.9. BULL AND BEAR MARKETS

It is common knowledge that prolonged periods of increases and decreases in share prices occur on the stock markets. These periods where equity prices increase and fall are referred

to as bull and bear markets respectively (Pagan & Sossounov, 2003). It is a feature of all stock exchanges which has received much speculation on predicting the turning point between a bull and a bear market. A study conducted by Maheu & McCurdy (2000) revealed empirical results that bull market returns decreases with duration. In other words higher returns are realised during the early stages of a bull market than the latter stages. Their research also indicates that the longer a bull market persists, the more optimistic investors become about the future. This increases investors' appetite to invest more in stock markets and is referred to as a momentum effect. According to Bradshaw (2004), empirical evidence suggest that analyst recommendations correlates more with simple heuristic valuations like the PEG ratio than fundamental valuation models. The argument is that once the market gains momentum, investor optimism drive analysts toward using faster, less complex valuation metrics to identify investment opportunities, possibly ignoring underlying value. Due to the popularity and frequent use of heuristic models during such periods, one could expect a higher correlation between heuristic model estimates and share price growth during the latter periods of a bull market.

Previous work experience as an analyst suggested that during and just after a bear market period there is an argument for the popularity and more frequent use of value based models. Due to investor scepticism and uncertainty, analysts revert back to intrinsic values derived from fundamental models. Thus it can be expected that the correlation between fundamental valuation estimates and share price growth is higher during a bear market period and the early stages of a bull market period. In order to test these arguments data have been demarcated into seven twelve month periods including one bear market period and six periods during the bull market.

2.10. CONCLUSION

The JSE experiences numerous periods of prolonged growth or decline in equity values, referred to as bull and bear market periods respectively. Though many studies have been done on the predictive power of EVA™ and RIM as fundamental valuation models, and on PEG as a commonly used heuristic valuation model, little research has been conducted on their ability to identify mispriced stock during different market periods. Therefore, the purpose of this study is to determine the predictive capabilities of the EVA™, RIM and PEG valuation models during the different market periods as stipulated above. This will be done by correlating EVA™, RIM and PEG value estimates for companies listed under the Industrial 25 index to share price growth during different stages of a bull market period and a bear market period.

CHAPTER 3

RESEARCH METHODOLGY

3.1. INTRODUCTION

During the literature review two value based fundamental models (EVA™ and RIM) and one heuristic model (PEG) has been selected. Both the fundamental valuation models and the heuristic model have proven to be valuable tools at investors' and analysts' disposal to assist in optimizing investment decisions. This chapter includes detailed descriptions of the research design, the study population, the sampling method, the data capturing process and the data analyses conducted for this research study.

3.2. RESEARCH DESIGN

This study made use of numerical data, thus a quantitative research approach was taken. Quantitative research refers to a systematic empirical investigation of occurrences through the use of certain statistical methods.

This study compares the margin of safety % derived from EVA™, RIM and PEG valuation metrics with the 1-year forward share price growth of the JSE Indi 25 shares. This was done in order to determine to what extent the selected valuation metrics are able to correctly identify mispriced stock during different periods of a bull market and a bear market. The research investigates the correlation coefficients between the margin of safety % derived from the various valuation methods and the 1-year forward share price growth for seven 12-month periods as identified earlier.

Furthermore this study also utilized the EVA™, RIM and PEG multiples to distinguish between buy, hold and sell recommendations for the JSE Indi 25 shares. These recommendations were compared with the 1-year forward share price growth, and based on predetermined parameters for share price growth, each data entry was captured as a categorical variable, "Recommendation Success", with two categories: yes (1) and no (0). Using descriptive statistics, a relative frequency distribution table was drawn up to summarize the various outcomes by valuation model per time period. Levine et al. (2011) defines a relative frequency distribution as table displaying the relative frequency (percentage distribution) of the various outcomes in a sample.

3.3. STUDY POPULATION

A population consist of all the individuals, companies, items etc. that share some set of characteristics, about which you want to draw conclusions or make inferences (Levine et al., 2011). The population of relevance in this study includes all companies listed on the main board of the Johannesburg Securities Exchange under the Industry Classification Benchmark (ICB) SA Industrials (J257).

3.4. SAMPLING METHOD AND SIZE

Levine et al. (2011) defines a sample as the portion of the population of relevance which was selected for analysis. In this study numerous calculations were required based on the availability of historic financial data, as well as historic consensus analyst forecasts. For this reason a non-probability, convenience sampling technique was used. Convenience sampling involves selecting units of analysis based on how easy it is to obtain the required data (Welman et al., 2005). Under the SA Industrials sector, various criteria is used to narrow hundreds of industrial shares down to the Industrial 25 index (J211). The main factor determining whether a particular share is included in this index is market capitalisation. Thus the Industrials 25 index includes the 25 largest companies listed under the Industrials sector on the JSE at any given time. Due to their size and popularity, the Indi 25 shares are also constantly evaluated by various analysts which ensures that the data required for calculations are easily accessible and readily available. Hence the sample for this study consists of the 25 shares forming part of the Indi 25 at the start of 2015. The sample group is presented in Table 1.

3.5. THE DATA COLLECTION PROCESS

All financial data and analysts forecast data required for the relevant calculations were extracted from the INET BFA database. In this study, standardised rather than normalised financial statements were used for the sake of comparability. Annual consensus analyst earnings forecasts were used. The consensus forecasts refers to the average of the different analysts' forecasted estimates. Additional supporting data was also retrieved from various websites such as www.jse.co.za and www.tradingeconomics.com. All data was collected for the time period starting January 2007 to January 2015.

3.6. DATA ANALYSIS

Valuation estimates were calculated over seven 12-month periods for all the individual companies using Microsoft Excel. Where missing data did not allow for the calculation of

valuation estimates, entries were treated as missing or invalid. Thus statistics for each pair of variables were based only on cases with valid data for that pair. Although the theory of all calculations were discussed in detail as part of the literature review, certain assumptions were made for the calculation of the different valuation estimates. These are discussed in detail below.

3.6.1. Actual Calculation of EVA

EVA™ was calculated using the formula as presented in Eq. (1) above. As mentioned in the literature review, accounting profit differs from economic profit, hence some adjustments were made to EBIT when calculating EVA™. EBIT was taken to NOPAT by subtracting the relevant tax portion from EBIT. Since NOPAT in Eq. (1) should be a true cash measure, accounting entries not affecting actual cash flows should be adjusted (Ward & Price, 2006). Thus 'Research and Development' and 'Intangible Assets Written Off'' were added back to NOPAT.

Calculation of WACC was done in accordance with Eq. (3). The following assumptions were made for these calculations:

- CAPM was used to calculate the cost of equity,
- A five year monthly Beta was calculated,
- A 6% estimate was used as the market risk premium which is in line with general practice in South Africa,
- The R186 government bond rate was used as the annual risk free rate, as this is a long term bond,
- Cost of debt was retrieved from INET BFA; and
- The Debt/Equity ratio retrieved from INET BFA was used to calculate the weights of debt and equity.

Total Capital Employed (TCE) as per Eq. (1) was retrieved from the INET BFA database and is equal to the total assets minus the current liabilities found in the statement of financial position. A template for the calculation of EVA is presented in Table 2 below:

Table 2 - Calculation of EVA Template

STEP 1: CALCULATING NOPAT
Earnings Before Interest & Tax
Minus: Tax on Operating Profit
= NOPAT Before Adjustments
Plus: Research & Development
Plus: Intangible Assets written off
= NOPAT After Adjustments
STEP 2: COST OF CAPITAL
Tax Adjusted Cost of Debt (INET BFA)
x Debt Weighting
+
K_e = R186 + β*(6%)
x Equity Weighting
= WACC
x Total Capital Employed (INET BFA)
= Opportunity Cost of Capital
STEP 3: CALCULATING EVA
NOPAT After Adjustments
minus: Opportunity Cost of Capital
= Economic Value Added (EVA)

It was mentioned earlier that analysts' earnings forecasts represent a good surrogate for market earnings expectations (Givoly et al., 2009). Furthermore Barniv et al. (2009) state that analysts do comprehensive firm-, industry- and economy-specific research when generating forecasts. Thus consensus analyst earnings forecasts were used for calculating the EVA intrinsic value per company. Analysts forecasted earnings per share refers to the forecasted net income per share. Since forecasted annual financial statements were not available to calculate forward EVAs, the consensus analyst earnings forecasts were adjusted using an EVA factor to derive forward EVAs. This EVA factor is

simply EVA as a percentage of net income. The EVA factor was calculated using the following formula:

$$EVA\ Factor = \frac{EVA}{NI} \tag{23}$$

Where:
EVA = Economic Value Added; and
NI = Net Income.

Forward EVA per share was calculated by multiplying the consensus analyst earnings forecasts with the EVA factor. This produced forward EVAs three years ahead which was used for the EVA intrinsic value estimates as per Eq. (12).

Penman (1991) suggests that continued competitive pressures in the long-run should drive abnormal future profits to zero. Thus a long-term sustainable growth rate (g) was assumed as the 10-year historic inflation rate (CPI) plus the 10-year historic real GDP growth rate of the country. This is presented in Table 3 below:

Table 3 - Sustainable Growth Rate Assumption

Year	10 Year Average (CPI)	10 Year Average (GDP)	Sustainable Growth Rate (g)
2008	5.13%	3.73%	8.86%
2009	5.17%	4.00%	9.17%
2010	5.55%	3.61%	9.16%
2011	5.18%	3.49%	8.67%
2012	5.37%	3.54%	8.91%
2013	4.59%	3.39%	7.98%
2014	5.28%	3.32%	8.60%

Data source: Trading Economics, 31 Aug. 2015

EVA intrinsic value estimates was converted to EVA margin of safety percentages and EVA price multiples by applying Eq. (21) and Eq. (22) respectively.

3.6.2. Actual Calculation of RIM

RIM was calculated in accordance to Eq. (13). Consensus analyst earnings forecasts retrieved from INET BFA were used as net income per share, future book values per

share were derived by applying the clean surplus relation as presented in Eq. (14) and the CAPM was used to calculate the equity cost of capital. In the traditional income statement, net income accounts for the cost of debt capital through the deduction of interest expense, thus only the equity cost of capital was required. A template for the calculation of RIM is presented in Table 4 below:

Table 4 - Calculation of RIM Template

STEP 1: RETRIEVE FORECASTED EPS
Consensus Analyst Earnings Forecast
STEP 2: EQUITY COST OF CAPITAL
CAPM = Risk Free Rate (R_f) + β*(6%)
STEP 3: BOOK VALUE PER SHARE
$BVPS_t = BVPS_{t-1} + EPS_t – DPS_t$
STEP 4: CALCULATE RIM
Forecasted EPS_t
-
CAPM = R_f + β*(6%)
x $BVPS_t$
= Residual Income per Share

The following assumptions were made in calculating equity cost of capital:

- CAPM was used to calculate equity cost of capital (r),
- A five year monthly Beta was used,
- A 6% estimate was used as the market risk premium; and
- Risk free rate (R_f) = Annual R186 government bond rate.

The same sustainable growth rates used for the EVA calculations were used for the RIM calculation. These rates are presented in Table 3. RIM intrinsic value estimates were converted to RIM margin of safety percentages and RIM price multiples by applying Eq. (21) and Eq. (22) respectively.

3.6.3. Actual Calculation of PEG

The PEG ratio was calculated in accordance to Eq. (18). The 1-year forward consensus analyst earnings were used and the analyst long-term earnings growth rate (LTG) were calculated as the compound annual growth rate (CAGR) of the consensus analyst earnings forecasts over a three year forecast period. Furthermore heuristic value

estimates were calculated using the formula as presented in Eq. (19). These valuation estimates were used to calculate PEG margin of safety percentages as per Eq. (21).

3.6.4. Statistical Analysis

The coefficient of correlation is a measure of the relative strength of the linear relationship that exists between two variables (Levine et al., 2011). It ranges between the values -1 and 1, with -1 indicating a perfect negative linear relationship and 1 indicating a perfect positive linear relationship. SAS statistical software was used to draw up correlation matrices for seven 12-month periods from 2008 – 2014. This was done in order to establish a relationship or connection (if any) between the margin of safety percentages derived for each valuation method, and the 1-year forward share price growth. The relative strengths of the relationships will be compared for each valuation method within each period, as well as between periods. The aim is to determine which valuation metrics correlates better with share price growth during which periods and discuss some possible reasons behind it.

The first secondary objective of this study is to ascertain to what extent selected valuation metrics can be utilized to make successful buy, hold or sell recommendations. The price multiples calculated for RIM, EVA™ and PEG was used to choose between a buy, sell or hold decision based on the following criteria:

Table 5 - Price Multiple Recommendation Criteria

Criteria	Recommendation
Multiple < 0.85	Buy
0.85 < Multiple < 1.15	Hold
Multiple > 1.15	Sell

RIM, EVA™ and PEG recommendations were then compared to 1-year forward share price growth recommendations based on the following logic: The compound annual return on the JSE All Share over the past decade is approximately 15%. The average risk free rate (R186) over the past decade is approximately 8.5%. This study assumes that a potential investor would expect to receive at least the historic annual compound return of the JSE All Share if a correct buy recommendation was given, between the historic annual compound return of the JSE all share and the average risk free rate if a correct hold decision was given, and below the average risk free rate if a correct sell decision was

given. Thus the1-year forward share price growth rate was used to determine what would have been the correct recommendations based on the following criteria:

Table 6 - Share Price Growth Recommendation Criteria

Criteria	Recommendation
Growth > 15%	Buy
8.5% < Growth < 15%	Hold
Growth < 8.5%	Sell

The price multiple recommendations were compared with the share price growth recommendations and each data entry was captured as the categorical variable "Recommendation Success" as either a "YES" (1) or a "NO" (0). "Recommendation Success" categories were defined as follows:

- If the price multiple recommendation matches the share price growth recommendation, "Recommendation Success" = 1,
- If the price multiple recommendation is "Hold" and the share price growth recommendation is "Buy", "Recommendation Success" = 1; and
- For all other outcomes "Recommendation Success" = 0.

A relative frequency distribution table was drawn up for "Recommendation Success" outcomes by valuation model per time period. Side-by-side bar charts were used to visualize the joint responses for "Recommendation Success" per valuation model in each period. This was done to determine to what extent each model produced successful buy, hold or sell recommendations during different market periods.

The second secondary objective is to ascertain to what extent the selected valuation metrics used together can be used to make successful buy, hold or sell recommendations. The same criteria as per Tables 5 and 6 were used to determine recommendations. The price multiple recommendations were grouped together per period and only data entries where all three recommendation (from PEG, EVA™ and RIM) were exactly the same were used. The combined price multiple recommendations were compared with the share price growth recommendations and each data entry was captured as the categorical variable "Combined Recommendation Success" as either a "YES" (1) or a "NO" (0). "Combined Recommendation Success" categories were defined as follows:

- If the price multiple recommendation matches the share price growth recommendation, “Recommendation Success” = 1,
- If the price multiple recommendation is “Hold” and the share price growth recommendation is “Buy”, “Recommendation Success” = 1; and
- For all other outcomes “Recommendation Success” = 0.

A relative frequency distribution table was drawn up for “Combined Recommendation Success” outcomes per time period and a side-by-side bar chart was used to visualize the outcomes for “Combined Recommendation Success” per period.

3.7. CONCLUSION

In this study, a quantitative research approach was used. The margin of safety % for EVA™, RIM and PEG valuation metrics was used in order to determine to what extent the selected valuation metrics are able to correctly identify mispriced stock during different periods of a bull market and a bear market. Correlation coefficients between the margin of safety % and the 1-year forward share price growth were calculated and investigated for seven 12-month periods. This study also utilized the EVA™, RIM and PEG multiples to distinguish between buy, hold and sell recommendations and compared them with the 1-year forward share price growth. Based on predetermined parameters for share price growth, the study used relative frequency distribution tables to determine the success of the buy, hold and sell recommendations.

The population of relevance in this study includes all companies listed on the main board of the Johannesburg Securities Exchange under the Industry Classification Benchmark (ICB) SA Industrials (J257). A non-probability, convenience sampling technique was used and the sample for this study consists of the 25 shares forming part of the Indi 25 at the start of 2015. Tables 2 to 6 indicate the calculations and predefined parameters used throughout this study.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1. INTRODUCTION

All data have been demarcated into seven twelve month periods; one bear market period (2008) and six bull market periods (2009 – 2014). All statistical results will be revealed in table format, indicating results per variable and per period. It will also be represented as graphs in order to visualize the results where applicable. All statistical results will be interpreted and discussed as far as possible.

4.2. MARGIN OF SAFETY % AND SHARE PRICE GROWTH

The objective is to ascertain to what extent EVA™, RIM and PEG valuation estimates are able to correctly identify mispriced stock in different periods of a bull market and a bear market for industrial companies listed on the JSE.

4.2.1. Statistical Test:

Spearman's rank correlation coefficient (rho) was used to test for correlation between the different variables. It is a nonparametric measure of the statistical dependence between the variables. It is important to note that user-defined missing values (where not enough data was available to do the valuation calculations) were treated as missing and statistics were based on all the cases with valid data in the specified period(s) for all variables. The following statistical guidelines were used to interpret the results:

- ± 0.70. A strong positive/negative linear relationship exists,
- ± 0.50. A moderate positive/negative linear relationship exists,
- ± 0.30. A weak positive/negative linear relationship exists; and
- No linear relationship exists.

A positive correlation indicates that both variables move in the same direction. In other words if one increases, the other increases and vice versa. A negative correlation indicates that both variables move in the opposite direction. In other words if one increases, the other decreases and vice versa. For the valuation estimates to correctly identify mispriced stock, the assumption is that the share price must move in the direction required to close the gap between the valuation estimate and the share price. Thus the 1-year forward share price growth percentages and the margin of safety percentages

should move in the same direction. Hence a positive correlation will indicate that selected valuation metrics are able to correctly identify mispriced stock and the size of the correlation will ascertain to what extent it can do this.

4.2.2. Test Results:

The test results are presented as correlation matrices for each period in Tables 7 to 13 below.

Table 7 - Bear Period Correlation Matrix (2008)

2008 - Correlation Matrix		Share Price Growth	PEG MOS%	EVA MOS%	RIM MOS%
Share Price	Correlation Coefficient	1.000	0.381	0.033	0.539*
	Sig. (2-tailed)		0.108	0.892	0.017
	N	19	19	19	19
PEG MOS%	Correlation Coefficient	0.381	1.000	0.070	0.209
	Sig. (2-tailed)	0.108		0.775	0.391
	N	19	19	19	19
EVA MOS%	Correlation Coefficient	0.033	0.070	1.000	0.200
	Sig. (2-tailed)	0.892	0.775		0.412
	N	19	19	19	19
RIM MOS%	Correlation Coefficient	0.539*	0.209	0.200	1.000
	Sig. (2-tailed)	0.017	0.391	0.412	
	N	19	19	19	19

* Correlation is significant at the 0.05 level (2-tailed).

In 2008, the bear market period, there was a moderate, positive linear relationship between the RIM margin of safety percentage (RIM MOS %) and 1-year forward share price growth (SPG %). A weak-to-moderate, positive linear relationship existed between PEG margin of safety percentage (PEG MOS %) and SPG % and there was close to no linear relationship between EVA margin of safety percentage (EVA MOS %) and SPG %.

Table 8 - Bull 1 Correlation Matrix (2009)

2009 Correlation Matrix		Share Price Growth	PEG MOS%	EVA MOS%	RIM MOS%
Share Price	Correlation Coefficient	1.000	0.088	-0.093	-0.384
	Sig. (2-tailed)		0.721	0.705	0.104
	N	19	19	19	19
PEG MOS%	Correlation Coefficient	0.088	1.000	0.496*	0.332
	Sig. (2-tailed)	0.721		0.031	0.166
	N	19	19	19	19
EVA MOS%	Correlation Coefficient	-0.093	0.496*	1.000	0.330
	Sig. (2-tailed)	0.705	0.031		0.168
	N	19	19	19	19
RIM MOS%	Correlation Coefficient	-0.384	0.332	0.330	1.000
	Sig. (2-tailed)	0.104	0.166	0.168	
	N	19	19	19	19

* Correlation is significant at the 0.05 level (2-tailed).

In 2009, the first year of the bull market period, there was a weak-to-moderate, negative relationship between the RIM MOS % and SPG %. EVA MOS % and PEG MOS % showed approximately no linear relationship with SPG %.

Table 9 - Bull 2 Correlation Matrix (2010)

2010 Correlation Matrix		Share Price Growth	PEG MOS%	EVA MOS%	RIM MOS%
Share Price	Correlation Coefficient	1.000	0.14	-0.108	0.281
	Sig. (2-tailed)		0.556	0.65	0.23
	N	20	20	20	20
PEG MOS%	Correlation Coefficient	0.14	1.000	0.332	0.215
	Sig. (2-tailed)	0.556		0.152	0.363
	N	20	20	20	20
EVA MOS%	Correlation Coefficient	-0.108	0.332	1.000	0.376
	Sig. (2-tailed)	0.65	0.152		0.102
	N	20	20	20	20
RIM MOS%	Correlation Coefficient	0.281	0.215	0.376	1.000
	Sig. (2-tailed)	0.23	0.363	0.102	
	N	20	20	20	20

In 2010, the second year of the bull market period, RIM MOS % indicated a weak, positive linear relationship with SPG %. Once again the correlations of PEG MOS % and EVA MOS % were very low.

Table 10 - Bull 3 Correlation Matrix (2011)

2011 Correlation Matrix		Share Price Growth	PEG MOS%	EVA MOS%	RIM MOS%
Share Price	Correlation Coefficient	1.000	0.248	0.128	.777**
	Sig. (2-tailed)		0.292	0.591	0.000
	N	20	20	20	20
PEG MOS%	Correlation Coefficient	0.248	1.000	0.146	0.290
	Sig. (2-tailed)	0.292		0.539	0.214
	N	20	20	20	20
EVA MOS%	Correlation Coefficient	0.128	0.146	1.000	0.408
	Sig. (2-tailed)	0.591	0.539		0.075
	N	20	20	20	20
RIM MOS%	Correlation Coefficient	.777**	0.290	0.408	1.000
	Sig. (2-tailed)	0.000	0.214	0.075	
	N	20	20	20	20

** Correlation is significant at the 0.01 level (2-tailed).

In 2011, the third year of the bull market, RIM MOS % indicated a very strong, positive linear relationship with SPG %. PEG MOS % showed a weak, positive linear relationship with SPG % and the EVA MOS % linear relationship was almost non-existing.

Table 11 - Bull 4 Correlation Matrix (2012)

2012 Correlation Matrix		Share Price Growth	PEG MOS%	EVA MOS%	RIM MOS%
Share Price	Correlation Coefficient	1.000	-0.075	-0.106	-0.299
	Sig. (2-tailed)		0.746	0.646	0.188
	N	21	21	21	21
PEG MOS%	Correlation Coefficient	-0.075	1.000	-0.148	-0.171
	Sig. (2-tailed)	0.746		0.522	0.457
	N	21	21	21	21
EVA MOS%	Correlation Coefficient	-0.106	-0.148	1.000	0.601**
	Sig. (2-tailed)	0.646	0.522		0.004
	N	21	21	21	21
RIM MOS%	Correlation Coefficient	-0.299	-0.171	0.601**	1.000
	Sig. (2-tailed)	0.188	0.457	0.004	
	N	21	21	21	21

** Correlation is significant at the 0.01 level (2-tailed).

In the fourth year of the bull market period (2012), PEG MOS % and EVA MOS % had extremely weak negative correlations with SPG %. RIM MOS % had a weak, negative linear relationship with SPG %.

Table 12 - Bull 5 Correlation Matrix (2013)

2013 Correlation Matrix		Share Price Growth	PEG MOS%	EVA MOS%	RIM MOS%
Share Price	Correlation Coefficient	1.000	.244	-.116	-.331
	Sig. (2-tailed)		.286	.618	.143
	N	21	21	21	21
PEG MOS%	Correlation Coefficient	.244	1.000	.158	-.052
	Sig. (2-tailed)	.286		.493	.823
	N	21	21	21	21
EVA MOS%	Correlation Coefficient	-.116	.158	1.000	.377
	Sig. (2-tailed)	.618	.493		.092
	N	21	21	21	21
RIM MOS%	Correlation Coefficient	-.331	-.052	.377	1.000
	Sig. (2-tailed)	.143	.823	.092	
	N	21	21	21	21

The 2013 results indicated a weak, negative linear relationship between RIM MOS % and SPG%, a weak, positive linear relationship between PEG MOS % and SPG% and once again almost no correlation with EVA MOS%.

Table 13 - Bull 6 Correlation Matrix (2014)

2014 Correlation Matrix		Share Price Growth	PEG MOS%	EVA MOS%	RIM MOS%
Share Price	Correlation Coefficient	1.000	.359	.018	.332
	Sig. (2-tailed)		.120	.940	.152
	N	20	20	20	20
PEG MOS%	Correlation Coefficient	.359	1.000	.117	.135
	Sig. (2-tailed)	.120		.622	.569
	N	20	20	20	20
EVA MOS%	Correlation Coefficient	.018	.117	1.000	.439
	Sig. (2-tailed)	.940	.622		.053
	N	20	20	20	20
RIM MOS%	Correlation Coefficient	.332	.135	.439	1.000
	Sig. (2-tailed)	.152	.569	.053	
	N	20	20	20	20

In the final bull period (2014), PEG MOS % had the strongest positive linear relationship with SPG % in the period. The relationship was weak to moderate in strength. RIM MOS % showed a weak, positive linear relationship with SPG % and EVA MOS % showed no linear relationship.

4.2.3. Conclusion:

Using the statistical interpretation guidelines for Spearman's rank correlation coefficient (rho), Table 14 below summarizes the test results as follows:

Table 14 - Correlation Interpretation

		RIM MOS %		PEG MOS %		EVA MOS %	
Period	**Year**	**Direction**	**Strength**	**Direction**	**Strength**	**Direction**	**Strength**
Bear	**2008**	+	Moderate-to-Strong	+	Weak-to-Moderate	+	Close to Zero
Bull 1	**2009**	-	Weak-to-Moderate	+	Close to Zero	-	Close to Zero
Bull 2	**2010**	+	Weak	+	Close to Zero	-	Close to Zero
Bull 3	**2011**	+	Strong	+	Weak	+	Close to Zero
Bull 4	**2012**	-	Weak	-	Close to Zero	-	Close to Zero
Bull 5	**2013**	-	Weak	+	Weak	-	Close to Zero
Bull 6	**2014**	+	Weak	+	Weak-to-Moderate	+	Close to Zero

The results indicate that there was practically no correlation between EVA MOS % and SPG % in all seven periods. These results are consistent with the findings of Chen & Dodd (1997) and Palliam (2006), whose results indicate that EVA valuation estimates are unreliable and invalid when tested for association with stock returns. Hence, investigating the argument stating that during a bear market period and the early stages of a bull market period it can be expected that the correlation between fundamental valuation estimates and share price growth is higher than the correlation with heuristic valuation estimates, only the PEG MOS % and RIM MOS % correlations with SPG % were considered.

Table 14 indicates that during the bear market period (2008), RIM MOS % had a moderate-to-strong, positive linear relationship with SPG %, while PEG MOS % only had a weak-to-moderate positive linear relationship with SPG %. In 2009 (Bull 1) there was a weak-to-moderate, negative correlation between RIM MOS % and SPG % and approximately no correlation between PEG MOS % and SPG %. In 2010 (Bull 2) RIM MOS % had a weak, positive linear relationship with SPG %, while PEG MOS % had a correlation close to zero. In 2011 (Bull 3) RIM MOS % had a very strong, positive linear relationship with SPG %, while PEG MOS % only had a weak, positive linear relationship with SPG %. Thus, excluding 2009 (Bull 1), these results support the argument that in a

bear market and during the early stages of a bull market, RIM valuation estimates correlate higher with share price growth than PEG value estimates.

The negative RIM correlation of 2009 indicates that, to a certain extent, SPG % moved in the opposite direction as suggested by RIM MOS %. Although this does not align with the argument above, there is a possible explanation for this. The valuation estimates were calculated using consensus analyst forecasts. If the average analyst is reactive rather than proactive to the market conditions, the consensus analyst forecasts at the end of the bear period will still be one of scepticism and negative perceptions. This could lead to under stated earnings forecasts, resulting in negative RIM margin of safety percentages. If this data is then compared with the 1-year forward share price growth percentages at the end of the first bull year, one would expect a negative correlation. This is however just a theory to explain the anomaly. Levine et al. (2011) states that the correlation alone does not necessarily prove causation. In other words the change in SPG % is not necessarily caused by the change in RIM MOS %.

The second argument states that once the market gains momentum, one could expect a higher correlation between heuristic model estimates and share price growth than with fundamental valuation estimates. This would be during the latter periods of a bull market. In 2012 (Bull 4) there was a weak, negative correlation between RIM MOS % and SPG % and approximately no correlation between PEG MOS % and SPG %. In 2013, the firth bull year, there was a weak, negative correlation between RIM MOS % and SPG % and a weak, positive correlation between PEG MOS % and SPG %. During the sixth bull year (2014) there was a weak, positive correlation between RIM MOS % and SPG % and a weak-to-moderate, positive correlation between PEG MOS % and SPG %. To a certain extent, these results supports the argument that the PEG margin of safety percentages are more successful in predicting share price growth during the latter stages of the bull market period than RIM.

The negative RIM correlations of 2012 and 2013 can be explained in support of the second argument. As the market gains momentum, the share price moves away from intrinsic value, resulting in a negative RIM MOS %. Because the bull market momentum continues, the 1-year share price growth remains positive, resulting in a negative correlation. Although not strong, the results indicate positive correlations between PEG

MOS % and SPG % for 2013 and 2014 in support of the argument. Once again it is important to note that correlation alone does not necessarily proof causation.

4.3. INDIVIDUAL RECOMMENDATIONS AND SHARE PRICE GROWTH RECOMMENDATIONS

The objectives to ascertain to what extent RIM, EVA™ and PEG valuation multiples used separately can be utilized to make successful buy, hold or sell recommendations.

4.3.1. Statistical Test:

Individual Price/Value multiples were used to determine buy, hold and sell recommendations as per the criteria of Table 5. These were compared with the buy, hold and sell recommendations established from the 1-year forward share price growth in accordance to the criteria as per Table 6. Results were captured as categorical variables with the categories 1 (YES) and 0 (NO) according to the "Recommendation Success" criteria specified in section 3.6.4. Category 1 (YES) indicates that the recommendation was successful according to the specified criteria and category 2 (NO) indicates that the recommendation was not successful according to the specified criteria. A relative frequency distribution table was drawn up and side-by-side bar charts was used to visualize and discuss the outcomes.

4.3.2. Test Results:

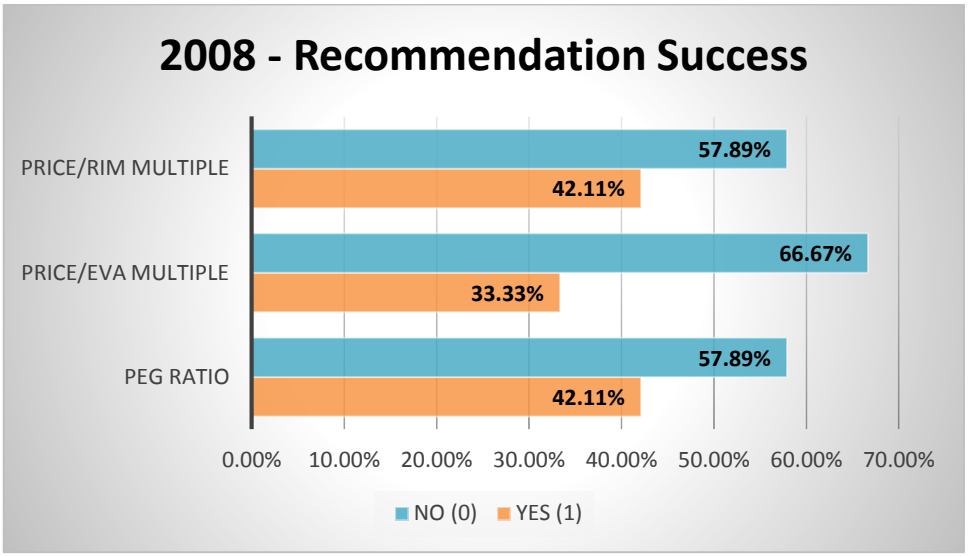
The test results for the individual recommendations are presented in the relative frequency distribution Table 15 below.

Table 15 - Individual Recommendation Distribution Table

Relative Frequency Distribution Table		PEG Ratio			PRICE/EVA Multiple			PRICE/RIM Multiple		
		Recommendation Success		Total	Recommendation Success		Total	Recommendation Success		Total
		NO (0)	YES (1)		NO (0)	YES (1)		NO (0)	YES (1)	
2008	Count	11	8	19	12	6	18	11	8	19
	% within Year	58%	42%	100%	67%	33%	100%	58%	42%	100%
2009	Count	2	17	19	5	13	18	4	14	18
	% within Year	11%	89%	100%	28%	72%	100%	22%	78%	100%
2010	Count	6	17	23	6	13	19	11	12	23
	% within Year	26%	74%	100%	32%	68%	100%	48%	52%	100%
2011	Count	11	13	24	8	11	19	6	18	24
	% within Year	46%	54%	100%	42%	58%	100%	25%	75%	100%
2012	Count	9	15	24	6	14	20	10	15	25
	% within Year	37%	63%	100%	30%	70%	100%	40%	60%	100%
2013	Count	10	13	23	11	8	19	17	8	25
	% within Year	43%	57%	100%	58%	42%	100%	68%	32%	100%
2014	Count	8	11	19	5	13	18	9	12	21
	% within Year	42%	58%	100%	28%	72%	100%	43%	57%	100%
Total	**Count**	**57**	**94**	**151**	**53**	**78**	**131**	**68**	**87**	**155**
	% within Period	**38%**	**62%**	**100%**	**40%**	**60%**	**100%**	**44%**	**56%**	**100%**

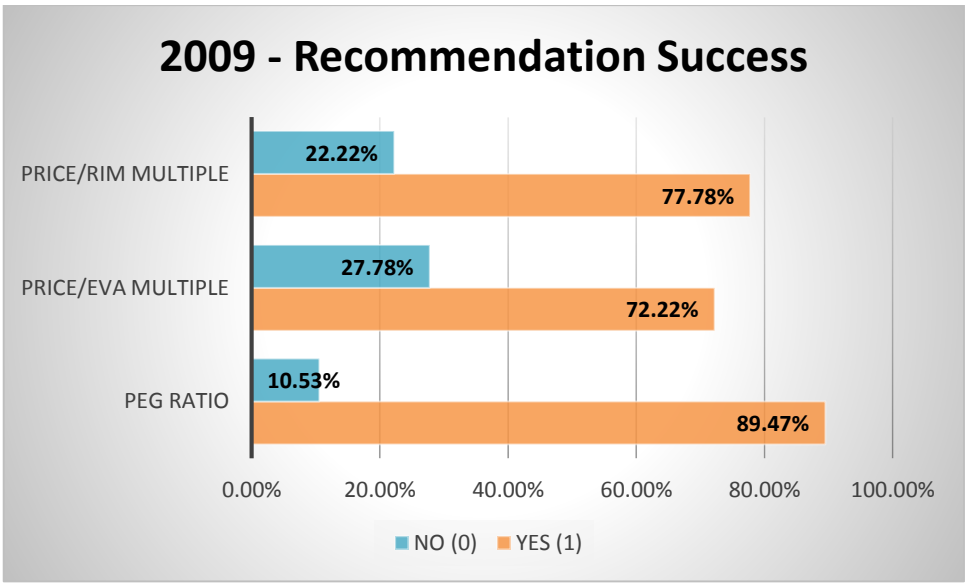
Furthermore the individual recommendations are depicted per period in Figures 4 - 10 below:

Figure 4 - 2008 Recommendation Success



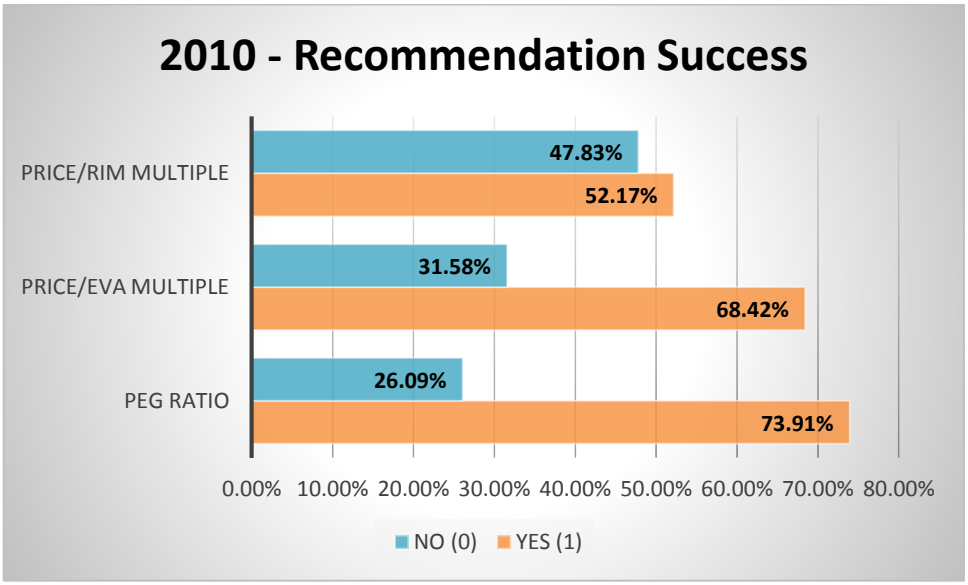
In the bear market period (2008) the RIM and PEG multiple recommendation only aligned with the share price growth recommendations 42% of the time, whilst the EVA multiple achieved only 33% success. Thus all three valuation multiples performed poorly in correctly predicting stock recommendations during the bear market period.

Figure 5 - 2009 Recommendation Success



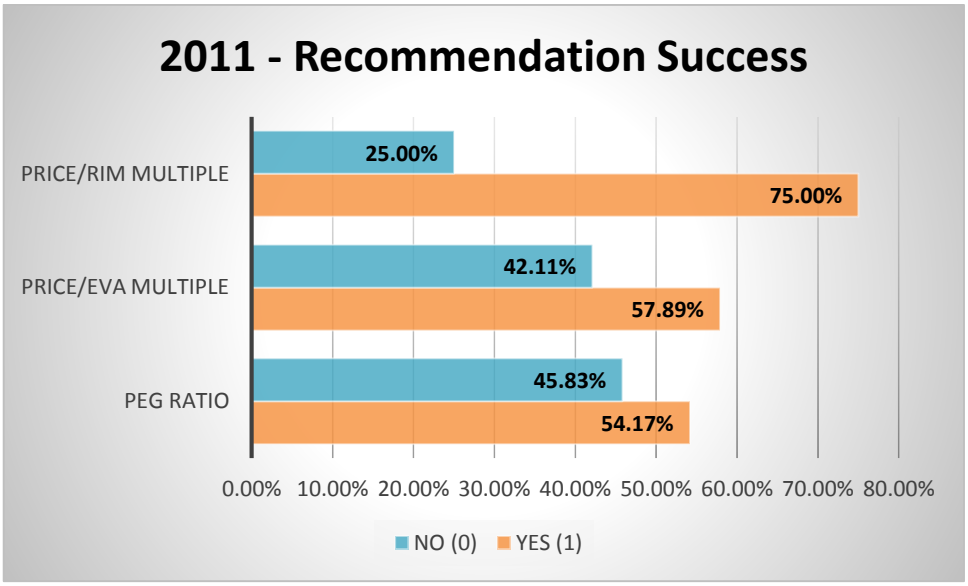
In the first year of the bull market (2009) the EVA multiple achieved 72% recommendation success, the RIM multiple achieved 78% recommendation success and the PEG multiple achieved the best results with 89% recommendation success.

Figure 6 - 2010 Recommendation Success



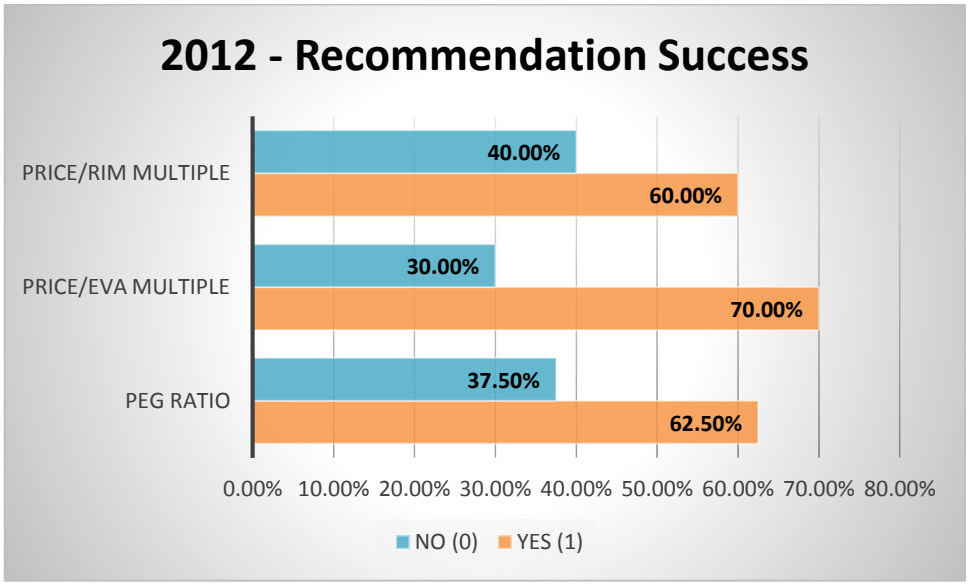
In 2010, the second bull year, the RIM multiple performed the worst with only 52% successful recommendation, the EVA multiple achieved a 68% success and the PEG multiple outperformed RIM and EVA again with 74% successful recommendations.

Figure 7 - 2011 Recommendation Success



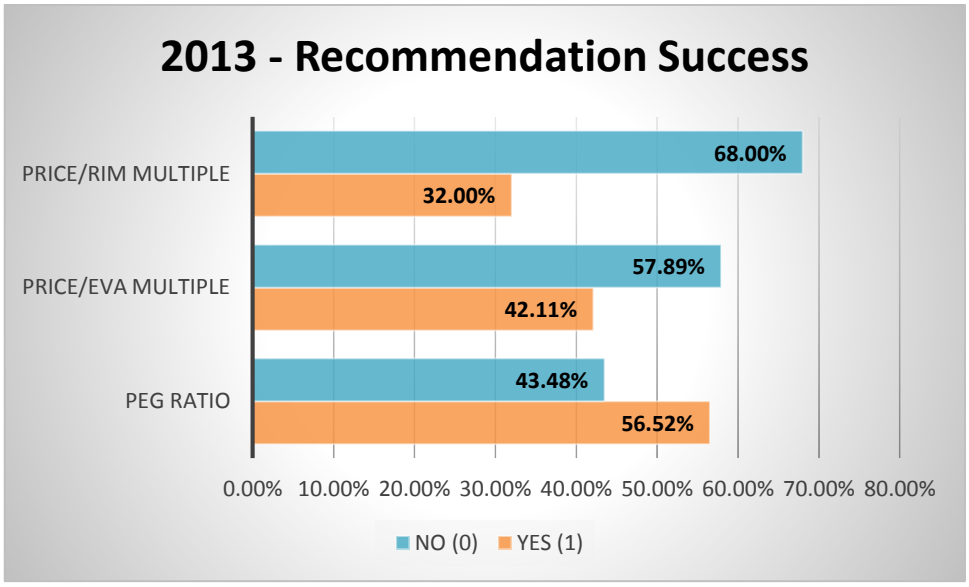
In 2011 (bull 3) the RIM multiple achieved the highest success rate with 75%, followed by the EVA multiple with 58% and the PEG multiple achieved the lowest success rate of 54%.

Figure 8 – 2012 Recommendation Success



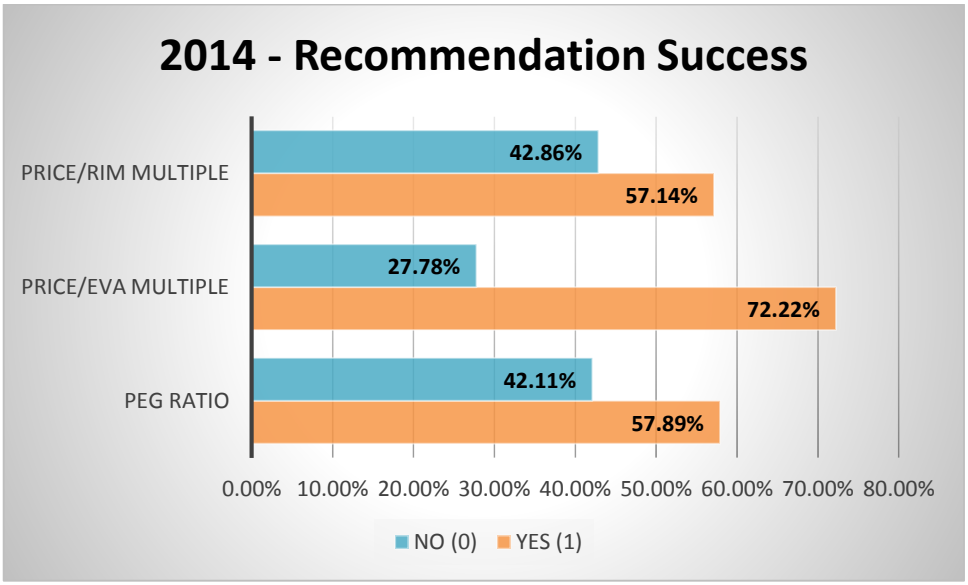
In the 2012 period, the EVA multiple achieved the highest successful recommendations with 70%, the PEG multiple achieved the second highest with 63% and the RIM multiple achieved the lowest with 60%.

Figure 9 - 2013 Recommendation Success



In 2013 (bull 5) the data revealed that both the RIM multiple and PEG multiple did not predict stock recommendations very well, with 32% and 42% success rate respectively. The PEG multiple predicted 56% successful recommendation.

Figure 10 - 2014 Recommendation Success



In the final year of the bull market (2014), RIM and PEG multiples predicted stock recommendations with approximately 57% success, whilst EVA multiples predicted 72% successfully.

4.3.3. Conclusion:

The individual recommendation results revealed that recommendations made based on price multiples were not very successful in the bear market period (2008). In the first year of the bull market period (2009) it was however very successful with a success rate between 72% and 89%. Over the rest of the five bull market periods (2010 – 2014), recommendation success varied between periods with no explainable trend. Over the entire seven year period, recommendation based on the PEG multiple had the highest success rate with 62%, EVA multiples had a recommendation success rate of 60% and RIM multiples has a recommendation success rate of 56%.

4.4. COMBINED RECOMMENDATIONS AND SHARE PRICE GROWTH RECOMMENDATIONS

The objective is to ascertain to what extent RIM, EVA™ and PEG valuation multiples used together can be used to make successful buy, hold or sell recommendations.

4.4.1. Statistical Test:

Buy, hold and sell recommendations were determined similar to section 4.3 above. Only price multiple recommendations where all three recommendations (from PEG, EVA™

and RIM) were exactly the same were compared with 1-year forward share price growth recommendations. For example if PEG, EVA™ and RIM each provided a buy recommendation, the combined recommendation will become a buy recommendation. This combined recommendation was then compared with the 1-year forward share price growth recommendation. Results were captured as a categorical variable with the categories 1 (YES) and 0 (NO) according to the "Combined Recommendation Success" criteria specified above. A relative frequency distribution table was drawn up and a side-by-side bar chart was used to visualize and discuss the results.

4.4.2. Test Results:

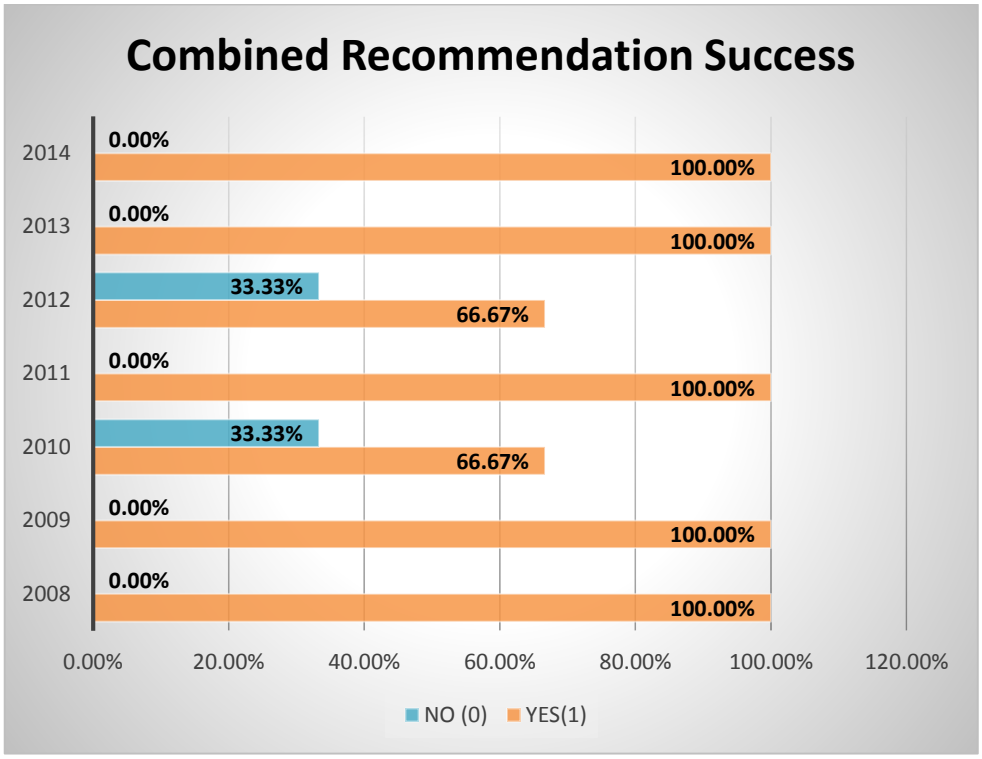
The test results for the combined recommendations are presented in the relative frequency distribution Table 16 below.

Table 16 - Combined Recommendation Distribution Table

Relative Frequency Distribution Table			**Combined Recommendation Success**		
			NO (0)	YES (1)	Total
Year	2008	Count	0	4	4
		% within Year	0%	100%	100%
	2009	Count	0	6	6
		% within Year	0%	100%	100%
	2010	Count	2	4	6
		% within Year	33%	67%	100%
	2011	Count	0	4	4
		% within Year	0%	100%	100%
	2012	Count	1	2	3
		% within Year	33%	67%	100%
	2013	Count	0	2	2
		% within Year	0%	100%	100%
	2014	Count	0	1	1
		% within Year	0%	100%	100%
Total		Count	3	23	26
		% within Period	12%	88%	100%

Furthermore the combined recommendations per period is depicted in Figure 11 below:

Figure 11 - Combined Recommendation Success per Period



Taking only the outcomes where all three multiples indicate the same recommendation yields exceptional results. In 2010 (bull 2) and 2012 (bull 4) the combined recommendations were 67% successful. In all the other years the combined recommendations had a 100% success rate. The overall success of the combined recommendations was 88% for the 7 year period. Although this approach indicates an exceptional success rate, it resulted in only 26 "Buy/Hold/Sell" recommendations out of a possible 155 cases over the seven 12 month periods.

4.4.3. Conclusion:

The results indicate that although this approach limits the amount of buy, hold or sell recommendations, when the price multiples of RIM, EVA™ and PEG all determines the same recommendation, the chance of recommendation success is extremely high. Thus it is advisable that investors utilise multiple valuation metrics in order to increase the likelihood of investment success. According to Alexis (2013), the majority of companies needs a combination of different valuation methods in order to establish a fair value. It is also common practice for financial analysts to base their stock recommendations on more than one valuation method. Although this approach only provided stock recommendations in 17% of the cases, it resulted in a success rate of approximately 88%, substantiating

that the use of a combination of multiple valuation estimates outperforms the use of individual valuation estimates when making investment decisions.

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1. INTRODUCTION

During this study it was established that investors and analysts utilize numerous fundamental and heuristic valuation methods to identify possible investment opportunities. The literature revealed two value based fundamental models (EVA™ and RIM) and one heuristic model (PEG) which are often used in practice. The final chapter includes inferences and conclusions made regarding the relationships between the different valuation models and share price growth during different market periods. It also includes recommendations for future research based on the findings of the study.

5.2. CONCLUSION AND RECOMMENDATIONS

The objective of this research study was to ascertain to what extent EVA™, RIM and PEG valuation metrics are able to correctly identify mispriced stocks in different periods of a bull market and a bear market, specifically for industrial companies listed on the JSE. Spearman's rank correlation was used to establish the linear relationship between the different valuation methods' margin of safety percentages and the 1-year forward share price growth percentages. The results revealed the following:

- Consistent with the results from Chen & Dodd (1997) and Palliam (2006), EVA™ does not perform well in identifying mispriced stock.
- RIM margin of safety correlates positively with 1-year forward share price growth during a bear market period and year 2 – 4 of the bull market period. This substantiates that RIM can to some extent predict mispriced shares during a bear market and the early stages of a bull market.
- During the bear market period and the early stages of the bull market period (bull 2 – bull 4), RIM MOS % had a higher positive correlation with SPG % than PEG MOS %, supporting the argument that RIM valuation estimates correlates higher with share price growth than PEG value estimates in these periods.
- During the latter stages of the bull market period (bull 5 and bull 6), PEG MOS % correlates positively with SPG %, indicating that PEG valuation estimates can to some extent predict mispriced stock during the latter stages of a bull market.
- During the latter stages of the bull market period (bull 5 and bull 6), PEG MOS % had a higher positive correlation with SPG % than RIM MOS %, supporting the argument

that PEG is more successful in predicting share price growth during the latter stages of the bull market period than RIM.

Taking these results into consideration, it is recommended that value based fundamental models such as RIM be used as an indication for underlying value during a bear market and the early stages (first 3-4 years) of a bull market for identifying mispriced stock within the industrial sector of the JSE. Furthermore it is suggested that heuristic valuation models such as PEG might be better at identifying mispriced stock during the latter stages (year 5 and beyond) of a bull market than fundamental models.

The secondary objectives of this study are to test how well individual valuation metrics can be utilized to make successful buy, hold or sell recommendations; and how well the selected valuation metrics used together can be used to make successful buy, hold or sell recommendations. A buy, hold or sell recommendation was made using price multiples based on the criteria set in Table 5 above. A successful recommendation was determined based on whether the 1-year forward share price growth targets as set in Table 6 were achieved. The results of using individual valuation metrics revealed the following:

- During a bear period, the use of individual valuation metric (EVA™, RIM and PEG) price multiples was unsuccessful when used to make stock recommendations.
- During the first year of the bull period, price multiples from EVA™, RIM and PEG had a success rate of between 72% and 89% when used for making stock recommendations.
- During the remaining 5 periods of the bull market, recommendation success varied between periods with no explainable trend.
- Over the seven year test period, recommendation based on the PEG multiple had the highest success rate with 62%, EVA multiples had a recommendation success rate of 60% and RIM multiples has a recommendation success rate of 56%.

To conclude, using individual price multiples derived from EVA™, RIM and PEG to make stock recommendations during a bear market period does not increase the probability of making successful investments in bear market period. Considering that the statistical probability of randomly making a correct decision from three possible outcomes is 33%, the result does indicate that using either one of the three valuation multiples to assist in making investment decision will improve the chance of making a correct decision based on the criteria set in Table 6.

The results of using a combination of valuation metrics to make stock recommendations revealed the following:

- The approach of only considering the outcomes where all the valuation multiples indicates the same recommendation, resulted in only 17% of possible recommendations being made.
- In 2010 and 2012 (bull 2 and bull 4) a 67% success rate was achieved when only considering the case where all the valuation metrics gave the same recommendations.
- In the other five years, considering only the cases where all three valuation metrics gave the same recommendation resulted in a 100% success rate.
- This approach resulted in an 88% overall success rate over the 7 year period, based on the criteria set in Table 6.

To conclude, using a combination of price multiples derived from EVA™, RIM and PEG to make stock recommendations yielded exceptional results for industrial shares listed on the JSE. A recent article by Tepper (2015) states that approximately 67% of fund managers have not outperformed the market in the past 12 months and 80% of fund managers has not outperformed the market over the past 10-year period. Thus, using a combination of price multiples to make investment decisions could assist fund managers to outperform the market.

It must be noted that the analysis was performed on the Indi 25 sector of the JSE for the time period 2008-2014. It is also important to mention that very basic statistics were used and the findings does not indicate causation.

5.3. FUTURE RESEARCH

This research study specifically focused on the Indi 25 sector listed on the JSE for the period 2008-2014. It also focusses on only two fundamental valuation models (EVA™ and RIM) and one heuristic model (PEG). It is suggested that future research be conducted on different sectors within the JSE, and over a longer time horizon.

The study focused on 1-year forward share price growth as the dependent variable in all cases. Fundamental models indicates long-term value, which might exceed a 1-year time period. Therefore it is suggested that different time periods be tested to see how this impacts the research findings.

Price multiples for RIM, EVA™ and PEG were used to see how successful they can be used to make stock recommendations. It would be interesting to see how well other valuation metric perform in making stock recommendation based on their price multiples; individually and combined.

Lastly, Table 5 and 6 contains specific criteria for making stock recommendations and for determining when a stock recommendation was successful or not. This criteria remains constant for all investors and thus supports the assumption that investors are risk neutral. It would be of real interest to repeat this study, but instead of using the average market return to test for a buy decision, one could include a risk measure by using the CAPM.

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