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RESIDUAL INCOME AND STOCK PERFORMANCE: EVIDENCE FROM THE JOHANNESBURG STOCK EXCHANGE

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ABSTRACT

There is surprisingly little evidence provided by accounting research on whether the Residual Income (RI) model can give us more information on a stock's systematic risk. This report addresses two questions pertaining to the use of the RI model: (1) Does RI have any relationship with a stock's systematic risk? (2) Is the RI measure preferred by investors, in measuring stock returns as opposed to Cash Flow from Operations (CFO)? Using a cross-section sample of non-financial firms in the South African economy over a duration of six years and after applying panel data analysis this research finds that indeed there is a significant and negative relationship between RI and systematic risk. The report finds inconclusive evidence to suggest that the RI model is preferred by market participants in modelling stock returns over a firm's CFO, when an annual data set is used. However, we do find that the RI model is preferred, over CFOs, by the capital markets when it comes to measuring of stock returns when semi-annual data is utilized. Although not a direct objective of this research, it is found that the stock price continues to play a significant role in the determination of stock returns by investors. Furthermore, the report stresses the importance of firms to put more emphasis on long-term profitability, when they use the RI model to measure management performance, in order to fully rip its benefits post implementation.

DECLARATION

I, Joseph Wanjohi Kihara, hereby declare the following:

- I am aware that plagiarism (the use of someone else's work without their permission and/or without acknowledging the original source) is wrong.
- I confirm that the work submitted for assessment is my own unaided work except where I have explicitly indicated otherwise.
- I have followed the required conventions in referencing the thoughts and ideas of others.
- I understand that the University of the Witwatersrand may take disciplinary action against me if there is a belief that this is not my own unaided work or that I have failed to acknowledge the source of the ideas or words in my writing.

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1. INTRODUCTION

1.1 Background of Study

Residual income (RI), is the income a company generates after accounting for its true cost of equity capital. Abnormal earnings and excess profit are used in accounting and business economics to refer to earnings in excess of normal earnings (profit). To add, it is an accounting measure that has prevailed as a correct valuation measure. Unlike simple earnings, it recognizes that the capital employed by the firm bears a cost which should be accounted for (Negakis, 2005). Massive literature developed in the last century has incentivized a renewed interest on residual income both as a valuation tool and as a foundation for management compensation (Magni, 2010). The residual income model is as follows;

$$RI_t = (ROE_t - K_e)BV_{t\text{-}1} \qquad (1)$$

Where;

RI_t	-	residual income at time t
ROE_t	-	return on equity
BV_{t-1}	-	accounting book value of equity per share at time t-1
K_e	-	cost of equity capital

The fundamental objective of a publicly traded firm is to maximise shareholder wealth. There exists an agency problem between managers and shareholders, where managers seek to maximise their wealth through increasing their compensation packages. Incentives such as share options tend to be used by firms to mitigate these kinds of agency problems. The aim of using such measures is to improve the decisions made by managers when investing. The objective of this research is to analyse the use of Residual Income (RI) as a predictor of stock returns and systematic risk for selected South African listed firms.

Performance measurement is at the top of the pyramid of the challenges facing organizations. The choice of performance determines the management's strategic plans and how they will be evaluated and compensated. However, it is interesting to note that the management feel traditional based accounting measurements do not fill the above outlined functions. As a mitigating response, firms are increasingly implementing new performance measurements to counter these limitations for example the RI approach (Knauer, Silge, & Sommer, 2017).

A large number of economic theories analysing the choice of performance measures, have found that performance and reward metrics should incorporate any financial and non-financial measure that gives an indication of incremental information on managerial effort. Despite the existence of these models, firms continue to rely on financial measures such as profits, budgets, accounting and stock returns to measure performance (Ittner & Larcker, 1998).

Studies show that adopting Residual Income (RI) as a performance measurement may counter the agency problem that exists between managers and shareholders (Mohnen, 2003). RI has the “weak” congruence property which implies the present value of the RIs over a project’s entire life can be shown to equal the projects Net Present Value (NPV). But this only applies to situations where the manager is patient and selects projects that satisfy the NPV-maximising rule. If the manager is impatient, there is a high possibility he selects projects based on their positive RIs yet the NPV of the entire project may be negative (Mohnen, 2003).

There are various proposed measures that users claim to have more information content than traditional accounting earnings. Over the past three decades though, research has repeatedly shown that accounting earnings have information content. Information about earnings is also a better indicator of an entity’s ability to generate current and future cash-flows as opposed to cash receipts and cash payments (Chen & Dodd, 2001). Operating earnings however, are subject to accruals which lower the quality of earnings.

Chen and Dodd (2001) found that Operating Income, Economic Value Added (EVA™) and Residual Income all have information content in terms of value relevance. Contrary, to claims by advocates of EVA™, the data they used did not support EVA™ as the best measure for valuation purposes. Their results suggest that the market places large emphasis on audited accounting earnings as opposed to the unaudited EVA™ profitability measure. Empirically, a value relevance model exists where Operating Income offers the highest value relevance while EVA™ offers the lowest value relevance between the three measures; Operating Income, Residual Income and EVA™ (Chen & Dodd, 2001).

There is evidence that suggests including both the cost of debt and equity in the Residual Income measure, seems to contain significant incremental information that is not available in the Operating Income measure (Chen & Dodd, 2001). Using EVA™ as opposed to Residual Income may provide some benefit to the firm, but this benefit may not be enough to offset the cost involved to make the adjustments needed to compute EVA™. Chen and Dodd (2001) suggest that firms can obtain most of the practical benefits of the EVA™ model through the use of the less costly Residual Income model.

The stock’s fundamental value, according to the residual income approach, can be obtained through the use of equation 2 below.

$$V_t = BV_t + \sum_{t=1}^{\infty} \frac{(ROE_t - K_e)BV_{t-1}}{(1+K_e)^t} \quad (2)$$

Where;

ROE_t	-	return on equity
V_t	-	share value at time t
BV_t	-	accounting book value of equity per share at time t
K_e	-	cost of equity capital

This form of the RI model is equivalent to the dividend discount model, as long as the clean surplus relationship holds (Negakis, 2005). Moreover, the DDM valuation model is equivalent to the RI valuation model for stock fundamental value, as long as forecasts of earnings, book values and dividends follow the clean surplus relationship (Baginski & Wahlen, 2003).

Assuming the clean surplus relationship holds, equation 2 may be simplified to,

$$V_t = BV_t + \sum_{t=1}^{\infty} \frac{(EPS_t - K_e BV_{t-1})}{(1+ K_e)^t} \qquad (3)$$

Where;

EPS_t	-	earnings per share at time t
ROE_t	-	return on equity
V_t	-	share value at time t
BV_t	-	accounting book value of equity per share at time t
K_e	-	cost of equity capital

The RI model has a better stock price prediction capabilities than the Discounted Dividend Model (DDM) and the Discounted Cash-flow models (DCF). Additionally, the RI approach is better at explaining the cross-sectional variation in security prices (Bernard, 1995; Penman & Sougiannis 1998; Francis, Olsson, & Oswald, 2000). In theory though, the intrinsic value estimates produced by the DDM, DCF or the RI measures should be identical. The estimates differ if different growth or discounting rates are used for each of these models (Francis, Olsson, & Oswald, 2000).

It can be shown that RI follows a mean reverting process and the rate of mean reversion is systematically associated with firm characteristics suggested by economic and accounting theory. The rate of mean reversion can be seen to decrease with the quality of earnings, increase with dividend pay-out ratio and correlated across peer firms. Through analysis, there is an indication that stock prices partially reflect the mean reversion element in RI. Ohlson's (1995) formulation of RI provides a relatively simple explanation for incorporating information in earnings forecasts, earnings and book value in empirical research.

Baginski and Wahlen (2003) studied whether accounting risk measures i.e. systematic risk are correlated with the financial market's measurement and pricing in of equity risk. They built upon the work of Fama and French (1992) who postulated that the equity risk premium can be computed using three factors; stock beta, firm size and market to book ratio. Baginski and Wahlen (2003) aimed to examine whether the accounting earnings based risk measures gave incremental information about the market's measurement and pricing of risk beyond the other risk factors such as those postulated by Fama & French (1992). Lastly, RI valuation models assume investors are risk neutral and discount rates are non-stochastic and flat hence simplifying the role of risk. A direct approach to assess firm risk and share value can be developed, from a RI valuation context.

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1.2 Purpose of Study

This paper seeks to develop on the above literature with emphasis on the use of RI to predict stock returns of companies listed on the JSE top 40 index. RI will be used as a predictor of stock systematic risk in addition to its use in the valuation of a stock's fundamental value. Research on the use of RI in the valuation of stock price, has mostly been done in developed economies and this paper aims to have a look on its use on stocks listed on the JSE top 40 index.

The answer to the question of whether RI based valuation methods can be used to assess the market's pricing of risk will inform capital market participants, researchers and teachers in the field.

1.2.1 Research Questions

This research seeks to verify and give possible solutions to the below questions, which builds on the purpose of the study;

- Does RI have other uses such as the prediction of the stock's systematic risk for JSE top 40 index listed firms?
- To what extent does the RI offer a valuation of stock's returns compared to Operating Cash Flow (OCF) of JSE top 40 index listed firms?

1.2.2 Hypotheses

- *RI gives an indication of the stock's systematic risk.*
- *The RI model is a preferable measure of a stock's return than the OCF measure.*

Chapter Summary

This chapter gives a brief introduction of the emergence of the RI model. The chapter offers insights into other models e.g. the EVA^{TM} which various researchers have contested on its relevance as a valuation measure. The RI model is seen to reduce agency problems by making sure managers only invest in projects with positive NPVs. The purpose of our study is outlined and the relevant research questions are constructed. In the next chapter, we look at the variants of the RI model and the theory that supports and dismisses the use of the model. Appropriate research and their respective findings are discussed and contrasted. The DDM/DCF measures are revisited, albeit briefly.

2. LITERATURE REVIEW

2.1 Practical Applications and Variants of the RI Model

In recent years, the RI model has gained a larger acceptance among consulting firms such as Boston Consulting Group, Stern Stewart (who refer to it as EVA^{TM}, which is a varied form of the RI model) and KPMG have advocated for its use. Stern Stewart & Co. has been the consultant for over 200 companies that have adopted EVA^{TM} as a compensation as well as a financial management tool (Chen & Dodd, 2001). The use of the EVA^{TM} gained popularity among large corporates such as AT&T and CocaCola, as executives from these firms stated how satisfied they were with the model as their new performance measurement tool. For instance through its adoption of EVA^{TM}, CocaCola was incentivized to concentrate capital in its highly profitable division i.e. the soft drink business e.g. Coke and raise returns faster than the cost of capital through the increased use of leverage. As a result of this alteration, Coke increased its EVA^{TM} by 27% per annum and its stock returned 200% from its adoption of EVA^{TM} in 1987 to mid-1993. Following suite was CSX, its adoption of EVA^{TM} in 1988 led to a considerable reduction in its investment in locomotives, railcars and containers with a 25% increase in freight volume. The CSX soared to $75 per share in mid-1993 from its initial value of $25 per share pre EVA^{TM} adoption in 1988. Eli Lilly experienced a 105% increase in its stock price, just one year after the adoption of EVA^{TM} (Chen & Dodd 2001). Similar narratives of the successes achieved by the implementers of EVA^{TM} have been reported by other well-known firms such as GE, AT&T, Briggs & Stratton, Compaq Computer, Chrysler, Scott Paper and Quaker Oats (Chen & Dodd 1997). The stories among the adopters of the EVA^{TM} seem to differ among some users, but the common theme remains to be that; the model's utilization as a performance measure seems to drastically improve stock performance.

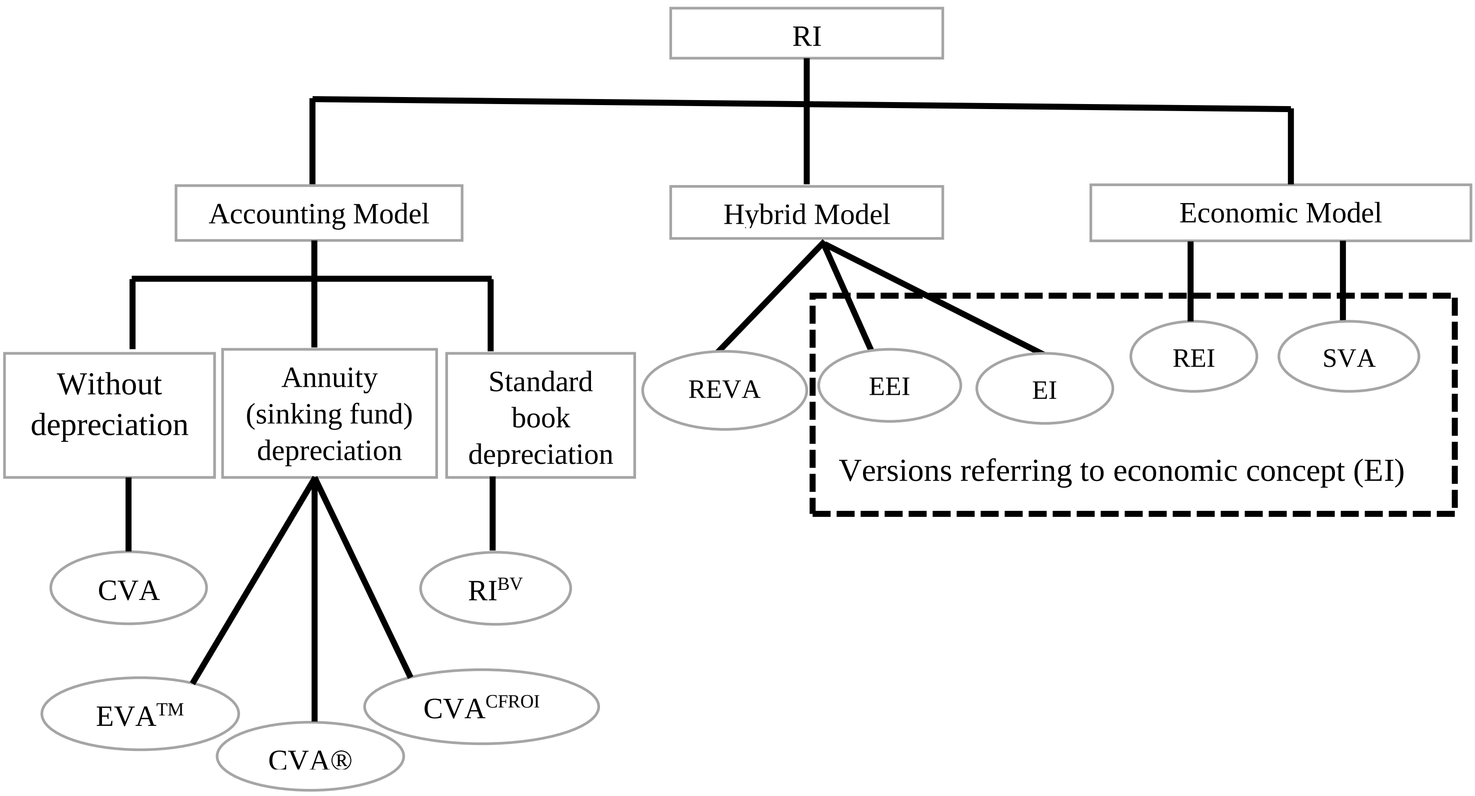
Research carried out by Chen & Dodd (1997) finds that EVA^{TM} is useful measure of corporate performance, however the model is neither the only performance measure that can be adopted to lead a company to superior returns nor is it as perfect as claimed by its advocates. In their study, they utilized publicly filed data as reported by the Compustat and Data compiled by Stern Stewart Management services (1993). The database contains EVA^{TM} performance on 1,000 leading U.S. companies. Although there are encouraging stories of success after implementation of the EVA^{TM} model, insufficient empirical evidence exists to support the notion of the model's supremacy as a performance measure in terms of value relevance.

Chen & Dodd (1997) utilized a sample of 556 U.S. firms using their ten year average measures of EVA^{TM}, as computed by Stern Stewart & Co. in its database. They conclude that although higher stock returns is associated with the improvement of EVA^{TM} performance, the strength of association is minimal than what the model advocates suggest. They find that EVA^{TM} is empirically comparable to the RI model. Some advocates of EVA^{TM} have even gone to the extent of suggesting that the reliance on Earnings per Share (EPS), Return on Equity (ROE) and Return on Investment (ROI) should be forgotten as accounting ratios and numbers that that drive stock prices. Their conclusion being; EVA^{TM} is what drives stock returns (Chen & Dodd 2001). However, Chen & Dodd (1997) find that simple accounting earnings are in fact a significant source of incremental information value in addition to the EVA^{TM} model.

It seems apparent that only firms with the financial power are able to adopt the EVA^{TM}. Yet, compared to the RI model, the costs incurred by implementing the EVA^{TM} seem to outweigh intended benefits. A firm would be better off adopting the RI model in its financial management and performance measurement plans, and still enjoy the benefits similar to those of the EVA™ model.

There are several versions of RI known to date. They can be categorized into three groups based on the valuation model they are based on: accounting, economic and hybrid. *Figure 1* gives a graphically illustration.

Figure 1: Three Groups of RI concepts



Source: (Cwynar, 2009)

Where;

EVA™	-	economic value added
CVA	-	cash value added before accounting for depreciation
CVA®	-	cash value added after standard book depreciation[1]
CVA ^{CFROI}	-	cash value added after non-standard book depreciation[2]
RI^{BV}	-	residual income based on unadjusted book values
REVA	-	refined economic value added
EEI	-	earned economic income
EI	-	economic income
REI	-	residual economic income
SVA	-	shareholder value added

[1] Standard book depreciation e.g. Straight Line method of depreciation reduces the asset by equal amounts every year until the useful life of the asset is fully depleted.

[2] Non- standard book depreciation e.g. Annuity Depreciation Method or Sinking Fund Method (a variant of the Annuity Depreciation Method), reduces the asset by non-equal amounts every year until the useful life of the asset is fully utilized.

Accounting Model

The group contains the oldest and simplest adaptation of RI which is solely based on unadjusted book values, this is represented by RI^{BV}. RI^{BV} is arrived at after accounting for standard book value depreciation. EVA^{TM} is also contained in this group and is known to be the most famous adaptation of the RI measures. The Cash Value Added (CVA), the closest competitor to EVA^{TM}, and its three forms are also included in the composition. CVA is computed before accounting for depreciation while EVA^{TM}, CVA® and CVA^{CFROI} [3] are all computed after subtracting depreciation notably through utilization of non-standard depreciation techniques. The accounting form of RI was used to carry out our research.

Economic Model

Unlike the accounting model which is backward looking, the economic model is forward oriented. The model assumes that the current capital invested in a company's assets is dependent on the future cash-flows from this capital. Economic value is the value of the assets the company's capital was invested in while economic depreciation is the use of these assets. The Residual Economic Income (REI), can be used to represent the group as a whole. Shareholder Value Added (SVA), is a variant of the RI and can be seen to be a mutation of the REI.

Hybrid Model

The third and last model combines features of the economic and accounting models. For this reason the variants included in the group are sometimes treated as unions of two different systems. The Refined Economic Value Added (REVA) for instance takes two forms one that measures the invested capital which in essence is company's market value (economic view). While another form of REVA measures the return on the invested capital is Net Operating Profit after Tax (NOPAT), which is simply income reduced by standard book depreciation (accounting view). The Earned Economic Income (EEI) and the Net Economic Income (NEI) can be taken as representatives of the whole group.

[3] A popular version of CVA that is marketed by and also a trademark of Credit Suisse. Hence, the CFROI® (Cwynar, 2009).

2.2 Measurement of Management Performance & Efficient Internal Capital Allocation

History shows managers have always behaved in a manner that aims to better their own self-interests i.e. managers will always want to maximise their own utility while shareholders would rather maximise the value of the firm. To put this into perspective, there are occasions where a manager may choose a project that has positive cash flows in its early years but overall the project has a negative NPV. If the manager is myopic due to, say a job change and is likely to leave the firm before the project is completed, then he/she is likely to choose a project with positive cash flows in the early years but a negative NPV, over a project with negative cash flows in the early years but with a positive NPV. This contrasts with the assumption that the time horizon that determines the mangers capital budgeting decision should be the same as the economic life of the project, thus ensuring positive NPVs. An ideal performance measure, would be one where the manager chooses the firm's investment portfolio in a manner that is governed by the non-negative NPV maximisation rule; which means accepting all projects with positive NPVs when an unlimited investment budget is available and only investing in the projects with the highest NPVs when a limited investment budget is available. Choosing projects with the highest NPVs is necessary as well in situations where the manager has to choose between mutually exclusive projects.

The RI model, if properly implemented in a firm, may positively change managers' behaviour. This concept was empirically tested by Wallace (1997), comparing a sample of firms that begun to use RI model as a measure of managers' compensation plans to a sample of firms that continue to use traditional based earnings incentives. His findings show that firms that adopted the RI model; (1) increased their dispositions of assets and reduced their investments, (2) share repurchases increased pay-outs to shareholders and (3) utilized their assets more intensively. The weak congruency property of the RI model, may suggest market participants will have positive and favourable response to its adoption in a firm, hence increasing stock returns. However, one may be tempted to ask questions on whether managers perform better by adopting the RI model? Or is the better performance attributed to market participants having positive sentiments on the RI models adopted by the firm? The latter may also be true. The purpose of the research done by Wallace (1997), was to study whether manager's decisions were in line with the incentives outlined by the RI model.

Although the RI model is generally considered as a way of mitigating agency costs, it may lead managers to reduce investing in positive NPV projects as a way of avoiding the now obvious capital charge (Knauer, Silge, & Sommer, 2017). Application of the RI model as a compensation measure implies the managers are only rewarded if earnings exceed a charge for capital they employ. In short, the Return on Investment (ROI) should be more than enough to compensate for the cost of equity, which is the return earned by the shareholders. This can be broken further, by looking at the risks the stakeholders face when they invest in a business. Idiosyncratic risk can be diversified away, leaving the shareholder with systematic risk. This may lead to a situation where a project is unattractive to the manager but attractive to the shareholder. Such deviations in the alignment of the management and shareholders' interests may cause mangers to make investments decisions which do not conform to the non-negative NPV maximisation rule.

Georgieva (2015) did research on a sample of 89 diversified firms that adopted or abolished RI plans between 1990 and 2001, and found firms that adopted RI plans mitigated investment distortions and lead to value gains. They found firms adopted RI models in their compensation plans, because they realized the models were advantageous compared to traditional compensation plans e.g. stock options and bonuses. Their research also finds that the RI model is likely to be implemented by large diversified firms that enjoy improved post-adoption efficiencies in internal capital allocation. These large firms are more likely to implement the model due to their strong financial positions, hence being able to absorb the potentially high costs related to the model's adoption. Georgieva (2015) also found that the model is likely to be adopted by a firm, if management is likely to gain from its implementation which raises questions on the model's relevance in the mitigation of the management-shareholder agency problem. To add, adopters of the model have lower cash reserves, are more profitable and invest less, post implementation. However, utilization of the RI model may be responsible for hurried asset sales and laying off employees as managers seek to reduce capital charges. Hogan and Lewis (2005) test the benefits of the RI model by studying the post-implementation performance of 108 companies from 1983 to 1990. Only after authors restrict their analysis to subsamples of the expected adopters in contrast to companies that were expected to implement the RI plans but for whatever reason chose not to, that significant post-adoption differences in performance appear. Adoption of RI plans by diversified firms, led them to start allocating investment funds based on growth opportunities in respective divisions (Georgieva, 2015).

Internal capital structures are seen to be inefficient allocators of investment funds across divisions, which leads to value losses. Internal capital structures should be used to fund profitable ventures that would otherwise be funded by external sources. There are instances where poorer performing, low growth opportunity divisions of diversified firms incoherently attract more investment funds at the expense of more lucrative, faster growing ventures. Such inefficiencies may stem from advanced agency problems (information asymmetry between division managers and headquarter offices among other agency problems), CEO's attempt to please divisions that he/she is not privy to in terms of experience, allocating more focus to the performance of newly acquired units, rent seeking nature of divisions, CEO's private comfort consumption. These abnormalities may explain why diversified firms trade at a "diversification discount" of approximately 15% compared to the sum of its parts i.e. sum of all the divisions is greater than the value of the entire firm. The adaption of the RI model improves the overall investment allocation efficiency and the diversification discount diminishes (Georgieva, 2015). However, it seems apparent RI models are temporarily used to measure corporate performance and primarily used by firms expected to generate bonuses for the management. In contract, firms with poor accounting performance and low management bonuses tend to eliminate the RI models (Georgieva, 2015). In agreement, Barniv et al. (2009) argue that the implementation of the RI model creates imprudent focus on short-term profitability.

2.3 Estimation of the Stock Price

A measure of a firm's market value was developed by Edwards and Bell (1965) and afterwards further developed by Peasnell (1982) and Ohlson (1995). Ohlson (1995) asked a crucial question as to whether one could devise a cohesive theory of a firm's value that relies on the clean surplus relation, and whether it could be used to identify the different roles each of the three variables; earnings, book value and dividends played. Given the popularity of research dealing with value versus return concepts, the Ohlson (1995) paper lays the foundation for work to be done on his idea of dividends being paid out of book value and not current earnings. The key feature of his model was the sequence of expected abnormal earnings neither depends on current earning nor the future dividend policy. Ohlson (1995) shares the same view as Miller and Modigliani (1961) on the basis of the market value of the stock being affected by dividends only because, dividends reduce market value on a dollar for dollar basis but they do not affect the sequence of the abnormal earnings. This notion suggests a firm's earnings must align with its book value, where the dividends are paid from.

The model Ohlson (1995) developed admits information beyond earnings, book values and dividends. The development of the RI model shows the significant role played by abnormal (residual) earnings as a variable that influences a firm's fundamental value. The RI model is defined as earnings minus a charge for the use of equity capital, measured by beginning of period book value multiplied by the company's cost of capital (Ohlson, 1995). The assumption that the term structure of discount rates is flat, implies the model incorporates ROE minus a constant discount rate. Baginski and Wahlen (2003) and Frankel & Lee (1998) employed a similar form of the model which subtracted the risk free rate from ROE. Using a constant discount rate implies the firm's cost of equity is constant, which may not necessarily be the case. The work done by Ohlson (1995) however, gives a benchmark model that one can use to conceptualize how the company value relates to the three accounting variables; book value, earnings and dividends.

From standard neoclassical valuation models, the present value of expected dividends (or the Dividend Discount Model; DDM) determines the market value of the stock. It is known that the true value of a firm is the summation of the discounted future cash-flows accruing to shareholders (Negakis, 2005). If the same assumptions on growth rates and discount rates are applied consistently across the DDM and the RI model, the market value estimates of the two models should be the same. This agrees with research which infer that the market value estimate of a firm's equity should not be affected by the valuation approach utilized. Plenborg (2002) suggests that it is important to ensure that the equity valuation methods are conceptually equivalent to each other so that the estimated market value of the firm is unaffected by the valuation approach used.

Contrary to the DDM, the Miller and Modigliani (1961) paper suggests dividend policy is irrelevant. The implication of dividends reducing book values, is what brings about the notion of: a dollar of dividends displaces a dollar or market value. This is the case as book values are unbiased estimators of market values, implying expected goodwill equals zero (Ohlson, 1995). The work done by Ohlson (1995) is centred on the sequence of abnormal earnings neither depending on current nor future dividend policy. This assumption, is in line with Miller and Modigliani (1961), whose arguments are based on the irrelevance of dividend policy. The apparent paradox of neoclassical security valuation is evident: the present value of the expected dividends is a determinant of the firm's value, yet the dividend sequence is immaterial if the underlying dividend policy is irrelevant. A better approach according to Ohlson (1995), would be to incorporate the clean surplus relationship in the valuation process and noting dividends are paid out from the current book value, while leaving the current earnings unchanged. A value sequence that does not depend on the dividend policy, e.g. future abnormal earnings may be used to conceptualize a firm's value (Ohlson, 1995). Penman (1992) observes that market value is dependent on the expected future dividends, but the observed dividends do not give us more information about the price (market value).

Studies done by Bernard (1995) find that the RI approach explains 68% of a firm's market value while the DDM only explains 29%. The results obtained by Bernard (1995) conflict with research that suggests the RI model is inherently based on the DDM, thus from a theoretical perspective both measures should yield the same firm value estimates. In agreement with this notion, Plenborg (2002) finds that applying the weights implied by the forecasted debt and equity ensures theoretical equivalence between the RI model and the DCF/DDM approaches.

Plenborg (2002) finds that the implied weights of the debt and equity in the computation of the Weighted Average Cost of Capital (WACC), should be adjusted according to the company's capital structure in order to capture the underlying financial risk. Ignoring the reality that the weights in the WACC formula change when the debt ratio (in market values) changes, leads to the estimated market value of the firm to be biased. The study done by Plenborg (2002) concludes that RI and DCF models are theoretically the same i.e. they both yield the same firm value estimates if applied consistently and properly. Moreover, the forecasting framework is based on accrual accounting and budget control generally relies on accounting numbers as opposed to cash flow measures. This being the case, a logical approach would be to estimate firm values using concepts and financial ratios known for accrual accounting and financial statement analysis, i.e. measures such as the RI model (Plenborg, 2002). To add, work done by Negakis (2005) indicates RI has a stronger association with market value in conjunction with book value. This may be the case as book value potentially captures future firm concepts omitted by other profitability measures.

Finally, the RI model uses information already provided for by the firm in their financial statements; book value of equity. We can infer from this that the RI model places less emphasis on the terminal value term than the DDM. This implies the RI model is likely to yield more accurate firm values estimates than the DDM approach when simplifying assumptions about growth are introduced (Plenborg, 2002). This is ideal especially in situations where the estimates made by an analyst on the terminal value of the firm may be biased due to their optimism regarding to the growth prospects of the firm. Higher growth rates expected to be experienced by the firm in coming years, suggest a higher terminal value which in turn leads to a higher price estimate.

2.4 Information Relevance of Residual Income and Earnings

Negakis (2005) suggests efforts to derive a theoretically correct valuation model based on accounting data, led to the development of the Ohlson (1995) model, which utilized book values and RI as the valuation main inputs. Closing book values and research and development (R&D) expenditures have been proved to have a statistically significant information relevance for market values. Plenborg (2002) finds that both RI and earnings are relatively more informative than DCF approaches. Thus, concluding that earnings and RI approaches are seen to be better indicators of performance than cash-flows. It can be shown that information content and significance is reduced by replacing RI with net income in valuation models (Negakis, 2005). It has also been shown periodic cash-flow is an unsatisfactory measure of economic performance for example startups are likely to have negative cash-flows in the short term, which may require subjective estimates of the growth rates, timing and amounts of the free cash-flows. Negaskis (2005) results suggest, on average, that earnings are unable to outperform RI as valuation attributes.

Biddle, Seow and Siegel (1995) drew a clear distinction between incremental and relative information content. The incremental information content measure is used to evaluate the value relevance of one measure against another, when both can be used to analysis the information content of a given set of variables. Contrary to this, relative information content measure is used to evaluate the value relevance of one measure against another, when only one measure can be used to analyse the information content of a given set of variables i.e. when you are in a position where you have to make mutually exclusive choices. Abnormal profits (economic profits) have information content that go beyond those of accounting earnings and prices.

Moreover, practitioners have historically linked economic profit to value creation (Georgieva, 2015).

As with the DDM, the Discounted Cash-flow (DCF) approach and the RI are based on the same theoretical framework, suggesting if the same assumptions are used and if properly implemented the two measures should yield the same firm value estimates. The two models approach the basic model for firm valuation: the DDM. However, care should be taken on how to utilize the estimation of the simplifying assumptions. Negaskis (2005) argues that, the simplifying assumptions are likely to introduce biases in the firm value estimates and they are likely to affect the two measures differently. The RI model is affected more by the book value estimate as opposed to the DDM model which derives a large part of its fundamental value estimate from the terminal value.

2.5 Limitations and Attractiveness of the RI model

The RI model assumes that the clean surplus relationship holds i.e. all incomes flow through the income statement and no adjustments are made to the equity stock. RI can only be derived, if the clean surplus holds. If the relation doesn't hold we may have to make simplifying assumptions to derive RI. Research shows that introducing simplifying assumptions (e.g. about growth, use of long term (target) capital structure in the computation of the WACC) in the firm valuation process, tends to also introduce biases in the firm value estimates (Negakis, 2005). In theory the clean surplus identity assumes other incomes such as unrealized gains and losses from Available for Securities and other comprehensive and dirty surplus net income items have been properly accounted for in the estimation of the firm's value. Biased assumptions made in the derivation of RI may lead to equally biased firm estimates. In addition to this, RI-based risk measures may be biased as they are determined by accounting information recognized in net earnings and book values. For example the RI model is affected by the conservative and liberal accounting. Plenborg (2002) finds that the use liberal accounting leads to higher ROE in the year of expenditure, but lower ROE in subsequent years, implying higher RI values in earlier years and lower values in years that follow.

The RI model is not be applicable to all firms for example firms with transitory earnings, dividends have a greater explanatory power than earnings. Research shows book values and earnings have close to the same explanatory power as book value and dividends (Negakis, 2005). The superior nature of the RI model is due to its derivation from earnings. If earnings are transitory in nature, this benefit tends to disappear and dividends tend to be preferred. However, findings by Negakis (2005) imply that book values used in the RI model more than compensate for the valuation irrelevancy of transitory earnings.

Another practical difficulty in utilizing the RI model is that it considers an economy with risk neutrality and homogenous beliefs i.e. a constant cost of capital suggesting the RI model is merely ROE minus a constant (which in this case is the cost of equity capital K_e). Negakis (2005) argued that the cost of capital does not have information content but rather the book value at time *t-1* and the constant cost of capital plays the role of the regression slope if the RI model is represented as outlined in equation 1. Unlike the DCF approach, the RI model puts a lot of emphasis on the book values of the firm, hence assumptions related to growth rates will not affect the firm's value (Plenborg, 2002). The firm value estimate will be undervalued (overvalued) if the growth rate applied in the DCF approach is smaller (larger) than the rate assumed in the forecasted financial statements.

To add, RI approach is relatively less sensitive to simplifying assumption than the DCF approach, as it makes use of information that has already been provided by the company in its financial statements i.e. book value.

The RI model is a value creation measure as opposed to widely used DDM and DCF approaches, which are distribution of value measures. Valuation creation measures are easier to explain and interpret than the distribution of value measures. Since the RI model stems from earnings, which are generally seen to dominate cash-flows in explaining same period stock returns, it too can be seen to dominate cash-flows in explaining contemporaneous stock returns. Negative cash-flows can be taken to be bad or good news same applies to positive cash-flows (Plenborg, 2002). A positive RI suggest the company should be trading a price to book value of more than one, however a positive cash-flow doesn't suggest the same. Arguably, this makes firm value estimates obtained through the utilization of the RI model to be easier to interpret and explain than estimates based on the free cash-flows. Moreover, the RI model is insensitive to different accounting principles used by the firm to measure book values and earnings, so long as the clean surplus accounting is applied to the forecasted financial statements (Ohlson, 1995). All these reasons coupled with its NPV maximisation rule in undertaking investment decisions, make the RI model to be analytically attractive.

2.6 Residual Income Risk

Empirical accounting research provides insufficient evidence to infer to whether accounting earnings numbers are able to capture cross-sectional differences in risk. The cross-sectional differences in risk are related to cross-sectional differences in share prices. Studies done by Baginski and Wahlen (2003) aimed to address two questions: 1) Are accounting related risk measures such as total volatility and systematic risk in a company's time series of residual return on equity related to the market's pricing and measurement of equity risk? 2) If this was the case, do these accounting related risk measures provide more information beyond the observable factors outlined by Fama and French (1992); stock beta, firm size and market to book ratio? Fama and French (1992) showed that the single factor Capital Asset Pricing Model (CAPM) may be incomplete because makeshift factors outside the model e.g. book to market value, seems to explain stock returns. Work done by Baginski and Wahlen (2003) contributes to research done to assess whether accounting earnings based risk measures capture what traditional measures of equity risk such as market beta or factors postulated by Fama and French (1992) do not capture. Prior studies use observed share values or the log returns of the share prices to estimate the risk premium and required rates of return that are to be used in the valuation models. The use of observed share values or log returns of the share prices to measure risk introduces a level of circularity into the valuation model.

Researchers typically use stock returns as proxies for the change in market perception and assessment of market risk through the likelihood of receiving future dividends i.e. the typically use proxies for expected future dividends as a way of assessing risk. Evidence suggests that when the necessary data needed to compute market based risk measures e.g. market beta, firm size and market to book value, is not available, volatility of abnormal ROE (ROE minus the risk free rate) is a useful measure in risk valuation. An accounting measure can be developed to account for the discount for the risk inherent in share prices. Baginski and Wahlen (2003) estimated a more direct approach that utilizes accounting numbers to measure firm risk and share values in a RI valuation approach. They estimated the risk free value based on the RI model, analysts' forecasts of earnings and replaced the required rate of return in the traditional

RI model with the risk free rate. The study done by Baginski and Wahlen (2003) developed a new accounting based measure of the effect of risk on the share price: the price differential. The price differential can be computed as the risk free value estimate minus the share price, hence giving an indication of the risk market participants were pricing-in the share value. The more positive the price differential, the lower the risk. The research finds the price differential to be positively related to RI measures i.e. risk is negatively related to RI. They found the price differentials to be positive for a majority of the firms used because the risk free values ignore the discounts for risk in share prices. They also found that capital markets participants and researchers could avoid the circularity in the stock based risk measures by directly analysing the risk inherent in the RI valuation approach.

Chapter Summary

This chapter covers prior research that pertains to the RI model. Variants of the RI measure are shown here, more specifically the accounting model which will be used in our research. Practical applications of the RI model are outlined, more specifically the EVA™ which is highly marketed by Stern Stewart & Co. The DCF measures are compared to the RI model and it is generally observed that the RI model outperforms these DDM/DCF models when it comes to performance measurement and information relevance. To add, the limitations and attractive attributes of the RI measure are covered. The pros of implementing the RI measure seem to outweigh the model's cons. Research done by Baginski and Wahlen (2003) gives us a good base to start conducting tests on our hypotheses which were outlined in the introduction chapter. Although the prior research on RI is comprehensive, it is heavily inclined toward developed countries. In the next chapter we will look at variables that constitute our models more so the methodology that will be employed to analyse the data. Data analysis techniques and how they will help us achieve our research objectives will also be discussed. Finally, we will revisit the hypotheses outlined in our introductory chapter.

3. DATA AND METHODOLOGY

3.1 Data

Our research used data on listed, nonfinancial firms from the JSE top 40 index. JSE 40 index listed firms constituted our first data set. We later eliminated financial services firms[4] from this data and went on to compute the RI values for the remaining companies. Firms with negative RI values were then eliminated leaving us with the relevant data, which was then used in our hypothesis tests. It should be noted that the choice of firms to be placed in our sample, was purely based on the availability of data and only firms with positive RI figures for at least two consecutive years were considered. A sample of the data set used can be found in Appendices, Table 4A. The primary source of our data was Bloomberg Terminal and the research utilized the historical financial information of the listed firms in question. All items are reported on a per share basis for example Book Value per Share (BVPS), apart from the yearly average company prices which are represented in the South African Rand. These prices are later transformed into return percentages as shown in equation 8 in this chapter.

Due to scarcity of data, we employed company financial information filed from 2011 to 2016 inclusive. The time period of six years is ideal as it allowed us to capture an entire business cycle. Business cycles are important as they play an important role in management decisions. When the economy is in a recession, management is likely to act conservatively as opposed to when the economy is in an expansionary environment and management acts aggressively to gain as much market share as possible. Using a time period that does not capture the business cycle may have led us to obtain skewed results depending on which stage of the business cycle the data was from. Hence, the six year timeframe is ideal.

3.2 Research Design

The method of analysis of the data is panel data analysis as it gives the user the ability to analyse a given cross-sectional data over a specified period of time. Empirical accounting research provides insufficient evidence to infer to whether accounting earnings numbers are able to capture cross-sectional differences in risk. Thus, it is clearly advantageous to use a cross-section of data over given period of time in order to test the relationship between RI and systematic risk. The clear advantages of using panel data are increased sample size and the ability to control for unobserved heterogeneity. To add, quantitative methods and techniques will be largely used.

To answer our research question on whether RI gives an indication of a stock's systematic risk we carried out a regression on equations 4 and 5. We achieved this by first regressing the annual systematic risk against the annual residual incomes (RI), Earnings per Share (EPS) and the log of the prices of the stocks which is equation 4. The same regression was carried out but instead of using the RI, the change in annual residual incomes (RI) was used. This was done while leaving the other independent and dependent variables intact essentially giving us equation 5.

[4] Financial services firms are excluded from our data because the financial reporting techniques they employ may be different from those utilized by other industries.

The models are as follows:

$$\text{Risk } \beta_{jt} = \beta_0 + \beta_1(\text{RI}_{jt}) + \beta_2(\log_e \text{P}_{jt}) + \beta_3(\text{EPS}_{jt}) + e_{jt} \quad (4)$$

$$\text{Risk } \beta_{jt} = \beta_0 + \beta_1(\Delta\text{RI}_{jt}) + \beta_2(\log_e \text{P}_{jt}) + \beta_3(\text{EPS}_{jt}) + e_{jt} \quad (5)$$

Where;

P_{jt}	-	price per share of firm j over time period t
$\log_e P_{jt}$	-	natural log of price per share of firm j over time period t
RI_{jt}	-	annual residual income per share
EPS_{jt}	-	earnings per share
ΔRI_{jt}	-	annual change in residual income per share
Risk β_{jt}	-	annual systematic risk
e_{jt}	-	error term

The RI values are derived from utilization of equation 6, which is a simplification of the RI model illustrated in the introduction chapter as equation 1. Both equation 1 and 6 give the same values for the RI values. We chose equation 6 as is directly relies on net earnings i.e. higher net earnings lead to higher RI values making it much easier to interpret results obtained. Equation 1 is derived from Return on Equity (ROE) which is, net income divided by average shareholders' equity. This makes it more complex to interpret the RI values computed through the utilization of equation 1. From equation 1, a higher RI value may arise from either higher net income figures or lower shares outstanding. Since the EPS and BVPS values are annual figures, the corresponding RI values are annual as well. The equity cost of capital K_e is what is reported by the firm and it is annualized. This percentage is taken to be constant as it is assumed the firm raises no additional equity funding within the year.

$$\text{RI} = (\text{EPS}_t - \text{K}_e \text{BV}_{t\text{-}1}) \quad (6)$$

Where;

K_e	-	cost of equity capital
BV_{t-1}	-	accounting book value of equity per share at time t-1
RI	-	annual residual income per share
EPS	-	earnings per share

It is from the RI values that we derived the change in RI (ΔRI). The EPS is computed from dividing the Net Income (NI) of the entire firm by the number of shares outstanding at the point of financial reporting. The daily stock prices were used to compute a yearly average for example a yearly average for 2010 for firm A, 2011 for firm A and so on. This yearly average was then standardized by taking its natural logs, allowing us to use it in our equations as an independent variable. It is however problematic to use observed share prices or stock returns to assess risk as doing so may introduce a degree of circularity into the valuation model. We have however seen from research, risk measures computed from share returns have information content due to the fact that share prices seize all value-relevant information (Baginski & Wahlen, 2003).

A regression of the stock's returns is carried out with the returns being the dependent variable while the annual RI, log prices and OCFs are the independent variables. Equation 7 helps us to investigate as to whether the RI model is a preferable measure of a stock's return than the OCF models, which is our second research question. The OCFs are the respective firm's operating cash-flows for the year, divided by the shares outstanding at that period in time. The empirical model of the relationship is given as:

$$Ret_{jt} = \beta_0 + \beta_1(RI_{jt}) + \beta_2(OCF_{jt}) + \beta_3(\log_e P_{jt}) + e_{jt} \quad (7)$$

Where;

Ret_{jt}	-	returns of firm j over time period t
P_{jt}	-	price per share of firm j over time period t
$\log_e P_{jt}$	-	natural log of price per share of firm j over time period t
RI_{jt}	-	annual residual income per share
OCF_{jt}	-	operating cash flows per share[5]
e_{jt}	-	error term

The Ret_{jt-1} values are computed through the use of equation 8. The adjusted closing share prices in the next period *t* capture dividend pay-outs, effects of capitalization, share splits and capital reduction. As is well known from previous literature, a stock's returns is made up of divided return and capital gains.

$$Retj_t = \log_e\left(\frac{P_{jt}}{P_{jt-1}}\right) \quad (8)$$

Where;

Ret_{jt}	-	returns of firm j over time period t
P_{jt}	-	price per share of firm j over time period t
P_{jt-1}	-	price per share of firm j over time period t-1

[5] OCF and CFO will be used interchangeable, but inherently refer to the same thing.

The beta coefficient values are computed through the use of equation 9. This is similar to regressing the FTSE JSE top 40 stock index returns against the corresponding stock returns for each firm under consideration. The annual systematic risk coefficients are averages of the betas computed using monthly returns for both the individual stocks and the market stock index.

$$\beta_{jt} = \frac{\text{Covariance}(\text{Ret}_{jt}, \text{Ret}_{Mt})}{\text{Variance}(\text{Ret}_{Mt})} \qquad (9)$$

Where;

Ret_{jt}	-	returns of firm j over time period t
Ret_{Mt}	-	returns of the FTSE JSE top 40 index over time period t
β_{jt}	-	annual systematic risk for firm j over time period t

We make postulations about our coefficients. Table 1 below, summarizes the expected signs for the independent variables outlined in equations 4, 5 & 7. The RI and change in RI are expected to have a negative relationship with the systematic risk. Baginski and Wahlen (2003) results support this with their results showed that the more positive the price differential, the lower the risk i.e. the higher the RI, the lower the risk. The same applies to EPS, as the RI is derived from it. The OCFs, log prices and the RI are expected to have a positive relationship with the stock returns this is in line with the risk/return trade off. Higher OCFs, EPS and RI imply the probability of the investor to recoup their investment is higher thus the equity risk premium is lower. From the Capital Asset Pricing Model (CAPM) a lower required rate of return can be computed which can be used to evaluate the stock price. Lower required rate of return, leads to higher stock valuation hence higher future potential capital gains.

Table 1: Definition of variables

Variable	Expected Sign of Coefficient
RI Equation 4	negative
RI Equation 7	positive
ΔRI Equation 5	negative
EPS Equation 4 & 5	negative
$\log_e P_{jt}$ Equation 4, 5 & 7	positive
OCF Equation 7	positive

Notes: Δ means change.

EViews software was used to carry out the regressions for the outlined models. Microsoft Excel was generally used to clean up the data, compute the variable transformations and store the data in a format that allowed us to import it into the EViews software. We preferred EViews software to analyse our panel data as it is relatively easier to use and interpret our results compared to other programs. Our data is in longitudinal form which allowed us to analyse a larger number of data points in turn increasing the degrees of freedom and reducing collinearity among the independent variables, hence refining the efficiency of our econometric estimates. The panel data used in our research is balanced with N cross-sectional units $j = 1,...,N$ over T time periods $t = 1,...,T$. Cross-section data may be seen as panel data with $T=1$ whereas time series data may be seen as panel data with $N = 1$ (Hsiao, 2007). But, we should be careful to note that increasing the data points doesn't necessarily imply more information has been captured.

The use of panel data analysis allowed us to analyse a variety of key economic questions which we may not have otherwise been able to address using cross-sectional or time series data sets. As stated earlier in this chapter, there is little evidence to infer whether accounting earnings numbers are able to capture cross-sectional differences in risk. Therefore, through utilizing panel data, we were able to analyse the effects of RI on the systematic risk for a cross-section of different companies over a period of six years. The models we regressed can then be used to forecast the future returns and systematic for out of sample firms. To add, the use of panel data increased the robustness of our estimated values. Tracking a cross-section of firms over the six year period allowed us to eliminate the business cycle effects that may have skewed our data to give biased results. With panel data sets, we can bank on differences in the cross-sectional data to reduce the collinearity between current and lag variables to estimate unrestricted time-adjustment patterns. Estimates obtained from utilization of time series data, which have highly collinear current and lagged variables, are not robust. Moreover, stationarity is a key element in the analysis of time series data. When the time series data is non-stationary the sample's approximation of the distributions, through the use of the Least Squares Method (LSM) or the Maximum Likelihood Estimators (MLE), ceases to be normally distributed. However, if a panel data set can be constructed or is available and the cross-sectional variables are independent then the Central Limit Theorem (CLM) can be used across the cross-sectional data sets to show that the limiting distributions of many estimators remain asymptotically normal (Binder, Hsiao, & Pesaran, 2005).

There are various panel data analysis models, including the pooled least squares model, Fixed Effects Model (FEM) and the Random Effects Model (REM). There exists heterogeneity across the *j* firms and over time *t* that are not captured by the general panel (Pooled Least Squares) data model. When the effects of the heterogeneity are assumed to be random variables we refer to it as the Random Effects Model (REM) while when they are fixed parameters we can refer to them as the Fixed Effects Model (FEM). The challenge of using panel data is how to control for the impact of the unobserved heterogeneity. For the FEM if you want to control for the effect of a variable, you must explicitly measure it. If the variable is not measured, you cannot control for it. Generally there will be some variables which one will have failed to measure or even measure poorly. It is because of this reason, the FEM is likely to suffer from a degree of omitted variable bias. The REM is another popular approach used in the analysis of panel data. If there are no omitted variables or the variables in the model are uncorrelated with the omitted variables then the REM is preferred over the FEM. Unlike the FEM, in the REM the effects of the time-invariant variable like employee sex can be estimated, not just controlled for. Moreover, the standard errors of the REM tend to be smaller than those of FEM (Hsiao, 2007). The REM however, yields biased coefficients if the relevant time-invariant variables are omitted from the regression.

We utilized the FEM, the pooled least squares model and the REM to analyse our data. The pooled least squares model assumes the individual effects are fixed and common across all the firms under analysis which is not necessarily true. The main distinguisher between the REM and the FEM is, unlike the FEM, the variation in the REM is assumed to be random and uncorrelated with the independent variables included in the model (Torres-Reyna, 2007). The more preferable or suitable model, for our four empirical equations, will be accessed through the use of the Hausman test.

3.3 Empirical Hypotheses

The motive of this research is to investigate the hypothesis that *RI gives an indication of the stock's systematic risk* and if *the RI model is preferred over the OCF models as a measure of stock returns*. The study is based on the notion that the cost of capital remains unchanged until the next financial year. Our hypotheses are constructed on the premise that the systematic risk is negatively related to RI, the change in RI and EPS, while being positively related to the stock's log prices. Secondly, stock returns are positively related to RI, the stock's log prices and OCF.

In summary, the above predictions, literature discussed and existing theories gave us a strong base to construct the two hypothesis outlined in our introductory chapter.

The predictions are:

Hypothesis 1:
H_0 *RI gives an indication of the stock's systematic risk.*

Hypothesis 2:
H_0 *the RI model is a preferable measure of a stock's return than the OCF measure.*

Chapter Summary

This chapter describes the data employed and outlines the various transformations our variables under went before running our regressions. A description of how the models were constructed based on prior literature is contained here. Comments are made on our data source and the limitations in constructing our panel data. The use of panel data analysis is discussed in detail and variants of the data analysis technique are described. We settled on the use the following forms of panel data analysis; FEM, REM and Pooled Least Squares models to carry out our research. The three models were compared along the lines of their suitability and non-suitability in helping us to answer our research questions. Moreover, the Hausman test was settled on to be the tie breaker when it came to choosing the most appropriate model. We finally revisited our hypotheses; *RI gives an indication of the stock's systematic risk* and if *the RI model is preferred over the OCF models as a measure of stock returns.* The next chapter, gives a summary of descriptive statistics of our data. Moreover, tables outlining our regression results for model 4, 5, and 7 are shown and discussed in detail.

4. EMPIRICAL RESULTS

In this chapter, we start by reporting our regression results for our analysis. We then have a discussion around these numbers and how they aid us in achieving our research objective. The discussion is the final step that gives the implications of the research questions we raised.

4.1 Descriptive Statistics

Table 2 provides a summary of the statistics of the variables under consideration. Our panel data is highly balanced, as all the firms had data over the focus period 2011 to 2016. From Table 2, we can see our book values per share increased gradually from approximately R66.05 to R131.67 per share over 2011 to 2016. Earnings followed a similar trajectory as the book values per share, by increasing from approximately R8.64 to R12.26 per share from 2011 to 2015. However, this increase dropped to approximately R8.10 in 2016. The average cost of equity to the firms being studied dropped from approximately 16.68% to 10.67% over 2011 to 2015, perhaps owing to the improved earnings and cash flow positions of the firms under consideration.

In the years prior to 2011, South Africa was hit by a number of shocks. First the electricity shortages that started in 2007. The sudden power outages never gave companies time to adjust. To add, the effects of these shocks became long lasting and firms operating in South Africa saw their electricity costs shoot up as they were forced to pay higher energy tariffs. This in turn had an effect on the performance of firms, especially those that are energy intensive for example mining companies. The second and third shocks were global financial crisis and subsequent global economic slowdown. The impact of these events is evident as Earnings per Share (EPS) and Cash Flow from Operations per Share (CFOs) for 2011 are lower than others years under consideration, suggesting firms were still recovering from these shocks. The highest average cost of equity capital was 16.68%, indicates the high level of interest rates in 2011. It also implies that investors were pricing in the perceived risk of loss of their equity capital by charging higher rates. Moreover, market prices were lowest in 2011 suggesting the JSE was yet to fully recover to levels pre the 2008/09 financial crisis. Table 2, summarizes these findings.

The mean returns shot up between 2011 and 2012 but have since reduced from approximately 28.35% to -3.77% over 2012 and 2016. At a macroeconomic level moderate household consumption growth, higher indebtedness and weaker disposable income reduced GDP growth in 2016 (National Treasury, 2017). Moreover, weak business confidence and low levels of business profitability continued to weigh on investment inflows. Table 2, shows that the cost of equity increased between 2015 and 2016, which may have stemmed from lower earnings and Cash Flow from Operations per share (CFOs) over the same period i.e. investors were asking for higher yields for their investments in these firms due to the perceived higher risk. Decision by the incumbent president to fire the then finance minister only deteriorated the situation. These among other issues, may have been the main contributing factors to subpar economic performance of firms in 2016 as is clearly shown by the lower Cash Flow from Operations and Earnings per share (CFOs) earned by firms within the period.

Table 2: Annual Means of the Empirical Model Inputs

Year	*Book Value per Share (BVPS)*	*Cash Flow from Operations per Share*	*Earnings per Share (EPS)*	*Cost of Equity (K_e)*	*Residual Income per Share*	Δ*Residual Income per Share*	*Beta*	*Market Prices*	*Stock Returns*
2011	66.0456	13.2216	8.6351	16.6845	-2.2107	n/a	0.7731	18576.51	19.8483%
2012	78.2533	14.1501	10.2338	12.3474	1.7153	3.9260	0.7033	23042.52	28.3527%
2013	90.1616	16.6456	11.1944	10.4973	2.7417	1.0264	0.8470	29398.19	9.1726%
2014	104.6119	20.1470	11.6362	11.2215	1.1618	-1.5799	0.8731	37772.57	7.6681%
2015	117.8886	19.6695	12.2616	10.6681	0.6575	-0.5043	0.8895	44089.96	4.5077%
2016	131.6668	16.7599	8.0985	10.9463	-5.4272	-6.0848	0.9255	48621.76	-3.7667%

Notes: N/A means the information was not available. Δ means change
Source: Author's own calculations using data collected from Bloomberg Terminal

4.2 Regression Results

4.2.1 Diagnostics

We checked if multicollinearity was present within our independent variables. The Pearson correlation coefficient matrix was used to identity and overcome the problems associated with multicollinearity within these variables. Multicollinearity is a main concern as it undermines the statistical significance of some if not all the independent variables i.e. it results in unstable parameter coefficients which make it very difficult to access the effect of the explanatory variables on the dependent variables.

Table 3 below shows the derived coefficients between the independent variables. Simple correlation coefficients were used to detect for multicollinearity. From the correlation matrix, we can clearly see the most significant correlation exists between the Cash flows From Operations per Share (CFOs) and Earnings per Share (EPS). This implies the two variables tend to move in the same direction. According to Brooks (2014), high correlations are substantial and cause problems in your regression if they are more than 80%. The CFOs and EPS were not used as explanatory variables in the same regressions and the rest of the correlation coefficients are less than 80%. Thus, we run the regressions without dropping any independent variables.

Table 3: Pearson Correlation Coefficient Matrix (2011 – 2016)

Variables	*CFOs*	*EPS*	*RI*	*Change in RI*	*Log Prices*
CFOs	1.0000				
EPS	0.9490***	1.0000			
RI	- 0.4668	- 0.2595	1.0000		
CHANGE IN RI	- 0.2715	- 0.0214	0.7742***	1.0000	
BETA	0.3710	0.3042	- 0.4007	- 0.2219	
LOG PRICES	0.6889**	0.6687**	- 0.2099	- 0.1445	1.0000

The standard errors are in parenthesis and the *, **, *** show the level of significance at 10%, 5% and 1% respectively with a p-value on a two tailed test

Source: Author's own

4.2.2 Effect of Residual Income on Systematic Risk

In this section we run regressions on the empirical equations outlined in chapter 3. As indicated earlier, we utilized the three models for our panel data analysis. The results for equation 10 are presented in Table 4 which is made up of panel A. We used our regression model to test the hypothesis that *RI gives some indication on a stock's systematic risk*. This is done by first looking at whether the RI level is significant in relation to the systematic risk.

Results are reported for the following regression,

$$\text{Risk } \beta_{jt} = \beta_0 + \beta_1\left(\text{RI}_{jt}\right) + \beta_2\left(\log_e \text{P}_{jt}\right) + \beta_3\left(\text{EPS}_{jt}\right) + e_{jt} \qquad (10)$$

RI **–** From the results outlined in Table 4, the RI coefficient is negative and insignificant for the FEM at 1%, 5% and 10% level, but negative and significant at 1%, 5% and 10% level for the Pooled Least Squares model. For the REM, it is negative and only significant at 10% level. The negative relationship between the firm's RI and the stock's systematic risk is in line with our prior postulations in chapter 3. These findings are consistent to those found by Baginski & Wahlen (2003) and Fama and French (1992). The negative and significant relationship implies market prices incorporate the lower risk associated with firms that implement RI as measure of management performance which is in line with findings by Wallace (1997). This means firms with higher RI values are more likely to be charged lower risk premium by investors.

Log Prices **–** The log prices coefficient is positive and significant at all three levels for the FEM and REM contrary to Baginski & Wahlen (2003), they indicated the circular nature of deriving systematic risk from stock price. Our results suggest log prices have information relevant pertaining to a stock's systematic risk. This could also mean that market participants rely heavily on the stock's market price to gauge systematic risk.

EPS **–** The EPS coefficient is positive and not statistically significant at all levels for the three models. It is surprising to find EPS has no significant relationship with the systematic risk, yet RI is a derived from EPS. This may be an indicator of more information relevance of the RI measure relative to EPS. These finfings imply that the expected RI/abnormal earnings do not depend on current earnings confirming results by Ohlson (1995) and Miller and Modigliani (1961). The superior information content of the RI, relative to EPS, may stem from it being directly derived from Book Values per Share (BVPS). Closing book values have been proved to have statistically significant information relevant to market values which are in turn used to determine the level of systematic risk. These results suggest earnings are unable to outperform RI as valuation attributes and replacing RI with net earnings in the valuation models leads to a reduction of information content and significance. Results supporting information relevance of RI relative to EPS are in line with results obtained by Negakis (2005) and Plenborg (2002).

Specification tests were used to determine the preference between the REM and FEM. More specifically, we utilized the Hausman test; results are shown in Table 4 below.

To run the Hausman test we test the following hypothesis;

H_o: The Random Effects Model is appropriate
H_1: The Fixed Effects Model is appropriate

The p-value of the chi-square statistic is 0.1357 which is greater than 0.05, hence at 5% level of significance fail to reject the null hypothesis and conclude the REM is appropriate for estimating equation 10. As indicated earlier, the Pooled Least Squares model assumes individual effects are fixed and common across all the firms under analysis which is not entirely true as our data contains firms from different industries and have heterogeneous factors affecting them individually.

Table 4: Regression Estimates for Equation 10

Panel A: Panel Data Regression Results (2011 – 2016)

Explanatory Variables & Constant	*Fixed Effects Model*	*Random Effects Model*	*Pooled Least Squares*
Constant	-1.46712*	-0.77401	0.18542
	(0.74427)	(0.58628)	(0.43605)
Residual Income	-0.01111	-0.00837*	-0.01229***
	(0.00748)	(0.00420)	(0.00513)
Log Prices	0.21920***	0.15452***	0.05968
	(0.07681)	(0.05939)	(0.04399)
Earnings per Share (EPS)	0.01100	0.00642	0.00502
	(0.01291)	(0.00568)	(0.00347)
Prob > F	[0.00000]	[0.01453]	[0.00400]
Hausman Test			
$X^2(3)$	5.54968	5.54968	-
P-value	0.13570	0.13570	-
No. of Observations	54	54	54

The standard errors are in parenthesis and the *, **, *** show the level of significance at 10%, 5% and 1% respectively with a p-value on a two tailed test. t- statistics are computed using the coefficient values and the standard error terms indicated. The corresponding t- statistics can be found in the Appendix, panel A. Detailed regression information can be found in the Appendix, panel A and Tables 1A-1D
Source: Author’s own calculations using data collected from Bloomberg Terminal

4.2.3 Effect of Change in Residual Income on Systematic Risk

We continue to test the hypothesis that *RI gives some indication on a stock's systematic risk* by carrying out a regression on equation 11. Table 5, panel B contains the regression results. We investigate whether the change in RI (ΔRI) has a significant impact, if any, on the level of systematic risk. We also run the same specification test; Hausman test, as run for equation 11.

Results are reported for the following regression,

$$\text{Risk } \beta_{jt} = \beta_0 + \beta_1(\Delta \text{RI}_{jt}) + \beta_2(\log_e \text{P}_{jt}) + \beta_3(\text{EPS}_{jt}) + e_{jt} \quad (11)$$

ΔRI **–** The change in RI is negative and insignificant for the Pooled Least Squares method and FEM. The REM has a negative and significant coefficient for the change in RI, only at 10% level. These results suggest that only the level of RI is important to the market participants as opposed to the change in RI which seems to have minimal relation, if any, to stock systematic risk. There is a likelihood of the RI model being used over the short term to monitor management performance, making the changes of RI to be irrelevant over the long term. Firms that implement the RI measure are likely to focus on short term profitability this is likely a factor contributing to no relation between the change on RI and the systematic risk. Barniv et al. (2009) obtain similar results along the same lines on the implementation of the RI creating imprudent focus on short term profitability.

Log Prices **–** The log prices coefficients are positive and significant at all levels for the FEM and REM. The coefficient is positive and significant at the 10% level only for the Pooled Least Squares model. Log prices as observed before, continue to be significant in all the three models suggesting their importance in capturing all the relevant information pertaining to systematic risk.

EPS **–** EPS is positive and significant at 10% level for the Pooled Least Squares model. This means the market may be putting more weight on earnings as opposed to the change in RI when it comes to pricing in the systematic risk. To add, results may be indicating that investors, over the short, are likely to revert back to EPS as a measure of company performance. Firms with strong and consistent earnings are considered less risky by investors as opposed to firms with transitory earnings. Management may be myopic, thus undertaking in projects that are profitable in the short term but do not satisfy the NPV maximisation rule i.e. higher earnings in the short term but negative NPVs at the end of the project. These results underline the short term application of RI model by management.

We run the Hausman test, a p-value of 0.42590 is greater than our 5% level of significance implies we should fail to reject the null hypothesis and conclude the REM is preferable in regressing the stock betas against the change in RI. Table 5, panel B gives a summary of the regression and specification test results.

Table 5: Regression Estimates for Equation 11

Panel B Panel Data Regression Results (2011 – 2016)

Explanatory Variables & Constant	*Fixed Effects Model*	*Random Effects Model*	*Pooled Least Squares*
Constant	-1.31234*	-0.82113	0.00832
	(0.74993)	(0.62256)	(0.44037)
ΔResidual Income (ΔRI)	-0.00671	-0.00777*	-0.00970
	(0.00448)	(0.00400)	(0.00607)
Log Prices	0.21334***	0.16106***	0.07533*
	(0.07742)	(0.06309)	(0.04458)
Earnings per Share (EPS)	0.00159	0.00444	0.00682*
	(0.00799)	(0.00574)	(0.00348)
Prob > F	[0.00000]	[0.01198]	[0.01577]
Hausman Test			
$X^2(3)$	2.78566	2.78566	-
P-value	0.42590	0.42590	-
No. of Observations	54	54	54

The standard errors are in parenthesis and the *, **, *** show the level of significance at 10%, 5% and 1% respectively with a p-value on a two tailed test. t- statistics are computed using the coefficient values and the standard error terms indicated. The corresponding t- statistics can be found in the Appendix, panel B. Detailed regression information can be found in the Appendix, panel B and Tables 2A-2D.
Source: Author's own calculations using data collected from Bloomberg Terminal.

From the results in sections 4.2.2 and 4.2.3 we can therefore infer the following;

Hypothesis 1: Our results corroborate with our earlier assumptions on the coefficients of the level of RI and change in RI being negatively related to the stock's systematic risk. The RI results from the REM and Pooled Least Squares models in section 4.2.2 show that RI has a negative and statistically significant relation with the stock's systematic risk. The REM results in section 4.2.3, show that the change in RI is negative and significant as well. Thus, not only is the level of RI important in explaining the stock systematic risk, but also the change in RI. These results back the null hypothesis that *RI offers an indication on a stock's systematic risk*.

4.2.4 Comparison of Residual Income and Cash Flows per Share on the Impact of Stock Returns

Finally, we run a regression on equation 12 to test our second hypothesis that *the RI model is a preferable measure of a stock's return than the OCF measure.* Table 6, panel C summarizes the relevant results.

Results are reported for the following regression,

$$Ret_{jt} = \beta_0 + \beta_1(RI_{jt}) + \beta_2(OCF_{jt}) + \beta_3(\log_e P_{jt}) + e_{jt} \quad (12)$$

RI **–** The RI coefficient is negative and significant only for the Pooled Least Squares Model. A negative coefficient is contrary to our earlier assumptions of it being positively related to the stock returns. These results suggest RI does not play a role in explaining contemporaneous stock returns. This is contrary to findings by Chen & Dodd (2001). The significant relation of RI and stock returns are in line with findings by Fama and French (1992) i.e. the Capital Asset Pricing Model (CAPM) may be an incomplete measure of stock returns due to makeshift factors outside the model, for example, book to market values which have since been used to provide relevant information with regard to a stock. For the REM and FEM, the insignificant relation between the RI and stock returns suggests that market participants do not perceive RI to be a strong driver of stock returns. It was our expectation that stock returns would increase with increase in abnormal earnings, as they do with normal earnings. However, our findings were contrary to this; RI had a negative relationship with stock returns. Book value being a major component of the RI model our findings may be suggesting that lower book values, which lead to higher RI values, may have be negatively perceived by investors i.e. a reduction in the book values has a more negative impact on the stock returns than the corresponding positive impact caused by an increase in normal earnings. Equation 6 shows the relationship between RI, earnings and book values.

OCF **–** The coefficients for the Cash Flows per Share are all positive and statistically insignificant for the three models utilized. These results suggest Operating Cash Flows are not important in determining stock returns. We however note the importance of these Operating Cash Flows especially in accessing the financial performance of a firm. Our findings may suggest the market assumes the price incorporates all information that pertains to the company performance and any new information that is public and material is immediately accounted for in the price. These findings are line with results obtained by Plenborg (2002) that both RI and earnings are relatively more informative than DCF approaches in short, concluding that earnings and RI approaches are seen to be better indicators of performance than cash-flows.

Log Prices **–** Our results suggest that that log returns are positive and significant when it comes to explaining stock returns both for the Fixed Effects and Random Effects Models but insignificant for the Pooled Least Squares model.

We run the Hausman test, the p-value of 0.14340 is greater than our 5% level of significance implies we should fail to reject the null hypothesis and conclude the REM is preferable in carrying out our regression for equation 12. The specification test results are summarized in Table 6, panel C.

From the results in section 4.2.4 we can therefore, infer the following;

Hypothesis 2: Our results are not in line with our earlier postulations on the coefficients of RI being positively related to stock returns. Moreover, they do not provide enough evidence to suggest that RI is the preferred measure relative the firm's Cash Flows, as a source of more information on stock returns. We do however find the stock price to be a significantly related to stock returns suggesting the Efficient Market Hypothesis (EMH) applies and price captures all the relevant information. Yet, we have to assume the market is not perfectly efficient else its participants would not be able to profit from it. In conclusion, our findings do not give us enough evidence to back our null hypothesis that *the RI model is a preferable measure of a stock's return compared to the OCF measure.*

Table 6: Regression Estimates for Equation 12

Panel C Panel Data Regression Results (2011 – 2016)

Explanatory Variables & Constant	*Fixed Effects Model*	*Random Effects Model*	*Pooled Least Squares*
Constant	-1.46557**	-0.77522	0.15754
	(0.74345)	(0.58187)	(0.43403)
Residual Income (RI)	-0.00630	-0.00584	-0.01018**
	(0.00377)	(0.00355)	(0.00557)
Log Prices	0.22380***	0.15524***	0.06271
	(0.07544)	(0.05855)	(0.04399)
Cash Flows per Share (OCF)	0.00402	0.00364	0.00298
	(0.00447)	(0.00281)	(0.00195)
Prob > F	[0.00000]	[0.01234]	[0.00358]
Hausman Test			
$X^2(3)$	5.42118	5.42118	-
P-value	0.14340	0.14340	-
No. of Observations	54	54	54

The standard errors are in parenthesis and the *, **, *** show the level of significance at 10%, 5% and 1% respectively with a p-value on a two tailed test. t- statistics are computed using the coefficient values and the standard error terms indicated. The corresponding t- statistics can be found in the Appendix, panel C. Detailed regression information can be found in the Appendix, panel C and Tables 3A-3D.
Source: Author's own calculations using data collected from Bloomberg Terminal.

4.2.5 Regression Analysis using Semi-annual Data

As a robustness check we run regressions on equations 10-12 using semi-annual data. Running regressions using higher frequency data for example monthly data would have been more ideal but a majority of public firms do their financial reporting semi-annually. To add, it is only financial services firms that report their earnings on a quarterly basis. The results for equation 10, using semi-annual data, are presented in Table 7 which is made up of panel D. We used our regression model to test the hypothesis that *RI gives some indication on a stock's systematic risk*. We continued to investigate whether the RI level is significant in relation to the systematic risk.

RI **–** The RI level is negative and significant for the Pooled Least Squares method, REM and FEM. These results suggest that the level of RI is important to the market participants over shorter periods of time. Investors may be looking to capitalize on these short term gains achieved by the respective firms. Our findings confirm the likelihood of the RI model being used by investors over the short term to monitor management performance. However, there is downside risk when firms implement the RI measure; the firms in question are more likely to focus on short term profitability. Firms that are overly focused on short term profitability, may give rise to management that is myopic when it comes to their investment decisions. To finalize, our findings are aligned to those obtained by Barniv et al. (2009); the RI creates imprudent focus on short term profitability. Our findings are also aligned with those found by Baginski and Wahlen (2003) i.e. higher RI values are linked to lower firm systematic risk.

Log Prices **–** The log prices coefficients are positive and significant at all levels for Pooled Least Squares model only. These results are contrary to our earlier findings using annual data, where we found log prices to be significant in all the three models which suggested their importance in capturing all the relevant information pertaining to systematic risk over the long-term. These findings, indicate that it is likely investors may be reverting back to company fundaments like BVPS when it comes to assessing a company's beta over shorter periods of time. Thus, making the log price variable to be redundant to them over shorter periods of time.

EPS **–** EPS is negative and insignificant at all levels for the three models used. It is surprising however that EPS is not significant in all the regression models yet, RI is directly derived from earnings. This means the market may be putting more weight on the RI level as opposed to EPS over the short term, when it comes to pricing in the systematic risk. Earnings are more likely to be manipulated as opposed to book values. This also gives an indication as to why RI coefficients are significant whereas the EPS ones are not i.e. BVPS are preferred over EPS when it comes to assessing risk in the short-term. These findings revert back to our earlier conclusions with regard to investors reverting back to company fundamentals like BVPS over the short-term.

We run the Hausman test, a p-value of 0.0376 is less than our 5% level of significance implies we should reject the null hypothesis and conclude the FEM is preferable in regressing the stock betas against the RI level. Table 7, panel D gives a summary of the regression and specification test results.

Table 7: Regression Estimates for Equation 10

Panel D Panel Data Regression Results (2011 – 2016)

Explanatory Variables & Constant	*Fixed Effects Model*	*Random Effects Model*	*Pooled Least Squares*
Constant	-0.2367	-0.034	-0.0179
	(0.8055)	(0.9564)	(0.9224)
Residual Income	-0.0247**	-0.0155**	-0.0134***
	(0.044)	(0.0254)	(0.0000)
Log Prices	0.2777	0.2096	0.1983***
	(0.2052)	(0.1404)	(0.0000)
Earnings per Share (EPS)	-0.0236	-0.0067	-0.0015
	(0.2067)	(0.4514)	(0.2562)
Prob > F	[0.0000]	[0.0910]	[0.0000]
Hausman Test			
$X^2(3)$	8.4459	8.4459	8.4459
P-value	(0.0376)	(0.0376)	(0.0376)
No. of Observations	108	108	108

The standard errors are in parenthesis and the *, **, *** show the level of significance at 10%, 5% and 1% respectively with a p-value on a two tailed test. t- statistics are computed using the coefficient values and the standard error terms indicated.
Source: Author's own calculations using data collected from Bloomberg Terminal.

To test the hypothesis that *RI gives some indication on a stock's systematic risk*, we carried out regressions on equation 11, using our semi-annual data. Table 8, panel E contains the regression results. We continue to investigate whether the change in RI (ΔRI) has a significant impact, if any, on the level of systematic risk. We also run the same specification test; Hausman test, as run for equation 11.

ΔRI – The change in RI is negative and insignificant for all the three models. These results suggest that only the level of RI is important to the market participants as opposed to the change in RI which seems to have minimal relation, if any, to stock systematic risk. There is a likelihood of the level of RI model being used over the short term to monitor management performance, making both shorter and long-term changes of RI to be irreverent to market participants. Firms that implement the RI measure are likely to focus on short term profitability this is likely a factor contributing to no relation between the change on RI and the systematic risk.

Log Prices – The log prices coefficients are positive and significant at all levels for the REM and Pooled Least Squares method. The coefficient is positive and significant at the 5% level only for the FEM. Log prices as observed before, continue to be significant in all the three models suggesting their importance in capturing all the relevant information pertaining to systematic risk.

EPS – EPS is positive and significant at 10% level for the FEM only. This means the market may be putting more weight on earnings as opposed to the change in RI when it comes to pricing in the systematic risk. To add, results may be indicating that investors, over the short-term, are likely to prefer EPS as a measure of company performance over changes in RI. Firms with strong and consistent earnings are considered less risky by investors as opposed to firms with transitory earnings. Our findings, go contrary to our earlier results of equation 10, Table 7 which showed that investors are more likely to prefer the level of RI over EPS i.e. they suggest over the short-term, the change in RI is not as important as EPS. To finalize, our results underline the short-term application of the RI model by firms through its management.

We run the Hausman test, a p-value of 0.4670 is greater than our 5% level of significance implies we should fail to reject the null hypothesis and conclude the REM is preferable in regressing the stock betas against the change in RI. Table 8, panel E gives a summary of the regression and specification test results.

Table 8: Regression Estimates for Equation 11

Panel E Panel Data Regression Results (2011 – 2016)

Explanatory Variables & Constant	*Fixed Effects Model*	*Random Effects Model*	*Pooled Least Squares*
Constant	-0.7847	-0.6694	-0.0408
	(0.2462)	(0.2111)	(0.8055)
ΔResidual Income (ΔRI)	-0.0057	-0.0021	0.0014
	(0.2671)	(0.7792)	(0.5687)
Log Prices	0.3604**	0.3412***	0.2005***
	(0.0221)	(0.0057)	(0.0000)
Earnings per Share (EPS)	0.0106*	0.0045	-0.001
	(0.0928)	(0.5614)	(0.6098)
Prob > F	[0.0000]	[0.0480]	[0.00003]
Hausman Test			
$X^2(3)$	2.5461	2.5461	2.5461
P-value	(0.4670)	(0.4670)	(0.4670)
No. of Observations	108	108	108

The standard errors are in parenthesis and the *, **, *** show the level of significance at 10%, 5% and 1% respectively with a p-value on a two tailed test. t- statistics are computed using the coefficient values and the standard error terms indicated.

Source: Author's own calculations using data collected from Bloomberg Terminal.

Hypothesis 1: Our findings confirm our earlier results obtained in section 4.2.2 and 4.2.3. The RI results from the three models used to regress equation 10, show that RI has a negative and statistically significant relation with the stock's systematic risk. However, our results for equation 11 are contrary to those obtained in section 4.2.3 especially for the REM which showed that the change in RI is negative and significant. Thus, from our regression on semi-annual data it becomes apparent that only the level of RI is important in explaining the stock systematic risk. These results give a strong confirmation to fail to reject the null hypothesis that *RI offers an indication on a stock's systematic risk.*

Finally, we run a regression on equation 12 to test our second hypothesis that *the RI model is a preferable measure of a stock's return than the OCF measure.* Table 9, panel F summarizes the relevant results.

RI – The RI coefficient is negative and significant for all the three models. A negative coefficient is contrary to our earlier assumptions of it being positively related to the stock returns. These results confirm that the RI level does not play a role in explaining stock returns. It was our expectation that stock returns would increase with an increase in abnormal earnings, as they do with normal earnings. However, our findings were contrary to this; RI had a negative relationship with stock returns. These findings, continue to confirm the key role book value plays in modelling the perceptions market participants have about a particular stock. As stated earlier, a firm's book value is a major component of the RI model. Thus, our findings confirm that lower book values, which lead to higher RI values, are negatively perceived by investors. However, we may make a different argument as to why the RI coefficients are negative. The risk-return relationship as seen from the Fama and French (1992) CAPM, is a globally accepted proxy for the measurement of the required rate of return for equity investors. Borrowing from the risk return relationship; the higher the risk the lower the required returns, we can infer that this may have been the cause of the negative relationship between the RI level and the stock returns. Higher RI values lead to lower perceived risk by the investors i.e. higher incomes imply investors are more likely to recoup their initial investment much quicker. Thus, leading to the negative relationship between RI values and stock returns.

OCF **–** The coefficients for the Cash Flows per Share is negative and statistically significant at all levels for the Pooled Least Squares method only. These results suggest Operating Cash Flows are not important in determining stock returns. They also suggest that CFOs are not highly considered by the market when it comes to pricing in their required returns, over the short-term. Our findings confirm our earlier findings in section 4.2.4, that CFOs gives no additional information when it comes to assessing a stock's returns. We cannot stress enough the importance of these Operating Cash Flows especially in accessing the financial performance of a firm. Our findings may suggest the market assumes the price incorporates all information that pertains to the company performance, over the long and short-term, and any new information that is public and material is immediately accounted for in the price. These results are line with Plenborg (2002) i.e. earnings and RI approaches are seen to be better indicators of performance than cash-flows.

Log Prices **–** Our results suggest that that log returns are positive and significant when it comes to explaining stock returns both for the Pooled Least Squares model only. These findings are not as compelling as those found in section 4.2.4, and one may make the argument that price movements over the short-term is irrelevant. From experience, however we know this is not necessarily true as a decline in price may cause unwarranted paper losses to the relevant shareholders.

We run the Hausman test, the p-value of 0.1890 is greater than our 5% level of significance implies we should fail to reject the null hypothesis and conclude the REM is preferable in carrying out our regression for equation 12. The specification test results are summarized in Table 9, panel F.

Table 9: Regression Estimates for Equation 12

Panel F Panel Data Regression Results (2011 – 2016)

Explanatory Variables & Constant	*Fixed Effects Model*	*Random Effects Model*	*Pooled Least Squares*
Constant	-0.3868	-0.0814	0.0007
	(0.6841)	(0.9015)	(0.9973)
Residual Income	-0.0129**	-0.0129**	-0.0123***
	(0.0354)	(0.025)	(0)
Log Prices	0.2929	0.2199	0.1961***
	(0.1821)	(0.1471)	(0)
Cash Flows Per Share (OCF)	-0.0052	-0.0039	-0.002***
	(0.3462)	(0.3633)	(0.0062)
Prob > F	[0.0000]	[0.0829]	[0.0000]
Hausman Test			
$X^2(3)$	4.7758	4.7758	4.7758
P-value	(0.1890)	(0.1890)	(0.1890)
No. of Observations	108	108	108

The standard errors are in parenthesis and the *, **, *** show the level of significance at 10%, 5% and 1% respectively with a p-value on a two tailed test. t- statistics are computed using the coefficient values and the standard error terms indicated.
Source: Author's own calculations using data collected from Bloomberg Terminal.

Hypothesis 2: After running regressions using semi-annual data, our findings give us evidence to back our null hypothesis that *the RI model is a preferable measure of a stock's return compared to the OCF measure.* Results obtained in this section, are contrary to our earlier findings in section 4.2.4 which gave us inconclusive findings to firmly conclude that the RI is preferred over OCFs when it comes to measuring stock returns.

Chapter Summary

Through the use of descriptive statistics, this chapter analyses the trends in our variables more specifically; Book Value per Share (BVPS), Cash Flow from Operations per Share, Earnings per Share (EPS), Cost of Equity (K_e), Residual Income per Share, change in Residual Income per Share, Betas, Market Prices and Stock Returns. The Pearson correlation matrix of the independent variables is computed and analysed before running regressions on our three models. The regression results that test for our two hypotheses are then reported and discussed. Comparisons between our findings and those found by prior research are also made. As part of robustness test, regressions are run on semi-annual data. In the next chapter, we make concluding remarks on the implications of our results and recommend future potential research areas based on what we think is key to advance the field especially from a South African context.

5. CONCLUSIONS AND RECOMMENDATIONS

As outlined in our introductory chapter, risk plays a crucial part in modelling stock returns and carrying out fundamental company valuations. The aim of this research was to explore the influence of Residual Income (RI) on the systematic risk of stock returns and to check whether the RI model is preferred by investors over the Cash Flow from Operations (CFO) in the measurement of stock returns.

Relying on literature on the information relevance of the RI model this report first establishes the uses of RI as a valuation measure, which when implemented by a firm, is able to reduce information asymmetry between managers and shareholders. There are many uses of the RI model and its different forms are outlined in the literature review chapter. One of its derivatives is the EVA™, which its users claim it drastically improved their stock performance. The narrative of stock performance improvement however, differs across multiple firms.

This research finds that there is indeed a relationship between the RI measure and stock systematic risk. Therefore, the RI may be used to model future or current systematic risk giving investors a clearer basis from which they could set their return requirements on a stock. Results obtained from utilization of the semi-annual data are more compelling. Moreover, the results obtained from the regression using semi-annual data give a strong base to hint at how market participants make use of the RI to assess a firm's systematic risk over shorter investment horizons. Generally, our findings are in line with results obtained by Baginski and Wahlen (2003) who found that the capital markets price systematic risk in RI.

Our findings do not give conclusive results to suggest the RI is 'better' at modelling stock returns relative to the CFO measures. From our results, the CFOs coefficients are not statistically significant for two out of the three models utilized. This is not to mean that CFOs are not important when it comes to modelling an investor's returns. Our findings are also not compelling enough to suggest that the change in RI is important to investors when it comes to measuring a firm's systematic risk in the long and short run. From these results, we may deduce that over the short-term investors are more concern with earnings and hence prefer EPS over the change in RI.

Results obtained when returns are regressed against RI and CFOs gives a negative sign for the RI coefficients. This was not as per our prior postulations. Two arguments may be deduced to suggest why this is the case: (1) From the risk-return relationship devised by Fama and French (1992) through their CAPM, one may argue that taking up more risk as an investor should grant you a higher required return i.e. lower RI values imply higher systematic risk thus warranty higher required returns (2) The impact of a decrease in BVPS values in the short and long-term is larger than increase in the RI values i.e. the negative perceptions of BVPS decreases is larger than the positive perceptions of RI increases. However, the coefficients are in fact statistically significant for all models when the semi-annual data is used in the regression. These results again point out to the short-term application of the RI by both management and the capital markets.

To add, the short term application of the RI in measuring management performance is seen to have its limitations i.e. a long term approach should be utilized to ensure the management only undertakes in projects that satisfy the NPV maximisation rule. Thirdly, from literature we find that firms are able to more efficiently allocate capital due to utilization of the RI measure

(Georgieva, 2015). However, efficient capital allocation post implementation of the RI model is only effective if these firms focus on long term profitability.

Current data is limited and insufficient especially from a South African view point. It would be necessary to compile a robust database, which tracks South African firms incorporating the RI model in their performance measurements. This would make it easier to conduct future empirical work especially on the use of the RI model in capturing stock returns and systematic risk in addition to the factors postulated by Fama and French (1992). To finalize, future studies should incorporate firm size, firm's debt amounts and management professional background/training when assessing the impact of RI on a firm's systematic risk. These firm specific factors should be controlled for when conducting future research on the subject area.

6. APPENDICES

6.1 Panel A: Raw Regression Results and Specification Tests

Table 1A: Raw Regression Results Pooled Least Squares

Dependent Variable: BETA
Method: Panel Least Squares
Date: 11/25/17 Time: 21:43
Sample: 2011 2016
Periods included: 6
Cross-sections included: 9
Total panel (balanced) observations: 54

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.185420	0.436053	0.425224	0.6725
RESIDUAL_INCOME	-0.012287	0.005134	-2.393354	0.0205
LOG(PRICES)	0.059679	0.043985	1.356809	0.1809
EPS	0.005015	0.003470	1.445105	0.1547

R-squared	0.231848	Mean dependent var	0.835246
Adjusted R-squared	0.185759	S.D. dependent var	0.311463
S.E. of regression	0.281049	Akaike info criterion	0.370615
Sum squared resid	3.949441	Schwarz criterion	0.517947
Log likelihood	-6.006611	Hannan-Quinn criter.	0.427435
F-statistic	5.030420	Durbin-Watson stat	0.930603
Prob(F-statistic)	0.004000		

Table 1B: Raw Regression Results Fixed Effects Model

Dependent Variable: BETA
Method: Panel Least Squares
Date: 11/25/17 Time: 21:55
Sample: 2011 2016
Periods included: 6
Cross-sections included: 9
Total panel (balanced) observations: 54

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.467122	0.744270	-1.971222	0.0553
RESIDUAL_INCOME	-0.011111	0.007484	-1.484642	0.1451
LOG(PRICES)	0.219196	0.076805	2.853916	0.0067
EPS	0.011004	0.012905	0.852699	0.3987

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.775741	Mean dependent var	0.835246
Adjusted R-squared	0.717007	S.D. dependent var	0.311463
S.E. of regression	0.165689	Akaike info criterion	-0.564276
Sum squared resid	1.153022	Schwarz criterion	-0.122280
Log likelihood	27.23546	Hannan-Quinn criter.	-0.393816
F-statistic	13.20761	Durbin-Watson stat	2.433057
Prob(F-statistic)	0.000000		

Table 1C: Raw Regression Results Random Effects Model

Dependent Variable: BETA
Method: Panel EGLS (Cross-section random effects)
Date: 11/25/17 Time: 21:44
Sample: 2011 2016
Periods included: 6
Cross-sections included: 9
Total panel (balanced) observations: 54
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.774013	0.586283	-1.320204	0.1928
RESIDUAL_INCOME	-0.008366	0.004204	-1.989898	0.0521
LOG(PRICES)	0.154517	0.059385	2.601934	0.0122
EPS	0.006417	0.005675	1.130886	0.2635

Effects Specification

	S.D.	Rho
Cross-section random	0.226382	0.6512
Idiosyncratic random	0.165689	0.3488

Weighted Statistics

R-squared	0.188327	Mean dependent var	0.239123
Adjusted R-squared	0.139626	S.D. dependent var	0.183126
S.E. of regression	0.169861	Sum squared resid	1.442641
F-statistic	3.867043	Durbin-Watson stat	1.970045
Prob(F-statistic)	0.014529		

Unweighted Statistics

R-squared	0.151400	Mean dependent var	0.835246
Sum squared resid	4.363063	Durbin-Watson stat	0.813930

Table 1D: Hausman Test

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	5.549683	3	0.1357

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
RESIDUAL_INCOME	-0.011111	-0.008366	0.000038	0.6575
LOG(PRICES)	0.219196	0.154517	0.002372	0.1842
EPS	0.011004	0.006417	0.000134	0.6923

6.2 Panel B: Raw Regression Results and Specification Tests

Table 2A: Raw Regression Results Pooled Least Squares

Dependent Variable: BETA
Method: Panel Least Squares
Date: 11/25/17 Time: 23:13
Sample: 2011 2016
Periods included: 6
Cross-sections included: 9
Total panel (balanced) observations: 54

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.008319	0.440366	0.018891	0.9850
CHANGE_IN_RESIDUAL_INCOM	-0.009702	0.006071	-1.598166	0.1163
LOG(PRICES)	0.075326	0.044582	1.689599	0.0973
EPS	0.006816	0.003483	1.957112	0.0559

R-squared	0.185455	Mean dependent var	0.835246
Adjusted R-squared	0.136582	S.D. dependent var	0.311463
S.E. of regression	0.289412	Akaike info criterion	0.429257
Sum squared resid	4.187968	Schwarz criterion	0.576589
Log likelihood	-7.589934	Hannan-Quinn criter.	0.486077
F-statistic	3.794656	Durbin-Watson stat	0.836187
Prob(F-statistic)	0.015768		

Table 2B: Raw Regression Results Fixed Effects Model

Dependent Variable: BETA
Method: Panel Least Squares
Date: 11/25/17 Time: 23:22
Sample: 2011 2016
Periods included: 6
Cross-sections included: 9
Total panel (balanced) observations: 54

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.312341	0.749927	-1.749957	0.0874
CHANGE_IN_RESIDUAL_INCOM	-0.006707	0.004484	-1.495875	0.1422
LOG(PRICES)	0.213335	0.077416	2.755688	0.0086
EPS	0.001588	0.007993	0.198642	0.8435

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.775911	Mean dependent var	0.835246
Adjusted R-squared	0.717221	S.D. dependent var	0.311463
S.E. of regression	0.165626	Akaike info criterion	-0.565033
Sum squared resid	1.152149	Schwarz criterion	-0.123037
Log likelihood	27.25590	Hannan-Quinn criter.	-0.394573
F-statistic	13.22051	Durbin-Watson stat	2.476933
Prob(F-statistic)	0.000000		

Table 2C: Raw Regression Results Random Effects Model

Dependent Variable: BETA
Method: Panel EGLS (Cross-section random effects)
Date: 11/25/17 Time: 23:23
Sample: 2011 2016
Periods included: 6
Cross-sections included: 9
Total panel (balanced) observations: 54
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.821130	0.622564	-1.318950	0.1932
CHANGE_IN_RESIDUAL_INCOM	-0.007765	0.003997	-1.942586	0.0577
LOG(PRICES)	0.161063	0.063086	2.553046	0.0138
EPS	0.004443	0.005735	0.774697	0.4422

Effects Specification	S.D.	Rho
Cross-section random	0.267792	0.7233
Idiosyncratic random	0.165626	0.2767

Weighted Statistics			
R-squared	0.195043	Mean dependent var	0.204479
Adjusted R-squared	0.146745	S.D. dependent var	0.178919
S.E. of regression	0.165271	Sum squared resid	1.365726
F-statistic	4.038367	Durbin-Watson stat	2.083598
Prob(F-statistic)	0.011978		

Unweighted Statistics			
R-squared	0.122913	Mean dependent var	0.835246
Sum squared resid	4.509529	Durbin-Watson stat	0.796027

Table 2D: Hausman Test

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	2.785656	3	0.4259

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
CHANGE_IN_RESIDUAL_INCOM	-0.006707	-0.007765	0.000004	0.6023
LOG(PRICES)	0.213335	0.161063	0.002013	0.2440
EPS	0.001588	0.004443	0.000031	0.6081

Cross-section random effects test equation:
Dependent Variable: BETA

Method: Panel Least Squares
Date: 11/25/17 Time: 23:24
Sample: 2011 2016
Periods included: 6
Cross-sections included: 9
Total panel (balanced) observations: 54

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.312341	0.749927	-1.749957	0.0874
CHANGE_IN_RESIDUAL_INCOM	-0.006707	0.004484	-1.495875	0.1422
LOG(PRICES)	0.213335	0.077416	2.755688	0.0086
EPS	0.001588	0.007993	0.198642	0.8435

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.775911	Mean dependent var	0.835246
Adjusted R-squared	0.717221	S.D. dependent var	0.311463
S.E. of regression	0.165626	Akaike info criterion	-0.565033
Sum squared resid	1.152149	Schwarz criterion	-0.123037
Log likelihood	27.25590	Hannan-Quinn criter.	-0.394573
F-statistic	13.22051	Durbin-Watson stat	2.476933
Prob(F-statistic)	0.000000		

6.3 Panel C: Raw Regression Results and Specification Tests
Table 3A: Raw Regression Results Pooled Least Squares

Dependent Variable: BETA
Method: Panel Least Squares
Date: 11/27/17 Time: 00:10
Sample: 2011 2016
Periods included: 6
Cross-sections included: 9
Total panel (balanced) observations: 54

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.157543	0.434032	0.362976	0.7182
RESIDUAL_INCOME	-0.010179	0.005567	-1.828433	0.0735
LOG(PRICES)	0.062714	0.043583	1.438933	0.1564
CFOPS	0.002980	0.001949	1.528676	0.1326

R-squared	0.235495	Mean dependent var	0.835246
Adjusted R-squared	0.189625	S.D. dependent var	0.311463
S.E. of regression	0.280381	Akaike info criterion	0.365855
Sum squared resid	3.930687	Schwarz criterion	0.513188
Log likelihood	-5.878096	Hannan-Quinn criter.	0.422676
F-statistic	5.133940	Durbin-Watson stat	0.922388
Prob(F-statistic)	0.003575		

Table 3B: Raw Regression Results Fixed Effects Model

Dependent Variable: BETA
Method: Panel Least Squares
Date: 11/27/17 Time: 00:10
Sample: 2011 2016
Periods included: 6
Cross-sections included: 9
Total panel (balanced) observations: 54

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.465568	0.743452	-1.971301	0.0553
RESIDUAL_INCOME	-0.006304	0.003773	-1.670851	0.1022
LOG(PRICES)	0.223798	0.075435	2.966755	0.0049
CFOPS	0.004024	0.004469	0.900364	0.3731

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.776179	Mean dependent var	0.835246
Adjusted R-squared	0.717559	S.D. dependent var	0.311463
S.E. of regression	0.165527	Akaike info criterion	-0.566230
Sum squared resid	1.150771	Schwarz criterion	-0.124234
Log likelihood	27.28821	Hannan-Quinn criter.	-0.395769
F-statistic	13.24091	Durbin-Watson stat	2.476332
Prob(F-statistic)	0.000000		

Table 3C: Raw Regression Results Random Effects Model

Dependent Variable: BETA
Method: Panel EGLS (Cross-section random effects)
Date: 11/27/17 Time: 00:12
Sample: 2011 2016
Periods included: 6
Cross-sections included: 9
Total panel (balanced) observations: 54
Swamy and Arora estimator of component variances

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.775215	0.581865	-1.332292	0.1888
RESIDUAL_INCOME	-0.005840	0.003552	-1.644200	0.1064
LOG(PRICES)	0.155238	0.058546	2.651547	0.0107
CFOPS	0.003636	0.002811	1.293410	0.2018

Effects Specification

	S.D.	Rho
Cross-section random	0.224267	0.6473
Idiosyncratic random	0.165527	0.3527

Weighted Statistics

R-squared	0.194010	Mean dependent var	0.240975
Adjusted R-squared	0.145650	S.D. dependent var	0.183367
S.E. of regression	0.169488	Sum squared resid	1.436305
F-statistic	4.011833	Durbin-Watson stat	1.987666
Prob(F-statistic)	0.012340		

Table 3D: Hausman Test

Correlated Random Effects - Hausman Test
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	5.421180	3	0.1434

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)	Prob.
RESIDUAL_INCOME	-0.006304	-0.005840	0.000002	0.7154
LOG(PRICES)	0.223798	0.155238	0.002263	0.1495
CFOPS	0.004024	0.003636	0.000012	0.9111

Cross-section random effects test equation:
Dependent Variable: BETA
Method: Panel Least Squares
Date: 11/27/17 Time: 00:14
Sample: 2011 2016
Periods included: 6
Cross-sections included: 9
Total panel (balanced) observations: 54

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.465568	0.743452	-1.971301	0.0553
RESIDUAL_INCOME	-0.006304	0.003773	-1.670851	0.1022
LOG(PRICES)	0.223798	0.075435	2.966755	0.0049
CFOPS	0.004024	0.004469	0.900364	0.3731

Effects Specification

6.4 Table 4A: Sample Data

Dates	*Company*	*BVPS*	*CFOPS*	*EPS*	*COST OF EQUITY*	*RESIDUAL INCOME*	*CHANGE IN RESIDUAL INCOME*	*BETA*	*PRICES*	*RETURNS*	**Ticker Sign**
2011	BAT	9.03	1.97	1.63	11.59	0.70	0.00	0.29	31198.64	0.40520	**BTI SJ Equity**
2012	BAT	7.84	1.92	1.61	9.32	0.77	0.07	0.13	41554.66	0.10682	**BTI SJ Equity**
2013	BAT	7.35	2.10	2.05	9.15	1.33	0.56	0.51	51380.66	0.26853	**BTI SJ Equity**
2014	BAT	6.42	1.95	1.92	10.00	1.18	-0.15	0.50	61171.53	0.12121	**BTI SJ Equity**
2015	BAT	6.17	1.85	2.18	10.05	1.53	0.35	0.52	71292.63	0.32192	**BTI SJ Equity**
2016	BAT	5.92	2.05	2.33	9.42	1.75	0.22	0.38	86312.18	-0.11505	**BTI SJ Equity**
2011	MTN	79.74	20.70	8.52	18.26	-6.07	0.00	0.99	13624.47	0.07177	**MTN SJ Equity**
2012	MTN	93.11	17.81	11.90	12.49	1.94	8.01	0.88	14701.47	0.21105	**MTN SJ Equity**
2013	MTN	101.92	19.94	12.56	10.37	2.91	0.97	1.06	18328.24	0.20046	**MTN SJ Equity**
2014	MTN	126.01	25.74	14.92	11.72	2.97	0.07	0.87	22310.33	0.02011	**MTN SJ Equity**
2015	MTN	137.87	35.13	16.63	10.78	3.04	0.07	1.25	19652.29	-0.50846	**MTN SJ Equity**
2016	MTN	143.94	21.24	1.43	11.15	-13.95	-16.99	1.37	12855.20	-0.05210	**MTN SJ Equity**
2011	TRUWORTHS	23.79	4.04	4.56	18.13	0.95	0.00	0.81	7216.12	0.06208	**TRU SJ Equity**
2012	TRUWORTHS	27.41	3.86	5.27	12.80	2.22	1.27	0.75	8993.78	0.35178	**TRU SJ Equity**
2013	TRUWORTHS	30.61	5.20	5.71	10.58	2.81	0.58	0.76	8988.05	-0.34763	**TRU SJ Equity**
2014	TRUWORTHS	32.75	5.97	5.73	11.45	2.23	-0.58	0.53	7437.81	0.00678	**TRU SJ Equity**
2015	TRUWORTHS	35.63	5.31	5.96	10.24	2.60	0.38	0.67	8784.23	0.16441	**TRU SJ Equity**
2016	TRUWORTHS	40.74	6.66	6.65	11.00	2.73	0.12	1.01	8598.10	-0.13515	**TRU SJ Equity**
2011	WOOLWORTHS	9.67	3.00	2.03	16.72	0.67	0.00	0.65	3101.42	0.44950	**WHL SJ Equity**
2012	WOOLWORTHS	10.73	3.71	2.57	12.24	1.39	0.72	0.73	5414.14	0.57862	**WHL SJ Equity**
2013	WOOLWORTHS	13.06	4.05	3.22	10.67	2.08	0.69	1.03	6681.46	0.00113	**WHL SJ Equity**
2014	WOOLWORTHS	16.14	4.91	3.35	11.15	1.89	-0.19	0.85	7127.63	0.08162	**WHL SJ Equity**
2015	WOOLWORTHS	30.36	6.16	3.71	10.47	2.02	0.13	0.89	9434.55	0.26052	**WHL SJ Equity**
2016	WOOLWORTHS	40.54	6.34	4.56	11.15	1.18	-0.85	0.96	8261.20	-0.34509	**WHL SJ Equity**

2011	SHOPRITE	25.24	5.57	4.97	15.97	1.62	0.00	0.78	10650.92	0.32534	**SHP SJ Equity**
2012	SHOPRITE	38.20	9.29	5.90	12.15	2.83	1.22	0.66	15508.20	0.39293	**SHP SJ Equity**
2013	SHOPRITE	51.75	5.27	6.73	9.78	3.00	0.16	0.75	17417.05	-0.22070	**SHP SJ Equity**
2014	SHOPRITE	59.92	14.10	6.98	10.78	1.40	-1.59	0.89	15529.17	0.02563	**SHP SJ Equity**
2015	SHOPRITE	67.49	10.57	7.72	10.52	1.42	0.01	0.85	16132.64	-0.16009	**SHP SJ Equity**
2016	SHOPRITE	78.24	6.61	9.02	10.90	1.67	0.25	0.82	17399.67	0.18041	**SHP SJ Equity**
2011	NASPERS	28.98	1.88	1.67	18.56	-2.96	0.00	1.05	37159.64	-0.09833	**NPN SJ Equity**
2012	NASPERS	30.04	2.20	1.37	14.09	-2.71	0.25	0.93	46718.62	0.42862	**NPN SJ Equity**
2013	NASPERS	29.21	2.72	1.61	11.43	-1.82	0.89	0.98	76376.92	0.70195	**NPN SJ Equity**
2014	NASPERS	31.42	0.56	2.09	11.73	-1.34	0.48	1.83	126330.84	0.32512	**NPN SJ Equity**
2015	NASPERS	32.95	0.57	2.86	11.51	-0.75	0.58	1.30	183369.89	0.33458	**NPN SJ Equity**
2016	NASPERS	44.80	0.00	2.28	11.73	-1.58	-0.83	1.35	212445.61	-0.05145	**NPN SJ Equity**
2011	SASOL	303.50	54.29	33.20	19.62	-20.10	0.00	1.09	35730.49	0.12567	**SOL SJ Equity**
2012	SASOL	363.78	60.23	39.01	13.31	-1.39	18.71	1.12	37073.84	-0.07516	**SOL SJ Equity**
2013	SASOL	425.19	78.19	43.43	10.95	3.59	4.98	0.86	44246.36	0.34934	**SOL SJ Equity**
2014	SASOL	507.12	94.45	48.85	11.77	-1.20	-4.79	1.33	56982.95	-0.17778	**SOL SJ Equity**
2015	SASOL	577.53	87.52	48.24	11.43	-9.74	-8.54	1.25	42419.24	-0.02720	**SOL SJ Equity**
2016	SASOL	642.06	72.96	21.64	11.88	-46.96	-37.22	1.24	40694.70	-0.05032	**SOL SJ Equity**
2011	VODACOM	20.94	10.56	5.62	15.34	2.86	0.00	0.67	8305.39	0.16693	**VOD SJ Equity**
2012	VODACOM	24.28	13.20	7.49	12.45	4.89	2.02	0.54	10385.61	0.31276	**VOD SJ Equity**
2013	VODACOM	27.44	13.63	9.04	10.41	6.52	1.63	0.71	11638.36	0.07007	**VOD SJ Equity**
2014	VODACOM	29.86	15.05	8.93	10.66	6.00	-0.51	0.51	12771.54	-0.03511	**VOD SJ Equity**
2015	VODACOM	29.81	14.07	8.74	10.24	5.68	-0.32	0.59	13965.86	0.17051	**VOD SJ Equity**
2016	VODACOM	31.78	16.24	8.80	10.44	5.69	0.01	0.38	15512.46	-0.00007	**VOD SJ Equity**
2011	TIGER BRAND	93.54	16.98	15.51	15.97	2.45	0.00	0.65	20201.59	0.27818	**TBS SJ Equity**
2012	TIGER BRAND	108.88	15.13	16.97	12.27	5.50	3.05	0.59	27032.42	0.24431	**TBS SJ Equity**
2013	TIGER BRAND	124.92	18.70	16.39	11.13	4.27	-1.23	0.95	29526.62	-0.19761	**TBS SJ Equity**
2014	TIGER BRAND	131.85	18.58	11.96	11.72	-2.69	-6.96	0.56	30291.34	0.32255	**TBS SJ Equity**
2015	TIGER BRAND	143.18	15.85	14.32	10.77	0.12	2.81	0.68	31758.40	-0.15051	**TBS SJ Equity**
2016	TIGER BRAND	156.98	18.74	16.17	10.85	0.64	0.52	0.83	35516.72	0.22981	**TBS SJ Equity**

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