Gordon Institute of Business Science
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Implied cost of equity, CAPM and financial services companies on the JSE; An empiric investigation.

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Abstract:

The CAPM has been in existence for almost 60 years and still conjures up robust arguments particularly from the sphere of business. The pertinence of the CAPM to academia is that it resides fundamentally in archival publications and there has been a dynamic shift from the sphere of business towards other more modern models for pricing assets.

The stamina of the CAPM eminates from its simplicity. It allows for relatively accurate estimations of requisite returns as well as costs of equity in a straightforward manner by using a single variable: the beta of the market.

The fundamental purpose of this research was to validate the CAPM in a modern world, using empiric testing and to assit in the determination of an implied cost of equity for financial services companies in the South African contect of the equity market.

One of the pertinent findings of the research was that calculations of market risk premiums are significantly higher than anticipated, and this appeared to be the case with the costs of equity as well. Further studies may well uncover the reasons for this discovery.

Keywords:

Capital Asset Pricing Model, All Share Index, Measurement, Cost of Equity, Company Valuations

Declaration:

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

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Contents

List of Tables

List of Figures

1. Introduction to the research problem

1.1 Research title

Implied cost of equity, CAPM and financial services companies on the JSE; An empiric investigation.

1.2 Research problem definition

Three notable American economists in Robert J Schiller, Lars Peter Hansen and Eugene F. Fama were in 2013 jointly awarded the Nobel Prize for Economic Sciences for the work they had accomplished in empirical analysis of asset prices. During their distinguished careers the three economists have offered often times conflicting research on the mechanics of financial markets and together have formed a group that is at times contradictory (Miller, Zambrun, and Magnusson, 2013). Fama has gained recognition for his work and expansion of hypotheses on the theories around market efficiencies, even as his biggest protagonist of his work has been Robert Schiller who regularly knocks holes in it using his own empirical testing and theories. Peter Lars Hansen has become renowned for his development and understanding of theories of asset pricing by using empirical data and statistical proficiency (Miller et al., 2013).

The apperception of Fama, Schiller and Hansen in 2013 by the Nobel Prize committee for the work that they have accomplished over a number of decades in the field of finance on pricing of assets, provided confirmation of the relevance of the study and its further exploration. The dynamic structure of the asset pricing model examination pricing has been advanced, with numerous scholars from all over the world over more than fifty years and is still vigorous and susceptible to further investigation.

The capital asset pricing model (CAPM) is the cornerstone used in the current theory incorporating finance. (Bodie, Kane, & Marcus, 2011). Despite the fact that the CAP model has failed a series of tests (Eugene F Fama & French, 2002), it still explains the apparent relationship between the return of an asset, and the risk of the asset. The link between the two aspects makes allowance for the comparison of different investments or assets and can be compared in order to determine a benchmark. This benchmark can be utilised to ascertain whether a share listed on the exchange exhibits a reasonable return considering its innate risk. The CAP model is principally utilised to evaluate listed companies, but can

just as easily be used to determine a surmised value for a company that is not listed by determining anticipated returns (Bodie et al, 2011).

Determining the value of a company or listed share and how to determine what a company is worth, is of significant importance to analysts, directors, employees, and shareholders. Valuations are important to companies as they are used when raising capital by selling shares, during acquisitions and mergers, and in share incentive schemes (Reilly, 2012). There are unfortunately numerous ways to obtain a company valuation that produce widely different results that give rise to questions about how accurate and valid the valuations are (Karsh, 2012). How accurate the valuations are, is compounded further by variables used in the majority of models that employ historical results, forecasts, or, underlying variable that are based on limited statistical testing (Eugene F Fama & French, 2002).

A frequently used method to determine a company's value in finance and accounting is the DCF or the discounted cash flow model. This model takes into account the funding of a company, debt and equity, and discounts cash flows expected in the future (Firer, Ross, Westerfield, and Jordan, 2012). By using an adjusted for risk discount rate is known in finance as the WACC or weighted average cost of capital, and can be determined using the capital asset pricing model equation.

Cost of equity in its discounted form is not used exclusively for valuation purposes only. Managers of investment portfolios are also evaluated by using average rates of return when compared to the SML or security market line. Additionally, in companies restricted by regulations, regulatory authorities use expected returns that are relative to risk so as to calculate the cost of equity. The cost of equity poses a significant impediment when capital budgeting decisions need to be considered (Correia & Cramer, 2008).

In spite of the widespread acceptance and implementation of the capital asset pricing model and the theory of cost of equity in the spheres of the business world and academic environment, it is dependant upon variables that are frequently guessed. The different components that make up the cost of equity are risk-free rate, beta, and the market-risk premium. It is possible to calculate beta and risk free rate, however the market risk premium does require supplementary examination (Ward & Muller, 2012).

1.3 Research motivation

The capital asset pricing model theory has been questioned from a number of different angles for many decades. The validity of the entire model has been cast into doubt by empirical academics, theoretical and even behavioural psychologists (Levy, 2011). Additionally, the market risk premium that is arbitrarily assumed when determining cost of

equity brings forth the possibility of manipulation and differing interpretations. The primary impetus of this project was to ascertain the implied cost of equity using pragmatic data and evidence. The study also aims to uncover if the cost of equity estimations typically used in South Africa are relatively accurate when the cost of equity rates of emerging markets, and in particular in the South African equity market could be elevated as compared to markets that are developed.

The anticipated returns from assets that is calculated using the capital asset pricing model equation is the foundation upon which the theory of valuation is based, and is one of the cornerstones of investment decisions and corporate finance. There is an ostensible relationship between return and risk of the capital asset pricing model, which has been extensively published for a long time. In spite of the ratification, there exist various studies in which this relationship is shown to either not exist or to be flimsy (Eugene F Fama & French, 2002; Montier, 2009; van Rensburg & Robertson, 2003), and there exists very limited statistical research that supports the capital asset pricing model (Ward & Muller, 2012).

A fundamental grasp of valuing companies that is based upon potential earning forecasts and the relationship with market value of an organisation that is determined by the index-listed price of the share is an imperative component of the analysis of equity (Gode and Mohanram, 2003). The relationship that exists when evaluating a company, and the realised earning potential of the company is found in using an expected return or the cost of equity, and is frequently used by analyst in doing their valuations.

The ephemeral essence of the cost of equity (Ashton & Wang, 2013) it is a requirement of valuation models to use mediary inputs. The two mediaries used most often are estimated implied cost of equities that is reliant on historic actual returns, or *ex post* gains, and estimated implied costs of equities that is established upon forecasted anticipated gains or *ex ante* gains (Ashton & Wang, 2013). Lamentably, these two mediaries are not a very precise evaluation measurement of the costs of equities based on the differing assumptions that are made as well as the models used in assuming the values.

One of the issues that the capital asset pricing model struggles with, is the theory that underpins the model is dependant on an *ex ante* beta, whereas the calculations in the model use an achieved or an *ex post* beta (Borgman & Strong, 2006). By utilising actual equity market returns as a mediary has been proven to be notably unreliable (F. Chen, Jorgensen, & Koo, 2004) and there could be more value in utilising more accurate estimations for the cost of equity. During the course of this study, using different mediaries for gains was maintained so as to endeavour at estimating a precise implied costing of equity, as well as attempt to obtain statistical evidence that is supportive of the CAP model.

Although there has been an overt use and acceptance of the cost of equity theory and the CAP model in both the business context and academia, the basis of a number of variables is still intelligent conjecture. Of the components that make up the equity equation are market risks premium, a risk-free rate, and beta, which is an indication of systemic risk. Beta provides a indication of the returns that an asset may earn as related to the returns that can be expected in the market (Ward & Muller, 2012). The first of the two factors to be considered in the cost of equity equation can be determined with justifiable accuracy and confidence, determining the market risk premium will require deeper probing.

The drivers of the difference in cost of capital estimation are of importance to finance managers and practitioners. Capital expenditure projects are undertaken on a regular basis as firms grow and invest. Ensuring that the greatest value for money is achieved in doing so is of importance to share holders, directors, and other important interested parties. By determining some of the drivers in the cost of capital estimations, better selection techniques can be developed in order to maximise shareholder value as the most profitable capital expenditure projects can be selected.

The work accomplished herein is a continuation of work done by Mike Ward and Chris Muller of the University of Pretoria's business school, the Gordon Institute of Business Science in which they tested empirically the CAP model on companies listed on the Johannesburg Stock Exchange (Ward and Muller, 2012), as well as work done by Paul Kempff in empirical testing of the CAPM on JSE listed companies (Kempff, 2014). In the two research projects mentioned above, future opportunities for further research were mentioned, namely cost of equity estimation and implied beta estimation. Considerable research has been done on implied beta estimation by Bergman and Strong in 2006, in the report titled "Growth rate and implied beta: interactions of cost of capital models" (Borgman and Strong, 2006). Studies focusing on the implied costs of equity and empirical analysis of this topic is limited, especially in a context of an emerging market.

The bulk of the work done around subject of the capital asset pricing model are specific to data and information on companies that call the United States of America their base. There is a body of work that encompasses countries outside of the US (F. Chen et al., 2004), however the majority of the information that is open to scrutiny is positioned towards companies that are located in North America . A study that was conducted by Hail and Leuz (2006) discusses differences across international boundaries that also included South Africa in its study, however the study's focus was on the efect of equities regulations and the efects of legal institutions on the cost of equity. The focus of this report is on financial services companies listed on the JSE in South Africa, a list of which can be examined in Appendix 1.

The aim was to develop a model to estimate cost of equity that could potentially be applicable to other emerging markets that have economy characteristics similar to that of South Africa.

1.4 Research objectives and outcomes

The aim of this project was to establish what the implied costs of equities of financial services corporations that are listed on the Johannesburg Stock Exchange by making use of financial statement data as well as the price of the company's shares over a period of 8 years from 2009 to 2016. The concept employed in this report differed from that of previous studies on the capital asset pricing model and earlier empiric studies, specifically the cost of equity. The assumptions of the efficient market theory (Fama, 1970) suggest that the market valuation of a company is an appropriate reflection of the actual value of the organisation over a long term period, which was utilised in this study as opposed to determining a value of the cost of equity and random mediary assumptions. The discount rate was calculated using the market value of a company and this implied discount rate in comparison to the valuation that was based on a factor of realised earnings and projected earning from the corporation.

The initial aspect to be considered in this study was to determine the valuation of a corporation as well as the cost of equity by using the conventional method using the discount cash flow and CAPM. By benchmarking the cost of equity, the implied costs of equity can then be determined. The secondary aspect of the research project, the previously computed valuation of the corporation and by re-arranging the capital asset pricing model equation, it was possible to determine the discounted rate of the calculated value that would be equal to the market valuation of a company that was a reflection of the price of the company share on a definitive date. In the determination of this discount rate and utilising the rearranged capital asset pricing model equation, it was feasible to determine the value of the cost of equity as an implication of the market value of the company and the actual financial data. During the third and final aspect of this study, a comparison was drawn between the data assimilated from the study on the implied costs of equity and the bench-marked cost of equity data points to ascertain whether a cogent contrast prevailed that could potentially produce a new definition of the market risk premium that was used in the cost of equity definition in the South African context. Additionally, the research project attempted to validate the capital asset pricing model by finding statistical data, specifically applicable to the South African by determining if a correlation between implied costs of equity and estimated costs of equity.

1.5 Scope of research project

Before commencing with the study, the method in which data was collated and processed needed to be determined. First of all, the number of companies that were to be included in the research as well as the selection criteria for the companies had to be determined. A decision was made to use financial services companies on the Johannesburg Stock Exchange All-Share Index (ALSI) on 31 January 2017. The data required was obtained electronically and includes financial statement data as well as share pricing and market value data, which were obtained electronically.

Concurrently, a rigorous study of the theory of the capital asset pricing model was done in the literature review. An initial consideration of all relevant literature pertaining to the statistical testing on the cost of equity, but this was reconsidered to only include literature relevant to the South African and emerging market context.

The step that followed was the construction of a spreadsheet that made it possible to add different variables so as to determine the implied costs of equity that was relevant to the study. The statistical analysis then followed which hoped to answer the research hypotheses and research questions with the aim of concluding meaningful research.

The proposal will be conducted in the following manner: the first chapter will give an introduction to the problem being researched. The second chapter will review the theory that the research aims to build upon. The third chapter will present the research questions and hypothesis. The methodology that will be implemented in the research project will be discussed in the fourth chapter. It will contain a description of the design of the research, the process of collection of data, sampling used as well as the population. Chapter 5 has a summary of the results of the study undertaken, followed by the statistic analysis of the salient data, and a discussion around the results obtained in chapter 5 was done in chapter 6. The conclusion of the research was detailed in chapter seven and highlights the application of the finding and possible future research opportunities.

A portion of the data that was utilised as well as some of the results of this research were not practical for inclusion in the report, due to the large size of the spread sheets. Had they been included, they would have added an additional two hundred pages to the study. A small selection of samples of the data are reproduced in this report, while some of the data was appended in this submission, while the balance of the data relevant to the research is submitted in a electronic excel spreadsheet.

2. Literature Review:

2.1) Introduction:

The theoretical relationship that exists between return of an asset and the risk of the asset in financial markets will be explored in the literature to be reviewed for the research proposal. The literature will broadly encompass the perception of risk and the manner in which that risk is recompensed in the market. It will be used to describe the CAP model, which endeavours to predict the expected return of an asset and its relationship with the exposure of owning it (Markowitz, 2005). Reviewing the CAP model as well as testing the model empirically over a period of time is vital as they provide the basis of the framework for this proposal.

An applicable discount rate such as the WACC is calculated utilising CAP model, and it utilised in calculating the future cash flow values in an organisation (Hillier, Clacher, Ross, Westerfield, & Jordan, 2014). During the second section of the literature review, the empirical testing that has been done on aspect pertaining to the discount rate, namely the cost of equity will be discussed.

2.2) History pertaining to capital asset pricing model

Harry Markowitz, during his work on portfolio selection in 1952, put forward an idea of return frontier versus efficient risk (Markowitz, 1952). His work is the cornerstone in the advancement of theory in CAP model in his analysis of mean efficiency. The contribution made by Markowitz is further broadened by John Lintner (Lintner, 1965) and Fischer Black (Black, Jensen, and Scholes, 1972), William Sharpe (Sharpe, 1964) and has resulted in the evolution in the theory of CAPM and has lead to the bestowing of the Nobel prize to Sharpe and Markowitz for the benefaction to finance and economics provided by them (Levy, 2011).

The CAP model can be used as a forecasting tool in attempting to balance anticipated return on assets of high risk (Sharpe, 1964). It aims to try to portray a relationship between anticipated future returns of assets and the risk of maintaining the asset over a predetermined time (Berger, 2011) The basis of these relations and the CAP model can be discovered in the endeavours that Harry Markowitz made in portfolio choices that were established on expectations of the portfolio performance into the future (Berger, 2011). The paper that he authored on mean-variance efficiency (M-V) analysis has been cited many times, and has constituted the basis of numerous studies in academia in the spheres of

economics and finance and has had a significant influence in the corporate finance sphere (Levy, 2011).

Of interest is in noting that the majority of authors on the subject appear to concur with the contributions made by Harry Markowitz, and that he formed the infrastructure on which the foundation is built, the credit given for the expansion of knowledge of the capital asset pricing model is attributed to various individuals. Bodie, Kane, & Marcus, (2011) opined that Lintner, Sharpe and Jan Mossin be credited with the model's conception (Mossin, 1966). French and Fama talk about the work of Lintnet and Sharpe, but also mentioned by them is the contribution made by Black in his zero beta model (Black, Jensen, and Scholes, 1972). In their respective studies, Black, as well as Ward & Muller credit Jack Treynor in manuscripts that were never published dated 1961 with the title of "Toward a theory of market value of risky assets" and Market value, time and risk" (French, 2003)

2.3) Definitions of concepts

A concise explanation of some of the concepts and terms used in the proposal will be imperative before the literature review can be continued.

CAPM

The element of risk in an asset is an appropriate point at which to begin the definition of the CAPM equation. When holding a share, there are two types of risk that are categorised as systematic risk and unsystematic risk. The systematic risk is referred to as the rate of response of a share in when compared to the gains of the portfolio market in its entirety. It is frequently represented as a coefficient of beta (Hillier et al., 2014). In the security market line (SML) the beta coefficient is the first component of an equation that results from charting the beta coefficients and the expected returns of a share and describes the relationship between expected returns and systematic risk in financial markets.

The different aspects of the capital asset pricing model are as follows:

- ***Re*** – defining the cost of equity or the expected returns for the share
- ***Rf*** – defining the market risk-free rate
- ***Be*** – defining the systematic risk of the share or the beta of the asset in its relation to the market

- ***Rm*** – ***R*** – defining the disparity in the risk-free rate and averages of forecasted returns of the equities which is alternatively known as the market risk premium

The tangent resulting from plotting of the divergent return and co-efficients of beta result in the SML equation, and if rearrangement of the different components of this equation is completed, we are left with the CAPM equation (Hillier et al., 2014) and is represented as:

$$Re = Rf + Be(Rm - Rf)$$

The equation illustrates that the anticipated share return is dependent on 3 significant facets (Hillier et al., 2014):

1. Risk-free rate which is a measurement the time-value-of-money
2. The market risk premium as a benefit of taking on systematic risk
3. The beta coefficient, which is a measurement of the mount of systematic risk of a specified asset, compared to the average asset risk profile.

Cost of Capital

Analysing CAPM was, at first, done by examining beta coefficient in its indication of risk innate in assets, for an individual who holds shares in that asset, and its link between the anticipated asset return, and the risk of the asset. The anticipated return that a shareholder gains from assuming the risk of investing in an asset is conversely , to the company that issued it, the cost of that asset (Hillier et al., 2014). The definition of the cost to the company that issued the asset is called the cost of capital, which comprises two separate factors: costs of equity and costs of debt.

The cost of equity is computed through various ways and includes the SML approach and the dividend growth model approach (Correia and Cramer, 2008). In the course of this paper, the SML approach, as illustrated earlier in the report, will be utilised in the cost of equity calculation. In some academic literature, it is important to note that the term “cost of equity” and “cost of capital” are used interchangeably (Borgman & Strong, 2006; Hope, 2002). For the scope of the research project, cost of equity will be utilised exclusively. The phrase cost of capital, for the purposes of this report, will be in the context of WACC as a combination of the costs of debt and equity simultaneously.

WACC

The consolidation of cost of equity and the cost of debt in an organisation that is computed in a measure equal to the measure of equity against the measure of debt in the organisation gives the WACC. The weighted average cost of capital can be utilised as an applicable discounted rate when determining cash flows in an organisation. WACC is the discount rate most often utilised when doing discounted free cash flow valuations on an organisation (PwC Corporate Finance, 2012). Using symbols the weighted average cost of capital (WACC) is illustrated as follows:

$$\mathbf{WACC = (W_{debt}(1\text{-}t)K_{debt}) + (W_{preferred}K_{preferred}) + (W_{equity}K_{equity})\ (1)}$$

Where

K = component cost of capital

W = weight of each component as percent of total capital

t = marginal corporate tax rate

For the sake of clarity, this formula incorporates a minimum number of sources of capital; it is possible to expand upon the formula to incorporate other income sources, should the need so arise.

The theory of finance offers many pertinent insights went the weighted average cost of capital is being estimated. Firstly, it is important to calculate the capital costs in their current state that reflect current financial conditions, and should not be sunken or historical costs. Essentially, each form of capital associated with the inferred internalised rates of return on anticipated cash flows should equal the capital costs. Secondly, the weighting that is used in the equation should reflect the weights used in the market, and not weights based on historic, arbitrary values that are out of date. Thirdly, when calculating the cost of debt, the benefits of tax deductions of interest should be used to illustrate the benefit.

In spite of finance theory guidance, using the WACC in estimation calculations of an organization cost-of-capital, often presents a number of challenges, the most pressing of which is the cost of equity-capital. Conflictingly, yield from bond markets are easily available, but no such record is available for equities. This results in practitioners having to rely on cost

of equity-capital methods that are unreliable and indirect (Bruner, Eades, Harris, and Higgins, 1998).

Implied versus Estimated

Cost-of-equity valuations are always estimations. This, is due to the fact that the elemental aspects of the cost of equity rate will be assumed and are inherently challenging to quantify accurately (Eugene F Fama & French, 2002). For the purposes of this report a judgment is made between estimated cost-of-equity and implied costs of equity. Implied cost of equity refers to the amount that is a determination of the market value determination made of the organisation and by rearranging the CAP model equation, as the methodology employed in this proposal. The estimated cost-of-equity will be calculated from the CAP model equation and the three components which are the beta, the risk free rate, and the market risk premium.

2.4) Underlying assumptions of the CAPM

In its basic form, the CAPM make assumptions on various aspects that simplify the CAP model to a manageable level (Bodie et al., 2011). Some of the assumptions are listed below:

a. The number of potential stockholders is high and individual trades do not influence prices of shares.
b. The holding period for investors is the same
c. There are no transaction costs and no taxes are paid on returns
d. Investments are limited to shares and bonds that are publicly traded and traders are able to access loans at a predetermined risk-free rate
e. All of the traders are rational and utilise the mean variance optimiser
f. All traders have a view of the economic world that is similar and they analyse shares in the same way.

The hypothetical world created by the assumptions listed above ignores the complexities existent in the real world and will require testing empirical in nature to establish that the model is applicable in the real world (Eugene F Fama & French, 2002). A number of

academic studies and tests done on the CAPM have changed and updated the assumptions in an endeavour to align it with real world situations (Leland, 1999).

2.5) Literature pertaing to the CAPM

There is a body of work that has been conducted on the CAPM in general, and there has also been a body of work that focuses on the empirical research on the cost of equity. In compiling this report, a distinction will be made between the two bodies of work. The report being compiled here is more closely related to the empirical testing of cost of equity. CAPM as a subject has been comprehensively analysed and covered by two contemporary studies and one earlier study, which is the most highly respected and focuses on the validity of the CAPM theory. The review of the CAPM will be done with the three studies mentioned earlier as the context, with other literature also referenced as need be.

Fama and French (2002) have contributed significantly to the CAPM body of work. The CAPM has been subjected to an increasing number of criticism and attacks which have resulted from empirical studies in finance and economics in which the outcomes of these tests have all but invalidated the CAPM (Eugene F Fama & French, 2002). Of the modern research of CAPM, most confer that the outcomes produced by Fama and French in 2002 is the most comprehensive on the topic (Levy, 2011). Speculation by Fama and French firstly that large numbers of assumptions that assist in simplifying the model (as mentioned earlier) result in theoretical shortcomings and that secondly due to the complications when trying to implement valid tests of the model (Eugene F Fama & French, 2002).

Of the criticism Fama and French brought forward in their investigations on the CAPM assumptions are that risk free borrowing and unconditional short selling is not realistic and that share holders will always be in agreement with one another and always act in the same way. This criticism does not singularly annul the CAPM as is illustrated in French and Fama who proffered that of all the models in asset pricing, require to be tested with actual data from real world instances.

Furthermore, French and Fama expound that many of the investigations on CAPM revolve around a trio of assumptions that commence from the relativity between risk and anticipated returns. The first assumption is that the anticipated returns of all assets are related directly to the beta value and no influence by any other variable is observed. The second assumption is that a positive beta premium exists which implies that the anticipated return from assets,

the returns are uncorrelated with the market return are exceeded by the expected return from a market portfolio. The third assumption as illustrated by the Sharpe-Lintner CAP model (Lintner, 1965) regarding the beta premium as the anticipated market return less the risk-free rate and that uncorrelated market assets have anticipated returns that are equal to the risk free interest rate.

The majority of the earlier tests of these models used one of two tests, namely time series regression or cross section testing. When testing was done on risk premiums, approximations used for individual asset betas were often the cause of measurement errors due to their imprecision. The results from regression testing had residuals that proved to have variation sources, such as the effect of different industries on return averages (Wen, Martin, Brien, & Lai, 2008). In an attempt to correct the inaccuracy of the beta estimations, a few researchers began to work with portfolios as opposed to individual securities (Fischer Black et al., 1972; Blume & Friend, 1973). In so doing, this group did receive a lower range of betas, and also reduced the statistical strength of these tests.

A method was introduced to address the issue of correlation of residuals. This was done by Fama and Macbeth (1973) by implementing a time series analysis of cross section regressions done on a monthly basis of the anticipated monthly returns on betas as opposed to single estimations (Eugene F Fama & Macbeth, 1973). The Sharpe-Lintner version of the CAPM was rejected as well in early empirical testing. The excess returns of an asset showed a positive relation between the average returns and beta however this relationship was confirmed in time series tests to be too flat (Fischer Black et al., 1972). Fama and French in 2002 used 912 company returns on 10 beta sorted portfolios that ranged from the year 1928 up to the year 2003 to update their evidence.

Fama and French observed and concluded early on that the CAPM as described by the Black version which states that market betas are acceptable to explain anticipated returns as well as a positive value for beta for the risk premium appears to be valid. However, the Sharpe-Lintner CAPM which states that the anticipated return minus the risk free interest rate is the premium per unit of beta is rejected consistently (Eugene F Fama & French, 2002). Further studies conducted during the 1970's by Basu (1977) and Banz (1981) denounce the CAPM put forward by Black. Fama and French did confirm from the studies by Banz and Basu as well as other research that momentum, size, earnings price, book to market ratios as well as debt equity all contribute to aspects of the relationships that exist between beta and anticipated return.

Levy approaches the CAP model using the point of view of a behavioural economist as well as the point of view of a psychologist. In his article, he considers research conducted by Tversky and Kahneman who showed that typically, an investor does not always behave in a

rational manner and not efficient in nature (Kahneman & Tversky, 1979). The implication of this assertion, is that part of the foundation of the CAP model are invalid, and by default, do not have any justification in theory.

By classifying the central empirical and objections in theory of the CAP model, Levy continues to overcome the criticism each in turn. Levy's idea to assessing the CAPM focuses on the theory of Expected Utility as proposed by Morgenstern and Von Neumann in 1953. According to Levy, the mean variance (M-V) efficiency analysis as put forward by Markowitz and the capital asset pricing model are derived from the expected utility theory. By extrapolating that aspersions of the expected theory model discredits the legitimacy of the CAPM as well as the M-V rule (Levy, 2011).

Levy has a detailed explanation of how the criticisms are not valid or inapplicable and concludes that no conclusive evidence exists that any of the criticism completely invalidate the CAP model. Levy goes on to state that the empirical results are not conclusive as parameters used in the tests are "after the fact" and that the theory underpinning the CAPM is "before the fact" or projections. Levy further purports that the empirical tests of Fama and French (2004) prove that negative relationships between variables can be altered to positive relationships by differentiating the data into alternate time periods (Levy, 2011).

Levy cites the study of Richard Roll during 1977 that illustrates the only applicable analysis of the CAP model is if the market portfolio that is employed is mean variance efficient (Roll, 1977). The differences between "before the fact" and "after the fact" parameters are again illustrated by Levy and how by manipulating the observed parameters that market portfolio is mean variance efficient thereby implying that the CAPM is valid. Roll had utilised a reverse engineering proposition for his methodology for the tests. Roll worked from a supplied market proxy portfolio, and by minutely adjusting the parameters, he positioned the proxy portfolio on the mean variance efficient line. He concluded that only the minute adjustments in the parameters are required to attain the M-V efficient frontier, and that the CAPM remains valid as market portfolio efficiency cannot be rejected.

In the conclusion of his study, Levy states that CAPM, in terms of psychology and behavioural economics, cannot be rejected as he had rejected the criticisms against CAPM. Additionally, when using "before the fact" parameters as opposed to "after the fact" parameters, CAPM cannot be rejected on empirical basis. Levy is of the notion that CAPM is resolutely supported with "before the fact" parameters and further concedes that estimating the "before the fact" parameters is extremely difficult. All theoretical models have great difficulty in estimating the parameter (Levy, 2011).

Berger's study is similar to Levy in that he confers that using "after the fact" parameters instead of "before the fact" parameters is questionable. This makes the assumption that predictions of returns are closely associated with observed returns. Berger points out many research papers that dispute observed returns' validity as an intermediary for anticipated returns in pricing models that are utilised for assets. Elton (1999), had argued in his paper that periods longer than ten years where financial instruments under achieved the risk-free-rate served to confirm that actual gains in the market returns can not be utilised as a 'before the fact" expectation. Claus and Thomas (2001), in their study found that a very low equity premium of approximately three per cent when comparing prevailing market values to anticipated earnings of those firms. Further research (Fama & French, 2002; Petkova and Zhang, 2005) proved that by rejecting the CAP model on the basis of realised returns, the CAPM is not rendered invalid and that research that is based on expected returns support the model strongly.

Considering all the evidence that disproves the observed or realised returns, Berger investigated the achievement of the CAPM using a different proxy for anticipated returns. He focused on CAPM beta's ability to clarify returns across book and size of market portfolios. During his research, Berger studied both fundamental returns and observed returns and as was expected the test results that utilised observed returns illustrated a failure of the CAPM. Additionally, there was substantial abnormal attainment in a sizeable number of stock portfolios. No evidence could be found that supported the notion that high beta portfolios surpassed portfolios with low betas when comparing average returns. Fama & French (2002) using fundamental returns was supportive of Berger's test giving support to the CAPM and illustrated that low beta stocks were outperformed by high beta stocks when looking at average returns (Berger, 2011).

2.6) Literature pertaining to cost-of-equity empirical testing

The following section of the literature review will focus on illustrations of the empirical examination of cost-of-equity as has been covered in prior academic research. The fundamental body of effort that has been done on cost of capital is the work done by Modigliani and Miller which was presented during 1958 in which they presented their Proposition I and II (Livingston, 2014). Proposition I infers that a firm's cost of capital, and concomitantly, its market value are not dependent on its structure of capital. Proposition II explains that the cost-of-equity of a firm rises proportionately as its debt to equity ratio rises. The propositions assumed that no corporate income taxes were applicable to the firms.

Modigliani & Miller (1963), made a correction to the paper published earlier and inferred that a levered firm, or a company with debt was of a higher value than that of a company with a capital structure comprising of only equity. This is due to the tax shield that the levered company benefits from on their debt. Expounding on the contributions made by Modigliani & Miller (1963) Hamada (1972) acquainted the idea of having two types of beta, namely levered beta and asset beta for use in valuing a company. This separated the financing exposure of a firm from the operating risk. The different betas put forward by Hamada (1972) are frequently utilised to adapt the betas of individual firms that are in the same sector of the economy to accommodate for the leveraging anomalies that are prevalent in two firms (Livingston, 2014). Additional research done on leverage and its effect on costs of capital was added by Miles and Ezzell (1980). They inferred that debt-rebalancing policy of a company drives the debt shield of corporations (Harris and Pringle 1985).

When attempting to determine costs of equity rate by empiric testing, the value is frequently assigned as an implied equity cost. Easton (2007) had defined the implied cost of equity as anticipated future pay off to share holders equated with internal rate of return. Borgman & Strong (2006) in their definition of inferred equity cost, the internalised rates of return is commensurate to the net present value of anticipated future cash flows of the equity price currently. In research conducted in finance and accounting, the utilisation of the implied costs of capitals is rising where it can be applied in testing of international asset pricing models and default risk pricing. Easton (2007) also highlighted the problems associated with using realised returns as a proxy for anticipated returns as was discovered in many other earlier research work.

Easton, during his study, utilised the valuation model based on discount cash flow in order to calculate an implied cost of equity but his method differed in that he used the abnormal variation model as well as the residual income variation model in his determination. Easton made an admission to the fact that the costs of equity implied rates that were established upon the theory he put forward were flawed, he however advanced that the rates he utilised were potentially more accurate as the rates were founded on better alternates of market expectations that the returns that were realised and conceivably more meticulous (Peter Easton, 2007). Alluding to information from Gebhardt, Lee, & Swaminathan, (2001), as well as from Lee & Frankel, (1998), Easton proffered cost of equity may be reasonably estimated and a correlation may be drawn with future returns, specifically when minute ameliorations have been made as is evidenced by Levy in his statistical study of the capital asset pricing model. Of the errors in measurement that Easton thought to be ambiguous was the disquiet of the equity price of the company of the stock and this facet of the implied cost of equity justified a more thorough and intense scrutiny.

Because the concept of cost of equity is ephemeral, this necessitates the use of alternates in order to estimate its value. The most frequently used alternates are costs of equity built upon forecasted expected returns and equity costs based on realised returns from the past (Ashton & Wang, 2013). Most statistical research studies utilise a cost of equity implication built on forecasted returns as the evidence contrary to costs of equity based on realised returns is poignant (Elton, 1999).

The issue in utilising this approach is that in using a terminal valuation, all infinite potential cash flows emanating from the asset is eliminated. According to Ashton & Wang (2013), the veracity of the costs of capital that is implied is conditional upon the growth rate assumptions, that is also used for calculating the discount rate for the cash flow terminal value. A study concluded by Ward & Muller (2012), illustrated that South African companies have a significantly higher growth rate and this further impedes the ability to test the implied cost of equity by means of a discounted cash flow valuation. The majority of opinions concluded around the subject of costs of equity that is implied utilise the rate of growth as a peripheral restriction. The studies concluded by Easton, Taylor, Shroff, and Sougiannis (2002), Easton (2007), have attempted to concurrently appraise the growth rate and the cost of equity.

Another attempt to calculate the future value of cost of equity estimation put forward by Borgman & Strong (2006) used the capital asset pricing model that used a beta that was implied by calculating specialist forecast values of future growth taking into account both future growth and earnings by endeavouring to obtain a more definite cost of equity with the knowledge of the shortcoming of historic data calculations. In the course of their study, they utilised a WACC that formed the basis of the theory of no arbitrage as put forward by Modigliani & Miller (1963), and took account of the cost of equity and debt prepossessed to the ratio of debt of the company, and further adjusted for the deductions of tax of the debt interest accrued.

Borgman & Strong (2006) made an effort in calculating the implied beta, and in so doing made an interesting observation with regards to the calculations of cost of equities and using rates of growth in the CAP model. The two of them proffered that the use of *ex-ante* rates of growth (forecasts) was more sensible than achieved growth rates based on *ex-post* rates from historical data. The findings that the assertions are based on, imply that there is no constancy in the potential long term earnings that extends past contingency (Chan, Carceski, and Lakonishok, 2003) and predictions of potential growth fare better than previous growth rates (Van Der Weide and Carlton, 1988). Borgman & Strong (2006) make additional assumptions that when considered over a long term period, organisations have a tendency to earn the value of their cost of equity. Should the companies earn less than their

cost of equity, they will be doomed, and should they earn higher, the value of their stock will be bid higher and as a consequence, their return of equity will be reduced (Copeland, Koller, and Murrin, 1995; Damodaran, 1994). By implication of the above statement, the long term expected return or cost of equities should be the same as its return on equities (Borgman & Strong, 2006).

In the conclusion of the study by Borgman & Strong (2006), they state that the betas of a share and the growth rate are analogous and that when the two most accepted ways of determining the costs of equities, i.e. the capital asset pricing model and the discounted dividends model, there is a possibility of estimating the implied betas by forecasting growth estimations. Borgman & Strong (2006) further claim that for companies in transition or in industries that are changing, the implied beta were superior alternates to utilise in the calculation of the cost of equities.

Increasingly used now as management tools, shareholder-value-add (SVA) is an additional contingency to experiment with the functional utilisation of the capital asset pricing model and categorically determine an exact and pertinent cost of equity (Hope, 2002). Shareholder-value-add actualised when the earnings of a share exceed the cost of equity and shareholder-value-add is destroyed in the opposite scenario. Decisions that are made regarding risk management, capital management and resource allocation should be driven by cost of equity values. Companies bereft of a cost of equity, make decision making around resource allocation, capital management as well as risk management very difficult. Some scholars are of the opinion that the capital asset pricing model weakness stems from the controversy in determining, with accuracy, the aspects that comprise the cost of equity i.e. risk free rate, the market risk premium and the betas (Hope, 2002) and it is therefore recommended that a different approach be taken. One suggestion of an alternative angle is to utilise the internals of measures of risks, estimate of earning growths and potential leverage to determine a infinite value of the equities and to calculate a return that is risk adjusted (Hope, 2002). There are parallels between the approach recommended above and the method to calculate the discount cash flow valuation utilised during the conclusion of this research report.

A large number of research reports into the cost of equity have the subject defined as the cost of equity, however what was studied was the cost of equity calculations and the specific effect of a variable. Of the variables that are included are earnings smoothness (McInnes, 2010), shareholders privileges (K. Chen, Chen, & Wei, 2011), and dividends tax (Dhaliwal, Krul, Li, & Moser, 2005) as well as cost of equity trading options. The above mentioned studies all provide invaluable observations in the cost of equity calculations, as well as the various model and assumption that were utilised in the calculations and practical

ramifications in the costs of equity computations devoid of any focus on shortcoming of the estimation model utilised and consequentially the capital asset pricing model.

The approach that was developed by Gebhardt et al., (2001) in cost of equity estimations entail the determination of the internal rate of returns where an intrinsic value of a company is equal to the price of a share which is presupposed by forecasted analysts earning. The Edward Bell Ohlsons residual income valuation models in order to determine the implied costs of equities. They also presuppose as had been reported by earlier researchers (Liu, Nissim, and Thomas, 2002), it appears that from the fourth year to the twelfth year of the forecasted horizon, the return on investment regresses to the mean of the industry and then remains infinitely consistent assuming that the dividend pay out assumption is one hundred per cent. Another assumption put forward by Gordon and Gordon (1997), is that a the return on equity of a company merges to the point of cost of equity when the time elapsed reaches four years. An additional alternate assumption is that market forecasts and analysis of terminal values remain constant (Botosan and Plumlee, 2002).

There is some evidence that exists, that implies that dependant on what industry a company operates in, will play a role in the estimations of the costs of equity. A study conducted in the insurance industry lends support to this concept (Wen et al., 2008). In the study concluded by Wen et al. (2008), a variation was developed on the capital asset pricing model that was established by distributed returns that were asymmetrical. A claims process that was asymmetric in these companies, which resulted in substantial errors when implementing the capital asset pricing model, caused this. The insurance industry specific model that was developed was based on the work done by Rubinstein (1976), and Leland (1999), and was named the R-L model and factored in other elements of risk such as higher moments, kurtosis, and skewness. Some interesting results were yielded by the implantation and use of the alternative model, according to the researcher. By utilising the R-L model, significant difference of the estimations of market risk for insurance companies, illustrating that return depart strongly from the normal distribution and is also applicable for smaller insurance companies. The conclusions that were drawn were that the R-L model was more applicable and relevant than the capital asset pricing model for the insurance companies whose returns were asymmetrical or when the insurance companies were small.

As already alluded to in this literature review, valuations of companies is presented with numerous difficulties when the capital asset pricing model and cost of equities is used to value a company. The valuation of private companies further compounds the issue. (Livingston, 2014) .A lack of transparency and the illiquid nature of private companies make the determination of the discount rate even more complex. The majority of investors in private companies, due to the small size, demand a premium, and will lead to an increased

cost of equity that insufficient access to a public market, and the loss of the ability to diversify. Discussed earlier in the literature review, unlevered and levered beta has a limited scope on public companies. For private companies, the capital asset pricing model could be adjusted to compensate for specific risk factors that are particular to private companies. The possibility of using the beta of a public company that is comparable to the private company, may be possible by adjusting the differences in debt, and making adjustments for size factors and illiquid companies (Livingston, 2014).

Numerous studies that have been conducted recently, have explored the cost of equity reliability estimations (McInnes, 2010). The studies conducted by Botosan & Plumlee (2002) as well as Easton and Monahan (2005) determine the accuracy of costs of equity by using different methods. The majority of the studies interestingly utilise the forecasted returns in their calculations. The study conducted by McInnes (2010) noted the earning smoothness and its effect on the implied costs of equity that utilised the actual returned in his experiments. During the course of his study, McInnes was not able to find any correlation between average stocks return and earning smoothness over a thirty year time span which is in stark relief the accepted idea that earning smoothness results in reduced costs of equity (McInnes, 2010).

The bulk of the research that has been carried out on costs of equities are on companies based in the United States. Gregory and Michou (2009) investigated the cost of equity in the United Kingdom, in their work titled “Industry cost of equity capital: UK evidence”. They based their approach on appraising the costs of equity on the Fama and French methodology that utilise the rolling and static versions of the capital asset pricing model. They expound on the Fama and French study as well as analyse numerous other alternate models including Fama-French 3 factor model (1993, 1995, 1996) the Caharts 4 factor model (1997), as well as simple market-adjusted return model, and conditional version of the capital asset pricing model. The argument put forward by Gregory & Michou (2009), casts aspersions on the capital asset pricing model with significant errors when making estimations of cost of equity, regardless of the models that were used. In their conclusion, however, they do concede that despite the noise around the estimates, the models do offer a solution that is compelling as opposed to making the assumption that betas are equal for all firms at one. A study conducted by Claus and Thomas (2001) investigated the stock markets of developed countries namely France, Germany, Canada, United Kingdom as well as Japan. The results that they achieved were analogous with the results whose headquarters are located in the US.

Even though the bulk of costs of equity studies have been conducted on companies whose headquarters are located in the US, the application of the studies to international studies

may not be detracted by this fact. Capital markets are increasingly becoming globalised, and strategies used in investment has indicated that various other countries could use similar valuations models with minor adjustments to compensate for unique factors in their given markets (Trombetta, 2004). The kind of training and tuition that financial analysts receive in countries with large and significant stock markets should bear many similarities across the globe. The majority of implied costs of equities when compared to different countries from around the world reveal many similarities in the valuations methodology in various countries (Chen et al., 2004) even though the earning based valuations methodology utilised may be dependant on the interpretation of the analyst in their specific reporting environment.

2.7) Literature pertaing to cost of equity empirical testing – South Africa

Empirical tests on South African companies have been insufficient and have done little to support the CAPM. Van Rensburg (2002) opined that most prior finance research in South Africa had been biased in favour of finding that no relationship exists between prescribed economic variables and JSE share returns. He further concludes that the JSE is not M-V efficient and that the CAPM is not a valid tool for the South African equity market (Van Rensburg, 2002). He is of the opinion that the arbitrage pricing theory (APT) model is more suited to the South African equity market. In the year that followed, van Rensburg and Robertson (2003) emulated the method employed by Fama and French in analysing the JSE empirically over a time period of ten years from 1990 to 2000 and discovered both a price to earnings effect as well as a size effect but came to the conclusion that the results did not support the CAPM (Ward & Muller, 2012). Another study conducted by Gilbert, Kruger, and Strugnell (2011) analysed data from 1994 to 2007 and the results were similar to the previous research.

Samouilhan (2007) was responsible for an investigation in which the risk and return relationship of companies that were JSE listed was examined. He confirmed in his research the lack of empirical testing conducted on the South African equity market and referred almost entirely to international research, which illustrated the same. Samouilhan (2007) utilised a 2 factor inter-temporal CAPM which was building upon the contributions of Merton (1973). What he discovered was there was a reward in history for taking exposure on the equity market in South Africa, which provided rudimentary support for the CAP model theory.

Ward & Muller (2012) employed a method of constructing five equally weighted portfolios using the ranked-beta methodology and scrutinised the 160 largest organisations listed on the JSE dating from 1986 up to 2011 and interestingly determined an inverted correlation among returns and beta. The findings of the researchers, in their opinion, made the single-factor CAPM obsolete for the equity market in South Africa (Ward & Muller, 2012).

Of all the aspects encompassed by the CAPM, this literature review covered all the facets that are relevant to this research report. Literature relevant to the subject of CAPM spans more than 6 decades, and is phenomenally diverse, and including all of the research would be impossible. Thus, the intent was to incorporate the most relevant and pertinent research to the research problem.

2.8) Arbitrage pricing model – South Africa

The Arbitrage Pricing Model (APT) is a model that focuses on one period and is concerned with capital-asset returns that are guided by the factor structure. The theory was initially put forward by Ross (1976), as cited by Huberman (2005). In the model, it is believed that the speculative properties of capital asset returns are rational and steady with that structure of factor. In his model, Ross (1976), infers that should the prices of equilibrium afford no opportunities for arbitrage when compared to static portfolios, then, the factor loadings are roughly related linearly to the anticipated returns on the assets (Huberman, 2005).

Of the differing methods of observing and analysing firms on the JSE, the CAPM is the most commonly used method (Ole-Meiludie, Mashinini, Huang, and Rajaratnam, 2014). An alternative to the capital asset pricing model is the arbitrage-pricing model. The main difference between the two models is the assumed risk as a measurement of variations in the market. According to Laird-Smith, Meyer, and Rajaratnam (2016), the need to break-down the risk of an asset further than the market portfolio, which is commonly represented by the JSE All Share Index (ALSI) in order to fully understand the returns gained, as well as to overcome the “diagonality assumption”. The diagonality assumption infers that in a model using a single index, such as the CAPM, the individualistic part of a company’s return is independent from other firms. The diagonality assumption is that the flaws are not correlated in a single index model (Laird-Smith et al., 2016).

Earlier studies conducted on the JSE All Share Index have suggested that the CAP model is not appropriate in evaluating market dynamics. The idea put forward by Van Heerden and Van Rensburg (2015) that the arbitrage pricing model is also not appropriate for the JSE, which then by default implies that the JSE is an inefficient market, or perhaps that models for market analysis are specified incorrectly and is further suggestive that momentum and value should be the risk factors primarily to be considered for model that is authentic (Noakes and Rajaratnam, 2014).

2.8) Literature review summary and conclusion

Due to the different assumptions and models that have been explored in the literature, it is not unusual to uncover discrepancies in the result obtain in all the various studies with substantial discrepancies between the actual costs of equity and the expected returns on equity (Ashton & Wang, 2013). This phenomenon is more axiomatic when findings are compared between historical return and evidence based on more contemporary returns or forecasted earnings.

The research approach followed in this study is closely resembled by the work that was concluded by Claus & Thomas (2001) titled “Equity premia as low as three percent? Evidence from analysts’ earnings forecasts for domestic and international stock markets.” The objective of their study was to show statistically that using a cost of equity estimate of eight per cent was too high in recent times. They purport that an equity premium of three per cent is more realistic.

It is imperative to note that the equity premium that Claus & Thomas refer to in the study that they conducted is what is used in this research as the market risk premium.

All aspects relating to the capital asset pricing model that pertains to this research report were explored in the literature review. It is imperative to be aware that literature on the capital asset pricing model encompasses sixty years of study, and is astonishingly diversified, and proves to be impossible to cover all the studies. The ambition was to encompass the most relevant and important work pertinent to the research scope and problem.

3) Research question and hypotheses:

The main aim of this research paper was to ascertain the implied cost of equity by statistical analysis of market and financial data for financial services companies listed on the Johannesburg Stock Exchange. In calculating the implied costs of equity, an implied market risk premium for the financial services companies could be determined and comparisons drawn between the benchmark of the market risk premium that is frequently utilised in company valuations in the South African context. The literature that was reviewed came to the conclusion that although this study topic has been attempted previously in many studies that employed a variety of methodologies, the outcomes were inconclusive, and the South African equity market has had a limited scope and application.

In studies that have been conducted over the last 25 years, companies frequently affirm that the discount rate employed by them utilises the weighted average cost of capital as is calculated from the capital asset pricing model to project what their estimated cost of capital will be. Even though the CAPM and WACC are the focal point of textbooks and graduate schools of business covering the topic of capital budgeting (Womack & Zhang, 2005), companies commonly employ a discount rate that far exceeds their WACC so as to possibly account for increased risk (Jacobs & Shivdasani, 2012). The secondary purpose of the research project was to test the validity of the capital asset pricing model by drawing comparisons among the implied costs of equity and the estimated costs of equity for correlation.

The research questions are as follows:

Research question 1:

> **"Is it possible to determine an implied cost of equity for South African financial services companies utilising market capitalisation values, DCF values and reconstructed capital asset pricing model equation?"**

Research question 2:

> **"Can a determination be made of the average implied costs of equity for the South African financial services companies expounding on the question above?"**

Research question 3:

> **"Was there a significant change in the implied costs of equity for South African financial services industry?"**

Research question 4:

> **"Can a determination be made of the implied market risk premium for South African financial services companies that was determined from the previously mentioned implied costs of equity found in this study?"**

The approach to answer the question stated above will be by comparison of the differing means that were calculated from the implied and estimated costs of equity of 73 financial services companies listed on the Johannesburg Stock Exchange over a eight year period.

The principle hypothesis of this of this research report interrogated the soundness of the capital asset pricing model and the implied costs of equity by conducting a test for correlation by means of a simple linear regression on the data set. Additionally, sub-hypotheses, which tested for correlation, could be carried out for each of the years included in the study as well as for each of the companies that were inclusive to the research project.

The null hypothesis for the primary hypothesis as well as each sub-hypothesis declared that a correlation did exists between the estimated costs of equity and the implied costs of equity. The hypothesis alternative stated that there was no existential correlation for the implied cost of equity and the estimated cost of equity. In order to simplify the equations, the = indicates that a correlation exists and ≠ indicates no correlation exists.

Hypothesis 1 for the whole dataset:

(H_0) Null hypothesis:	**Estimated Cost of Equity = Implied cost of equity**
(H_A) Alternative hypothesis:	**Estimated Cost of Equity ≠ Implied cost of equity**

Hypothesis 2 per year of study:

(H_0) Null hypothesis:	**Estimated Cost of Equity = Implied cost of equity**
(H_A) Alternative hypothesis	**Estimated Cost of Equity ≠ Implied cost of equity**

Hypothesis 3 per company in the study:

(H_0) Null hypothesis:	**Estimated Cost of Equity = Implied cost of equity**

(H_A) Alternative hypothesis	**Estimated Cost of Equity ≠ Implied cost of equity**

The tests for correlation had to be run many times in order to be able to answer the hypotheses: once for the total data set; once for each of the years of the project (8 iterations), and once for each of companies represented in the research project (100 iterations). It did occur that for some of the companies and some years, no data was available in order to do the testing, and as such no test for regression could be carried out.

4) Research Design and Methodology:

4.1) Introduction

The research project has attempted to explain an empirical assessment of the costs of equity from the capital asset pricing model by utilising actual data from the market. It has, furthermore attempted to uncover some of the reasons that influence the differences between the rates of return. Designing an alternative model may be one of the outcomes of the research paper, which can be used to guideline for measuring rates of return on capital investment projects. By utilising companies from the South African equity market, the model can present a more accurate representation of market risk premiums, and may be applicable to public as well as private company evaluations.

Data that will be used in the research project will be purely qualitative, and varying types of research designs will be of application to the research project. Collection of data that was measurable and quantifiable from the analysis of secondary data formed the basis of descriptive research design (Saunders and Lewis, 2012). Using an exploratory research design, an endeavour was made to establish whether a causal relationship existed between two variables, by utilising analysis of a statistical nature. All the data to be analysed was sourced from secondary sources comprising of companies listed on the JSE and thus no requirement existed for a primary data collection instrument to be developed. The data collection instrument that fulfilled the secondary requirement that was utilised was an excel spreadsheet.

The scale of measurement that was applied was percentage, which allowed comparisons to be drawn between various sets of data and additionally allowed for statistical analysis to be carried out (Zikmund, Babin, Carr, & Griffin, 2013). In order to do a thorough analysis of the data, a number of assumptions had to be made, in order to simplify the calculations. Detailed explanations of each of the assumptions will be given during the steps that were followed in the research methodology and are comprehensively discussed.

The units used in the analyses of the study, as well as the sample size, the population, sampling methodology, and the architecture of the research that was tested during assimilation of data pertinent to the research project was conferred. Following this, the final step was an analysis of the process engaged for the empirical analysis as well as the limitations pertaining to this particular study.

4.2) Population, sampling method, and sampling

The population to be used in this research project will consist of financial services companies based in South Africa that release a set of financial statements annually from which pertinent data can be utilised with a high accuracy level. This data should be able to be used to calculate a discounted cash flow valuation with impartial level of accuracy. Access to information will be a key driver of this research, and the JSE allows for simple access to data relevant to organisations that will the focus of this study. The fact that some of the variables that will be used in the rate of return calculations such as risk free rate and the beta of a share makes the decision to use publicly traded companies and necessity. By default, it will imply that the results obtained from the study are more suitable for extrapolation to listed companies. The possibility also exists to use the outcomes obtained in this research project on private companies.

By limiting the study to companies listed on the Johannesburg Stock Exchange, it will be feasible to access a comprehensive listing of all constituents of the selected population; by definition, this is defined as probability sampling (Saunders & Lewis, 2012).

4.3) Unit of Analysis

The unit of analysis that will be utilised in this project will be 73 financial services companies listed on the JSE ALSI on the 1 February 2017. Quantitative data from the JSE that includes share price, market capitalisation as well as share betas will be studied and reviewed. Information to be studied from the financial statements of the companies will also be included in the analysis. The study will be limited in scope to include a period of five years between 2012 and 2017. All the values of the analysis will be in rand terms and estimations will be expressed as percentages.

4.4) Data Collection

The proposed research project has made use of secondary data exclusively, data that was freely available to the public. It therefore qualified as data classified as non-human. Thus, consent was not a requirement from the companies that are to be studied. The information that was made available for the study was through the Gordon Institute of Business Science and their access to electronic databases and the requisite permissions are in place. The data was supplemented with information gathered from annual reports and financial statements from the various companies. This information is publicly available from the

respective websites of the companies that were studied, and was used primarily to verify certain facts and information that was obtained from the databases.

The two primary sources of data for this research report were:

1) The Johannesburg Stock Exchange Bulletin, which provided share pricing, market capitalisations as well as betas scores for all companies listed on the JSE.

2) The McFAS tool which utilises data from the McGregor database, which is available through the GIBS information centre.

Access to the databases mentioned above for the purposes of this study, was granted by Professor Mike Ward.

The data collection process as well as the design of the research required a multiple step and multiple stage process design. The stages that were involved in the process will be explained thoroughly during the course of this chapter and the clarification of each of the assumptions that were made during the different stages of the research will be elaborated upon in the following 2 chapters. The antecedence of the various measures and stages employed in the study was ascertained by the outcomes of the research that were to be discovered. A brief description of the steps were:

Phase 1: Ascertain the sample of company's to be included in the study

Step 1: Create the spreadsheet

Step 2: Insert data from JSE Bulletin data base

Step 3: Catalogue the data

Phase 2: Determine the DCF valuations

Step 1: Construct the spreadsheet

Step 2: Insert data from McFAS database

Step 3: Determine the value of WACC and its components

Step 4: Obtain the free cash flow valuation

Step 5: Determine implied costs of equity

Phase 3: Reproduce the second phase for all the companies being studied

Step 1: Reproduce the process 73 times and create final-results spreadsheet

Step 2: Analyse the data points using statistical tools

Phase 1:

During the first phase of the research processes, the sample of the companies to be used in the study from the Johannesburg Stock exchange was determined. The companies that were used in the study were identified using the ICB or Industry Classification Benchmark industry classification. This system segregates the market into different sectors within the macro economy. The system used by the ICB has ten industries, divided into 19 super sectors, which then get further divvied up into 41 sectors, which are then contained in 114 subsectors. The Industry Classification Benchmark is used universally to separate the market in to very specific sectors, which allows investors and shareholders the ability to draw comparisons between industry trends. The financial services sectors are identified by an 87xx prefix on their share code. By creating a spreadsheet using Microsoft Excel, the company names and codes can be entered by obtain the information from the JSE bulletin database. Using functions available on the JSE Bulletin, market capitalisations of each of the companies could be determined as on a 31 January 2017. This spreadsheet is included below and numbered as Appendix 1 in the research report. A shortened version of the spreadsheet is displayed below to illustrate the format as well as for easy referencing.

Table 1 Sample of companies illustrating market capitalisation

Company Code	Company Name	Market Cap 31/01/2017	Share Price
APF	Accelerate Prop Fund Ltd	R 6 501 534 019.20	R 6.60
AWA	Arrowhead Properties Ltd	R 9 258 208 713.00	R 8.92
ALP	Atlantic Leaf Prop Ltd	R 2 568 081 762.00	R 18.00
CRP	Capital & Regional Plc	R 6 840 815 950.00	R 9.74
DLT	Delta Property Fund Ltd	R 5 791 652 283.30	R 8.15
DIA	Dipula Income Fund A	R 2 099 853 730.00	R 10.00
EMI	Emira Property Fund Ltd	R 7 351 921 209.60	R 14.40
EQU	Equites Prop Fund Ltd	R 5 579 404 392.00	R 15.92
FFB	Fortress Inc Fund Ltd B	R 137 111 193 738.66	R 34.78
GRT	Growthpoint Prop Ltd	R 74 432 061 477.80	R 26.30

Phase 2

During the next phase of the research process, A templated spreadsheet that has been included with this submission in electronic format was constructed that was firstly able to

determine an estimated WACC as well as all the components that comprise the WACC, and also any additional variables that are necessary in calculating the discounted free cash flow valuation and secondly, complete the relevant valuations. The spreadsheet was constructed using the McFAS data base function that is able to identify the code of a particular share and the name of the share that was changeable for each additional company by changing the code of the share that was to be analysed. All the data that was relevant to a share code was linked, meaning that whenever the code of the share was altered, the relevant data obtained from the financial statement in the spreadsheet altered to that of the share code entered. As soon as the spreadsheet was completed, it provided the template from which the 2nd and 3rd phases of the study were to be concluded.

The following step in phase 2 was to capture the date on which the data to be utilised was extracted. A function that is available on McFAS allows for the latest date for which information is available to be obtained as well as a function to obtain data from previous years in order to provide five years of data from 2012 up to 2017 that was required for the research. All the information regarding the financial statements of the companies was now conveniently accessible in a format that is practical for al the years encompassed in the study. At this point in the study, all the relevant variables for the discount cash flow valuations and calculations were primed to be entered in to the calculation.

The next step to be completed in the data collation process, was to conduct the discount cash flow valuations. This was accomplished by determining the relevant weighted average cost of capital (WACC). The first element of the weighted average cost of capital was the costs of debt, which was calculated using the applicable interest rate for the debts of the company and the applicable tax rate were obtained. The prime interest rate for the South African market as obtained from the South African Reserve Bank website, and the corporate tax rate for South African companies obtained from the South African Revenue Services 2017/2018 tax guide were utilised in the determination of the cost of debt (K_d):

$$\mathbf{K_d = Int.\ Rate\ x\ (1- Corp.\ Tax\ Rate)}$$

An illustration of the spreadsheet is shown below, in which the costs of debt (K_d) for the specific company is calculated and other pertinent information is displayed such as share name, share code, and the applicable years of the study.

Table 2 Cost of calculation example, as a component of WACC

ARA	Astoria Investments Ltd			

YEAR	FINANCIAL STATEMENTS DATE	SA PRIME LENDING RATE - AVERAGE PER ANNUM	CORPORATE TAX RATE - SA	COST OF DEBT (Kd)
2016	31 Mar 16	8.50%	28.00%	6.12%
2015	31 Mar 15	9.00%	28.00%	6.48%
2014	31 Mar 14	9.50%	28.00%	6.84%
2013	31 Mar 13	12.00%	28.00%	8.64%
2012	31 Mar 12	15.00%	28.00%	10.80%
2011	31 Mar 11	13.50%	29.00%	9.59%
2010	31 Mar 10	11.50%	29.00%	8.17%
2009	31 Mar 09	10.50%	29.00%	7.46%

In order to calculate the second aspect of the weighted average cost of capital, the markets risk premium, betas and the relevant risk-free rate for the specified company were needed. The risk-free rate used in the determination of the WACC was the South African R157 government bond as it is the most traded and a liquid bond on the South African market. The market risk premium that was incorporated into the calculation was chosen at 7.2%. The determination of the market risk premium was done by collation of information gathered over a period of time from a diverse group of companies on market risks premium in the South African context, the details of which shall be expounded upon in greater scrutiny in the seventh chapter. The market risk premium rate that was implemented during this research was obtained in the 2016 publication of the periodical “Equity Risk Premium” published by the New York based Stern Business School (Damodaran, 2016).

The betas value that was utilised in the computation of the weighted average cost of capital equation was a sixty-month beta for the specific company. The value for the beta was retrieved from the Johannesburg Stock Exchange bulletin function that was obtained from the share code in the spreadsheet. The cost of equity was determined using the variables in the following equation:

The final two variables that were part of the templates spreadsheet, are the forecasted growth rate of free cash flows as well as the growth rate for the long term utilised in the calculation of the valuation of the company’s terminal value. An illustration of the follow-on section of the spreadsheet that provides an indication of the calculations of the costs of equity, long-term growth rates as well as the free cash flow forecasted growth rate is provided hereunder.

Table 3 Cost of equity calculation and additional assumptions

RISK FREE RATE - R157 GOVERNMENT BOND RATE (RFR)	SA MARKET RISK PREMIUM (MRP)	BETAS	COST OF EQUITY (Ke)	LONG TERM GROWTH RATE E	FREE CASH FLOW GROWTH RATE
6.01%	7.20%	0.26	7.89%	4%	10.00%
7.50%	7.20%	0.26	9.39%	4%	10.00%
8.03%	7.20%	0.26	9.92%	4%	10.00%
8.47%	7.20%	0.26	10.36%	4%	10.00%
10.72%	7.20%	0.26	12.61%	4%	10.00%
8.49%	7.20%	0.26	10.38%	4%	10.00%
8.65%	7.20%	0.26	10.54%	4%	10.00%
8.00%	7.20%	0.26	9.89%	4%	10.00%
10.20%	7.20%	0.26	12.09%	4%	10.00%
9.42%	7.20%	0.26	11.31%	4%	10.00%

The excel spreadsheet has been designed in such a manner so as to allow any changes to any one of the variables to be altered, and in so doing to effect changes to all other calculations in order to determine both the estimations and implied costs of equity in a simple and non-complicated fashion.

The last aspect in determining the weighted average cost of capital was the debt to total capital ratios of a listed company. This component was calculated using the McGregor financial analysis system database tool to obtain the values of total equity and total debt of the company, and obtaining a total capital value by adding the 2 figures together. The ratio of debt to capital was then expressed as a percentage of the total debt divided by the total capital.

Table 4 Debt to total capital ratio calculation

DEBT	EQUITY	TOTAL CAPITAL	CASH AND NEAR CASH ON BALANCE SHEET	DEBT TO CAPITAL RATIO
TOTAL LIABILITIES	Total Shareholders Interest		Cash & Near Cash	
R 48 249 000 000	R 15 433 000 000	R 63 682 000 000	R 3 070 000 000	75.77%
R 36 428 000 000	R 13 965 000 000	R 50 393 000 000	R 3 198 000 000	72.29%
R 26 323 000 000	R 12 879 000 000	R 39 202 000 000	R 3 410 000 000	67.15%
R 21 602 000 000	R 12 657 000 000	R 34 259 000 000	R 3 828 000 000	63.05%
R 16 981 000 000	R 12 412 000 000	R 29 393 000 000	R 2 984 000 000	57.77%
R 8 787 000 000	R 2 965 000 000	R 11 752 000 000	R 1 961 000 000	74.77%
R 5 473 000 000	R 2 690 000 000	R 8 163 000 000	R 1 252 000 000	67.05%

R 4 558 000 000	R 2 704 000 000	R 7 262 000 000	R 1 147 000 000	62.77%
R 4 694 493 000	R 2 640 534 000	R 7 335 027 000	R 1 944 148 000	64.00%
R 3 684 850 000	R 2 793 292 000	R 6 478 142 000	R 1 148 562 000	56.88%

A weighted average cost of capital that is based upon the capital asset pricing model, is now determinable in the excel template spreadsheet for each of the companies in the study by means of the following equation:

$$\textbf{WACC} = K_d \times \text{debt/total capital} + K_e \times (1 - \text{debt/total capital})$$

Subsequent to the determination of the WACC that was utilised in calculating the free cash flow evaluation for each year of the research, a calculation to determine the availability of free cash flow to the corporation for each year of the study had to be completed. The free cash-flow calculation is made up of different components listed below:

- **Net Operating Profit After Tax**
- **Capital Expenditure Spend**
- **Net Working Capital Changes**
- **Depreciation**

The above mentioned components were obtained by using the McGregor Financial Analysis System in extracting the information from the financial statements of the respective companies included in the study. The after-tax net operating profits were obtained by multiplying the corporate rate of tax and the earning before taxes and interest (EBIT) to get the figure. The CAPEX (capital expenditure) aspect called for two additional balance sheet entries which were the Land and Building, and the Plants and Equipment. The annual free cash flow of the company could be determined by using the following equation:

$$\textbf{Free Cash Flow} = \textbf{EBIT} \times (1\text{-Tax Rates}) + \textbf{Depr} - \textbf{Capital Exp} - \textbf{Net Working Capital}$$

An illustration of the template spreadsheet is listed below showing the calculation of free cash flows.

Table 5 Free cash flow calculation

EBIT	NOPAT	DEPRECIATION	CAPEX	LAND & BUILDINGS	PLANT & EQUIPMENT	CHANGES IN WORKING CAPITAL

Operating Profit/loss		Depreciation & Non Cash-items		Land & Buildings : gross	Plant & Equipment : gross	Decrease/increase Working Capital
-R 2 809 000	-R 2 022 480	R 5 909 000	-R 212 000	R 502 000	R 1 152 000	-R 344 000
-R 1 274 000	-R 917 280	R 4 223 000	R 190 000	R 502 000	R 1 364 000	-R 398 000
-R 1 440 000	-R 1 036 800	R 3 181 000	R 44 000	R 490 000	R 1 186 000	R 205 000
R 2 693 000	R 1 938 960	R 3 333 000	R 150 000	R 458 000	R 1 174 000	-R 62 000
R 2 285 000	R 1 645 200	R 3 037 000	R 978 000	R 370 000	R 1 112 000	-R 546 000
-R 511 000	-R 362 810	R 1 231 000	R 84 000	R 154 000	R 350 000	-R 208 000
R 1 837 000	R 1 304 270	R 895 000	R 26 000	R 113 000	R 307 000	-R 108 000
R 1 561 000	R 1 108 310	R 737 000	R 20 053	R 97 000	R 297 000	R 274 000
R 1 307 827	R 915 478	R 665 060	R 7 728	R 101 173	R 272 774	-R 88 458
R 1 049 613	R 734 729	R 617 331	#REF!	R 101 272	R 264 947	R 276 231

* All values are in millions

The free cash flow calculations results which were mentioned above, has to be adjusted appropriately and the growth-rate forecast was, over a five year period applied to the free cash flow calculation. Free cash flow calculations were comprised of a combination of forecast, observed, and expected earnings of a company, as was mentioned earlier in this report. Prior empirical research projects have followed the same approach, and include the work done by Berger (2011), Borgman & Strong (2006), and Levy (2011). The method used to calculate the free cash flows in the mentioned studies, forecasted earnings were utilised. During the course of this research report, actual earning of the share was used, and then an annual growth rate of forecasted ten per cent was utilised in the calculation of future free cash flows.

Table 6 Free cash flow forecast for 5 years

FREE CASH FLOW INCLUDING DEPRECIATION AND CAPEX BUT EXCLUDING ABNORMAL ITEMS	FREE CASH FLOW EXCLUDING DEPRECIATION AND CAPEX	FORECASTED FCF BASED ON 5 YEAR GROWTH RATE - YR + 1	FORECASTED FCF BASED ON 5 YEAR GROWTH RATE - YR + 2	FORECASTED FCF BASED ON 5 YEAR GROWTH RATE - YR + 3	FORECASTED FCF BASED ON 5 YEAR GROWTH RATE - YR + 4
R 4 442 520 000	-R 1 678 480 000	R 4 886 772 000	R 5 375 449 200	R 5 912 994 120	R 6 504 293 532
R 3 513 720 000	-R 519 280 000	R 3 865 092 000	R 4 251 601 200	R 4 676 761 320	R 5 144 437 452
R 1 895 200 000	-R 1 241 800 000	R 2 084 720 000	R 2 293 192 000	R 2 522 511 200	R 2 774 762 320
R 5 183 960 000	R 2 000 960 000	R 5 702 356 000	R 6 272 591 600	R 6 899 850 760	R 7 589 835 836
R 4 250 200 000	R 2 191 200 000	R 4 675 220 000	R 5 142 742 000	R 5 657 016 200	R 6 222 717 820
R 992 190 000	-R 154 810 000	R 1 091 409 000	R 1 200 549 900	R 1 320 604 890	R 1 452 665 379
R 2 281 270 000	R 1 412 270 000	R 2 509 397 000	R 2 760 336 700	R 3 036 370 370	R 3 340 007 407

At this point in the research, it was necessary to assess the free cash flows calculated for each of the companies for all of the years and draw a conclusion on atypical components

extracted from information in the financial statements of the respective corporation should be omitted from the calculation. Some of the cases necessitated the exclusion of capital and expenditure and depreciation from the calculations.

The free cash flow valuations were finalised in the determination of the NPV (Net-Present-Value) of the 5-year free cash flow and addition of the net present value of the terminal values, which was determined utilising the long-term growth rate. The long-term growth rate used in the completion of this study was 4 per cent. Ward & Muller (2012), during the work they accomplished on implied growths rate, determined that a long term growths rate of twelve per cent, but utilising this value in calculations in this study would have made the determination of costs of equity nigh on impossible. Consequently, a slightly higher percentage then the expected long-term rate of growth of the South African economy being selected as the rate of growth extrapolating for the long term for the equations. Calculating the terminal value was as follows:

Terminal Value = (FreeCashFlow yr 5 x (1 + GrowthRate)) / (WACC – GrowthRate) x (1/(1 + WACC))

Table 7 Net present value of cash flows as well as terminal values

NPV OF TERMINAL VALUE	NPV OF CASH FLOWS	FREE CASH FLOW VALUATION BASED ON CAPM WACC
R 139 055 585 477	R 16 006 699 956	R 155 062 285 434
R 84 363 848 442	R 13 031 308 081	R 97 395 156 523
R 37 413 558 896	R 5 974 269 871	R 43 387 828 767
R 72 575 002 057	R 20 317 715 748	R 92 892 717 804
R 38 704 885 543	R 15 987 611 633	R 54 692 497 176
R 13 629 034 857	R 3 391 691 557	R 17 020 726 415
R 35 124 901 629	R 9 549 190 826	R 44 674 092 455

At this juncture in the construction of the excel spreadsheet template, a CAP model positioned WACC could be determined and the costs of equity for every company and then, using these valuations to obtain a discount cash flow valuation of the company. The step proceeding from here was a determination of the company market capitalisation on the precise data that the free cash flow valuations was obtained on the basis of the shares price and sub sequentially the difference between the two variables. Of importance was the adjustment to be made to the market valuation of the corporation based on the price of the

share by the cash or debt holding of the corporation. Considerable evidence supporting the utilisation of prevailing stock pricing in the calculation of the implied costs of equity exists (Borgman & Strong, 2006).

Table 8 Market capitalisation and adjustment minus Discount Cash Flow valuation

MARKET CAP	MARKET CAP + DEBT LESS CASH ON BALANCE SHEET	DIFFERENCE BETWEEN FCF VALUATION AND MARKET CAP
R 26 577 990 360	R 71 756 990 360	-R 83 305 295 074
R 26 537 781 600	R 59 767 781 600	-R 37 627 374 923
R 28 829 680 920	R 51 742 680 920	R 8 354 852 153
R 23 723 168 400	R 41 497 168 400	-R 51 395 549 404
R 20 265 215 040	R 34 262 215 040	-R 20 430 282 136
R 15 589 593 410	R 22 415 593 410	R 5 394 866 995
R 11 003 833 100	R 15 224 833 100	-R 29 449 259 355

Using the goal seek function available in Microsoft Excel, and operating from the CAP model based WACC, a weighted average cost of capital where the difference between the discount cash flow of the company and the market capitalisation was nil. From the just-calculated weighted average cost of capital, the implied costs of equity could be determined, by readjusting the capital asset pricing model equation:

$$\textbf{Implied Cost of Equity} = (WACC_{new} - (K_d \times \text{Debt/Tot Capital}))/(1 - \text{Debt/Tot Capital})$$

The terminal view of the constructed spreadsheet is illustrated hereunder. The weighted average cost of capital is presented in the first column of the table, as it represents the critical aspect of the last step of phase 2 in the construction of the template spreadsheet. The new implied weighted average cost of capital is presented in the second column of the table, and the implied costs of equity, which represents the overriding aim of the research study, is presented in the last column in the table below:

Table 9 Implied cost of equity calculations

CAPM BASED WACC	WACC IF DIFFERENCE BETWEEN FCF VALUATION AND MARKET CAP IS R0	NPV OF TERMINAL VALUE BASED ON NEW WACC	NPV OF CASH FLOWS BASED ON NEW WACC	FCF VALUATION BASED ON NEW WACC	DIFFERENCE BETWEEN FCF VALUATION AND MARKET CAP - GOAL SEEK TO R0	IMPLIED COST OF EQUITY
7.40%	10.98%	R 57 605 981 545	R 14 151 008 815	R 71 756 990 360	R 11 709 189 747	26.16%
8.26%	10.73%	R 47 751 821 542	R 12 015 960 058	R 59 767 781 600	R 28 536 876 392	21.82%
9.01%	8.26%	R 45 600 555 610	R 6 142 125 310	R 51 742 680 920	R 10 932 906 420	11.15%
10.58%	17.89%	R 24 962 274 236	R 16 534 894 164	R 41 497 168 400	- R 6 738 567 539	33.67%
13.05%	17.97%	R 20 269 580 413	R 13 992 634 627	R 34 262 215 040	R 64 786 345 987	27.78%
10.68%	9.17%	R 18 852 187 303	R 3 563 406 107	R 22 415 593 410	R 86 294 786 472	7.93%
10.11%	20.79%	R 8 044 447 781	R 7 180 385 319	R 15 224 833 100	R 84 765 377 532	46.48%
9.67%	16.62%	R 8 678 407 151	R 5 322 912 849	R 14 001 320 000	R 17 654 782 897	32.07%
10.55%	7.88%	R 44 591 086 187	R 7 398 487 704	R 51 989 573 892	-R 49 239 228 892	8.21%
11.73%	9.38%	#N/A	# N/A	# N/A	# N/A	9.38%

Phase 3

The third phase of the process of the research involved duplicating the whole of the second phase for the corporations included in the project, by applying the constructed spreadsheet, and then subsequently cede the information regarding the estimated costs of equity and the implied costs of equity to a spreadsheet containing the eventual outcomes that would house all the relevant data point in order to be analysed (Appendix 2). For ease of reference, the actual spreadsheet containing all the data sets for each of the corporations incorporated in the study was not incorporated into this research report, however, it is submitted as part of the digital submission of the research.

4.5) Data analysis and processing

The investigation of the salient data was applicable and relevant to the costs of equity sets of data that is contained in the results spreadsheet (Appendix 2). Two columns were used to sort the data, each column representing the estimated costs of equity and the implied costs of equity and sorted by having the first sheet containing all the data set, the second sheet containing the data set for each year, and finally, the third sheet containing the data set for each of the companies included in the study.

Descriptive statistics techniques were applied and a mean and distribution for the data was analysed. To determine if whether a correlation between the implied costs of equity and the estimated costs of equity, a simple linear regression was conducted. The analysis was

conducted on the sample in its totality, as well as for each of the companies included for each year that the study included. Using the implied costs of equity, and its calculated mean, a determination of the implied market risk premium for the South African equity market was possible. The capital asset pricing model equation had to be rearranged for the second time in order to make the calculation possible, which was carried out for every year included in the study and for the equity market as a whole.

4.6) Limitations

Every aspect of the research process was considered with the utmost care, to ensure that each variable that was used was the most appropriate and was as accurate as possible. Care was exercised in order to obtain data that was able to withstand scrutiny and where possible, steps were taken to lessen data integrity issues. It is however admitted that the data used in the study as well as the data analysis processes had significant limitations, chief amongst which are identified below:

1. Of the methods used to determine the value of a company, only some may be relevant to the companies that use relevant market instruments. Hence, while a co-relation may exist between the independent variable and the dependant variable, pragmatic, real world applications of the model may be of little use. This limitation will however be further scrutinised as more detail is discovered about the sample being studies, and the types of financial instrument that is used.

2. If the models being investigated are incorrectly applied, both administrative and systematic errors may arise. This will have to be opposed as far as is possible by validating the model application by industry experts or from academic experts.

3. Where companies report a loss on earnings before interest and tax, it was not possible to make a determination of a cost of equity in that specific year for that specific corporation.

4. Financial statements for all the companies that will be studied have not all been consulted. Only random checks will be done, but the majority of information will be taken at face value.

5. Adjustments will need to be made to the data. Abnormal values will have to be excluded, and this will be done on the judgment of the researcher. It is thus prone to errors of judgment.

6. Of the results that were obtained, some were so implausible that their exclusion was mandatory. In some cases, the implied costs of equity were so high, or even

negative, that aspersions were cast on whether the study was valid at all. Because of the question of validity, some corporations were omitted in their totality from the study.

7. In the calculations of the implied costs of equity, the market capitalisation determined on a particular set date. Fluctuations over a short period of the share price, and by default, the market capitalisation due to factors other that company performance, could potentially affect the results of the study severely.

8. Two vital aspects of the free cash valuation were premised on inferences that were not supportable by empiric evidence. They were the forecasted long term rate of growth, and free cash flow growth rate based on forecasts. The two-abovementioned variables had a compelling effect on the final outcome of the research report.

5) Results

5.1) Introduction

The results obtained in the research paper will be presented in this chapter. The results obtained were applied to the questions posed in chapter 3 and were used to accept or reject the hypotheses that were also posed in chapter 3. Chapter six will cover a detailed discussion on the results obtained.

The various data collection stages and processes in the research design will be completed as outlined in chapter four, however in the course of this chapter, the core of the discussion will be around the results that were inferred during each of the stages and the specific modifications that were required to obtain the concluding data points. Consequently, the empiric investigation and the results attained will be presented referring to the hypothesis and questions the research hopes to answer.

5.2) Sample Selection

The focus of determining which companies listed on the JSE should be included in the research was the first step in the research process. By selecting a specific date to conduct the data analysis, it is conceded that incomplete data would be presented for a number of companies that were non-existent for the entire period in the study, or companies that had not published data for the complete duration of the study. It also implied that some companies would have been left out had the market capitalisation for the most valuable companies of each year been chosen. The method utilised in this study provided a better level of consistency in the determination of the results and data for the sample size.

The companies included in the research paper that comprised the sample is presented in the list as Appendix 1. Included in the appendix, is the market capitalisation of each of the companies dated on the 1st of January 2017, as well as a share price.

5.3) Weighted Average Costs of Capital

Cost of debt is the first constituent of the weighted average cost of capital, and its determination was pre-empted by calculating the rate of interest that each company was paying on long term debt calculations. This demonstrated to be a difficult task, as the results were often unreliable and confusing. A proxy for the interest rate payable was deemed necessary, and South African average annual prime interest rate was utilised for this purpose, thereby providing all the companies in the study with an identical cost of debt. It is conceded that this arrangement was not ideal, given that the focal point of this study was costs of equity, an exception was made to the situation, and the limitation was accepted.

The implication of using the South African annual prime interest rate was not a major detraction from the validity of the research report as was evident when the specific interest rate of companies that were analysed illustrated a debt rate that was either marginally above or marginally lower than the prime rate of interest at the time. An illustration of the after tax cost of debts for each year is presented below:

Table 10 Annual Cost of debt post tax for all corporations

YEAR	COST OF DEBT
2016	6.13%
2015	6.49%
2014	6.85%
2013	8.63%
2012	10.81%
2011	9.60%
2010	8.18%
2009	7.47%

The estimated cost of equity is the second component of the weighted average cost of capital to be determined from the capital asset pricing model. The risk free rate utilised in the calculation was the R208 bond rate of the South African bond market which replaced the R157 in 2014 (South African Reserve Bank, 2017) at a rate of 6.75%. A rate of 8.44% was used as a calculation of the market risk premium, and a 5-year beta that was specific to each of the companies in the research was also utilised. Of the three variables mentioned above, only the beta had adjustments made to it. The 5-year beta for each of the companies in the study was determined from the McFAS database and the value obtained was utilised for the duration of the study. The final constituent in calculating the weighted average cost of capital was the ratio of total debt to total capital for each of the corporations where the information collated from the annual financial statements was utilised in the calculation of the of the ratios.

An electronic submission for the results of the estimated costs of equity and weighted average cost of capital calculations for all the companies included in the study accompany this report, as attempting to display them here would not be practical.

5.4) Free Cash Flows Valuations

The discounted free cash flow valuations were completed using the real financial statement data of each of the companies in the study. Of the suppositions and modifications that were required were the growth rate assumed that was forecasted for returns as well as cash flows that were free, forecasted long term growth rates assumptions and modifications made to the depreciation of free cash flow calculations, capitals expenditures, net working capitals, and abnormal items on the financial statements. If companies listed in the study reported net losses in a specific year, discount cash flow valuations could not be carried out for that specific year, and the company would be excluded for that particular year.

5.5) Implied Equity Costs

During the final state of the collation of the data steps, all the steps that have been chronicled thus far in the research report were then duplicated one hundred times to assimilate data to calculate an implied cost of equity for every company for all the years included in the study. Results that were too large or negative implied costs of equity were obtained, were excluded from the study. When data points were excluded in the calculation of the implied cost of equity, the corresponding estimated cost of equity for that specific company was also excluded in order to provide a consistent final data output.

5.6) Data Set Points

The process utilised in this research yielded 602 data points for the implied cost of equity as well as 602 data points for the estimated costs of equity. The excel spread sheet that contains the data points has been included in the electronic submission that was submitted with this report. The presentation of the data points is in two lists, one list each for the estimated and implied costs of equity. Appendix 2 is a presentation of the two lists, which were then sorted into a more ordered format by company and then by year.

A basic descriptive statistical analysis was conducted on the data and is illustrated below.

Table 11 Descriptive statistics for cost of equity - entire data set

STATS	Implied Cost of Equity	CAPM Based Cost of Equity
No. of observations	602	602
Minimum	0.030	0.003
Maximum	0.238	0.748
1st Quartile	0.109	0.095
Median	0.129	0.146
3rd Quartile	0.158	0.225

Mean	0.136	0.171
Variance (n-1)	0.001	0.013
Standard deviation (n-1)	0.037	0.110

Another method of illustrating the data is the box and whisker distribution diagram.

Figure 1 Box and whisker plot Estimated cost of equity - entire data set

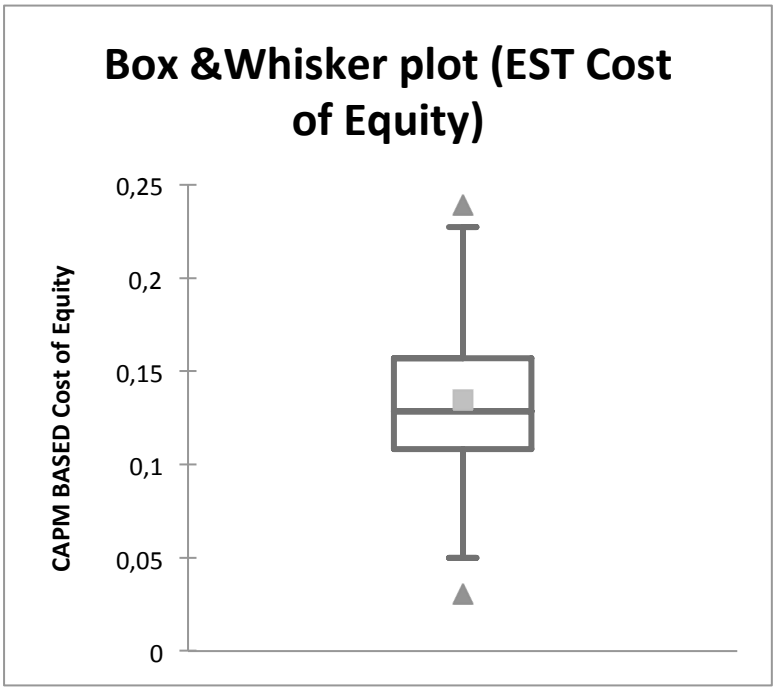
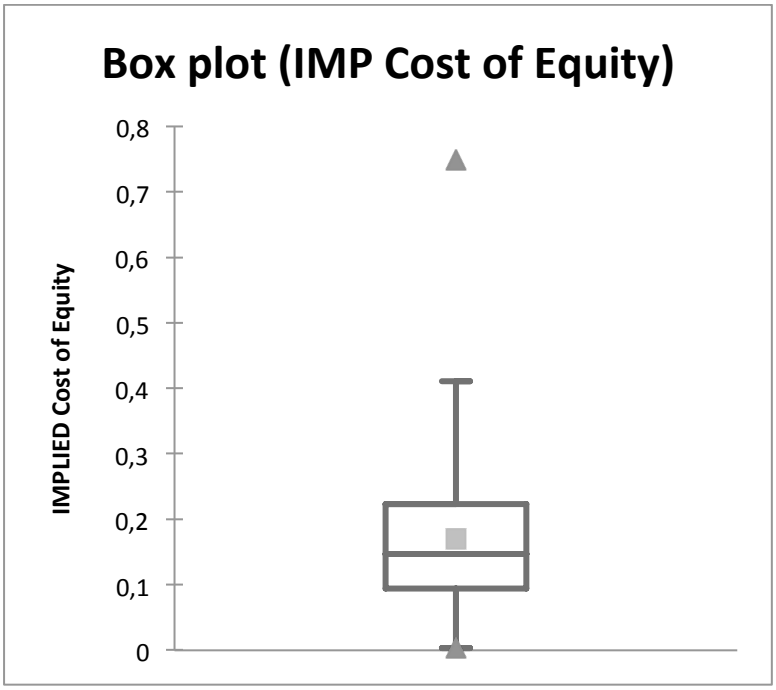


Figure 2 Box and whisker plot Implied cost of equity - entire data set



A statistical investigation was conducted and completed so as to provide and ascertain answers that the research questions had posed in the third chapter of this project. A range of the data set was also obtained.

The mean that was obtained for the estimated cost of equity for the data set was 13.5 per cent. The mean that was obtained was decidedly higher at 17.0 per cent. By substituting this implied cost of equity into the capital asset pricing model equation, the implied market risk premium can be determined in the context of the South African equity market. Using a risk free rate of 6 per cent for 2017, the determined implied market risk premium is 11 per cent for 2017, which is substantially greater than the value of 7.2 per cent that has been utilised in the capital asset pricing model equation used in this study.

A Kolmogorov-Smirnov distribution of the data sets was subsequently conducted:

Table 12 Statistical distribution of estimated cost of equity - entire data set

Stat	Input	Parameters
Means	0.136	0.135
Variances	0.001	0.001
Skewness (Pearson)	0.572	0.000
Kurtosis (Pearson)	-0.152	0.000
Kolmogorov-Smirnov test (ESTIMATED Cost of Equity):		
D	0.083	
p-value	0.001	
Alpha	0.05	

Figure 3 Histogram of estimated cost of equity distribution - entire data set

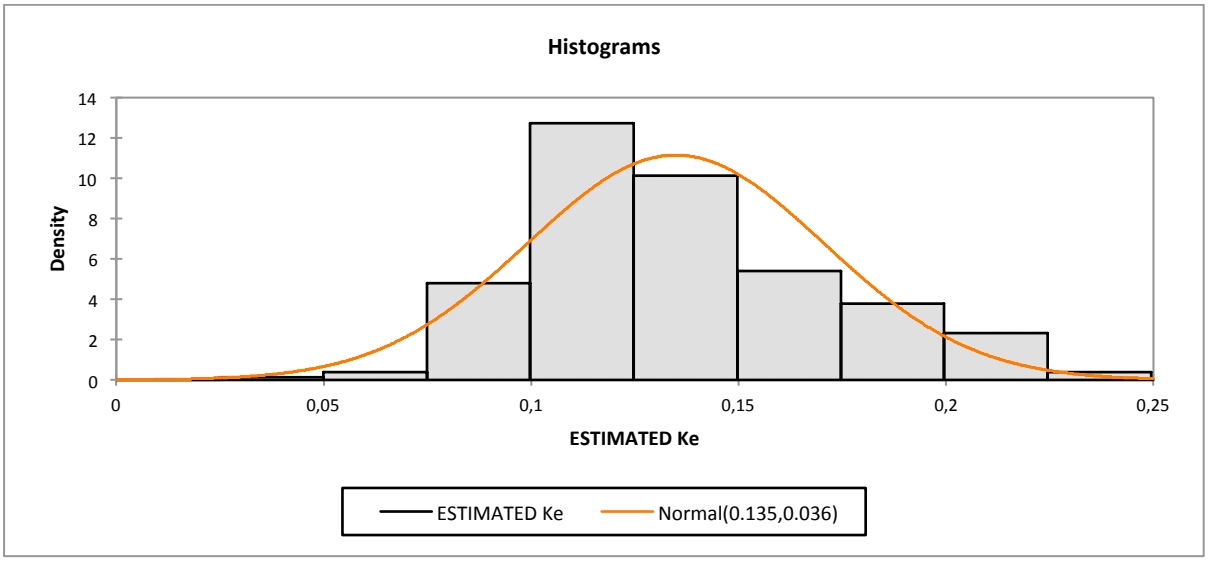
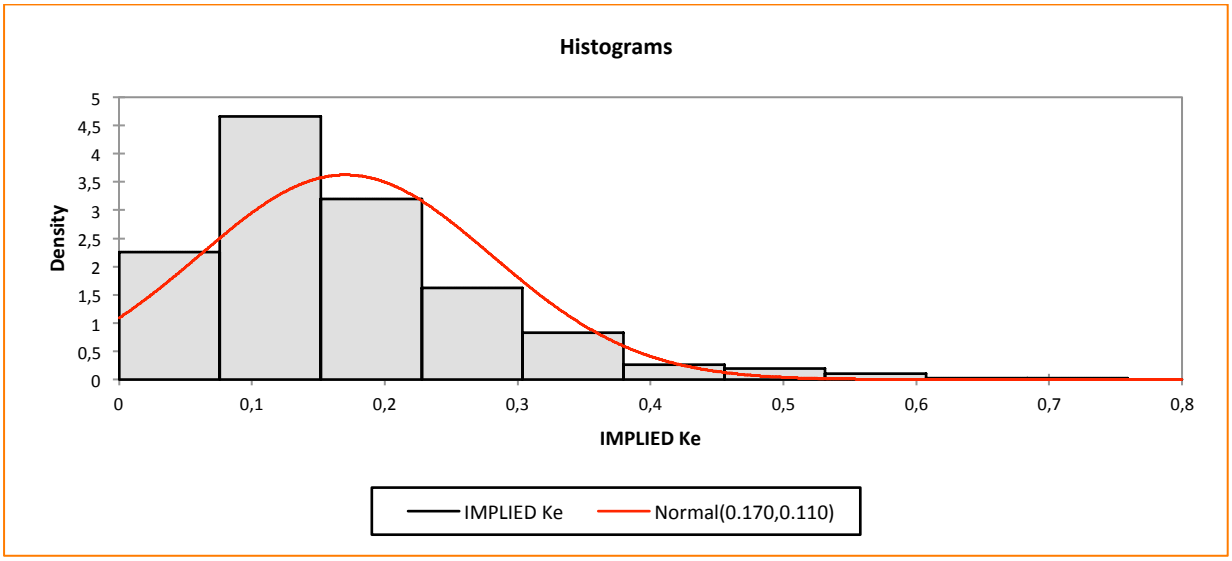


Table 13 Statistical distribution for implied cost of equity - entire data set

Stat	Input	Parameters
Means	0.171	0.170
Variances	0.013	0.012
Skewness (Pearson)	1.351	0.000
Kurtosis (Pearson)	2.853	0.000
Kolmogorov-Smirnov test (IMP Cost of equity):		
D	0.095	
p-value	< 0.00001	
alpha	0.05	

Figure 4 Histogram of implied cost of equity distribution - entire data set



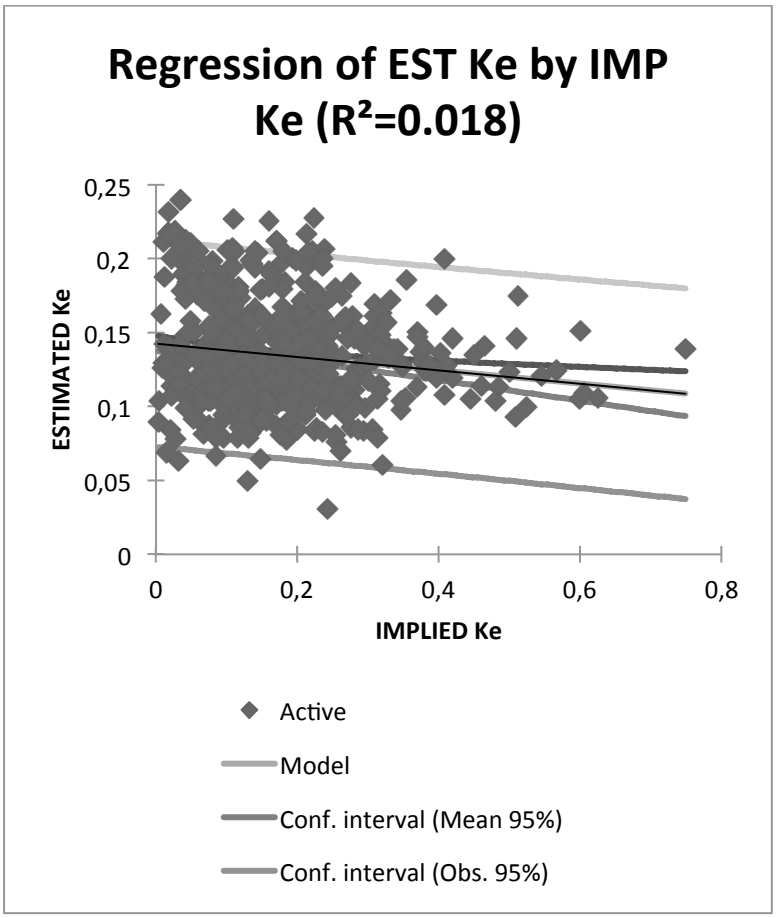
Of interest to note in the data sets, was that the two data sets were not illustrative of a normal distribution. The distribution was slanted towards the left of the cost of equity rate.

A correlation was sought during the final analysis of the data. It was sought between the implied cost of equity and the estimated cost of equity. In finding any sort of correlation between the two, that may have provided some substantiation in the calculation of the estimated cost of equity from a set of assumed variable, some validity could be ascribed to the capital asset pricing model theory. In testing if a correlation existed between the implied cost of equity and the estimated cost of equity, a simple linear regression test was performed. The test had to be conducted numerously, firstly on the data set in its entirety, then on each year in the study, and finally on each company included in the study.

Table 14 Regression analysis statistics - entire data set

Regression analysis of variable EST Cost of Equity Ke:	
Goodness of fit statistics:	
Observations	602
Sum of weights	602
DF	600
R^2	0.019
Adjusted R^2	0.018
MSE	0.001
RMSE	0.035
MAPE	23.115
DW	0.432
Cp	2.00
AIC	-4018.440
SBC	-4009.640
PC	0.987

Figure 5 Scatterplot illustration of regression analysis - entire data set



An illustration of the regression analysis that was completed for each year of study is to be found below:

Table 15 Regression analysis - 2016 data set

Regression of variable EST Cost of Equity Ke:	
Goodness of fit statistics:	
Observations	86
Sum of weights	86
DF	84
R^2	0.010
Adjusted R^2	-0.002
MSE	0.001
RMSE	0.033
MAPE	29.033
DW	1.881
Cp	2.000
AIC	-577.018
SBC	-572.109
PC	1.037

Figure 6 Scatterplot of regression analysis - 2016 data set

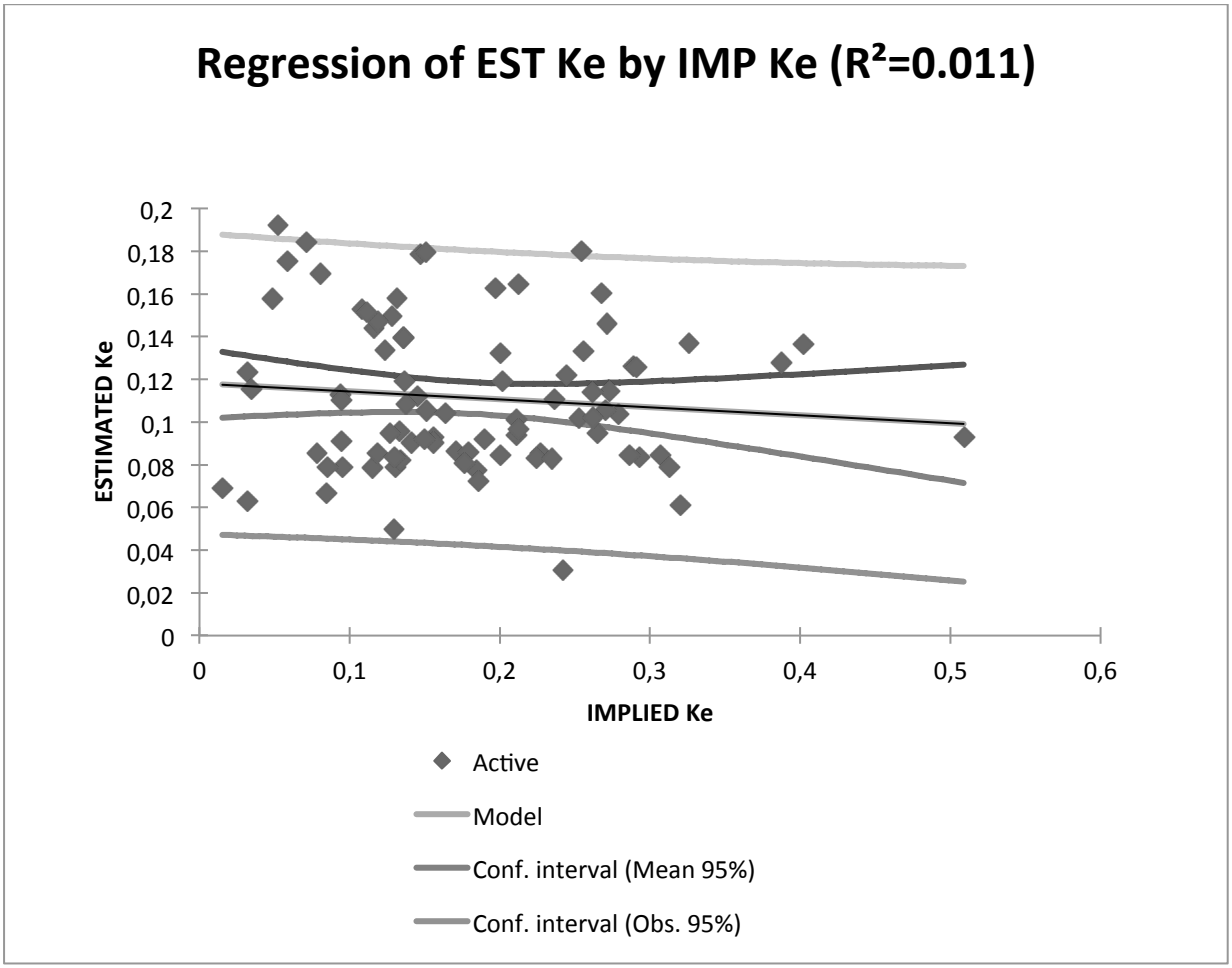


Table 16 Regression analysis - 2015 data set

Regression of variable EST Ke:	
Goodness of fit statistics:	
Observations	89
Sum of weights	89
DF	87
R²	0.016
Adjusted R²	0.005
MSE	0.001
RMSE	0.033
MAPE	22.291
DW	1.858
Cp	2.000
AIC	-605.888
SBC	-600.910
PC	1.029

Figure 7 Scatterplot of regression analysis - 2015 data set

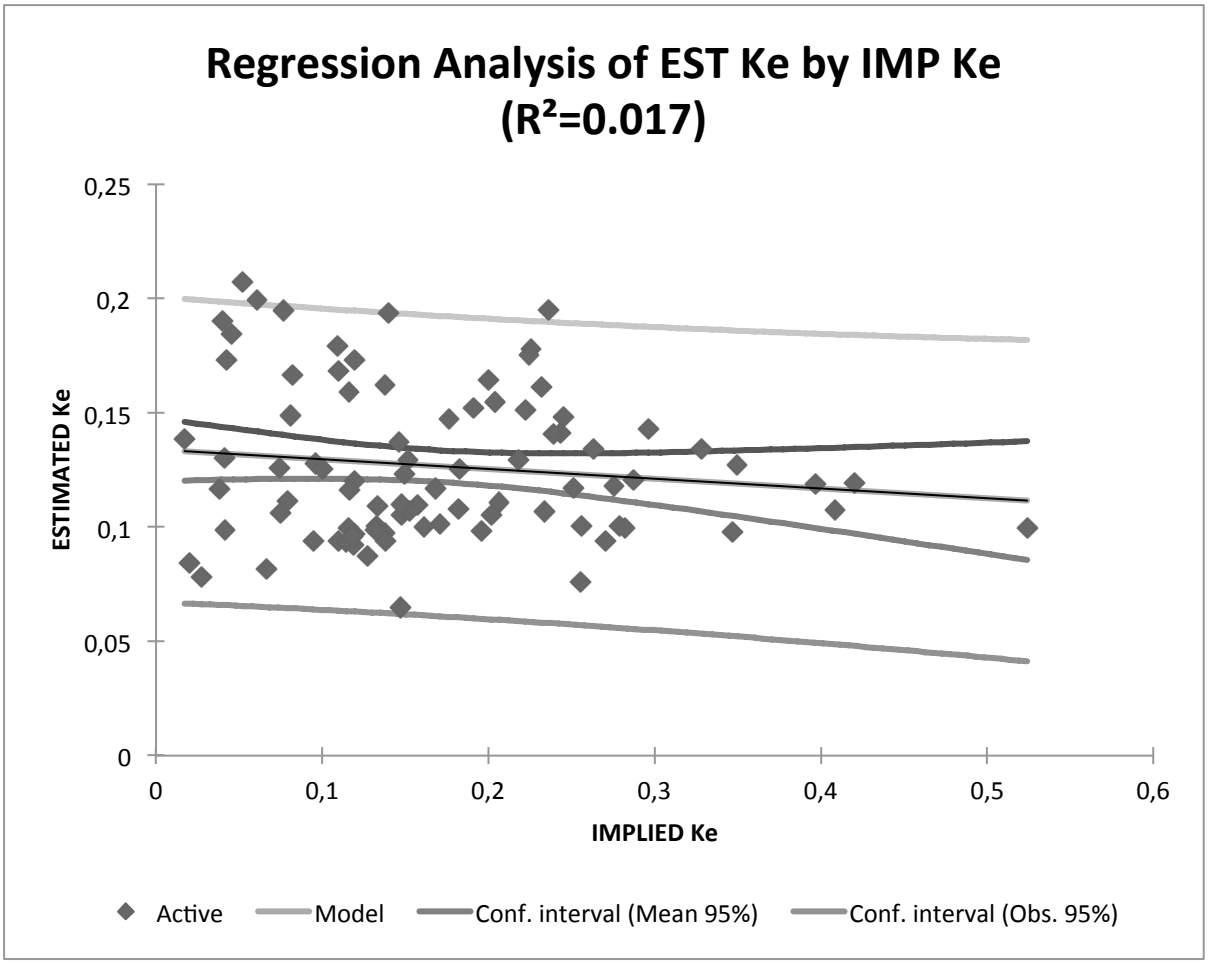


Table 17 Regression analysis - 2014 data set

Regression of variable ESTIMATED Ke:	
Goodness of fit statistics:	
Observations	84
Sum of weights	84
DF	82
R²	0.055
Adjusted R²	0.043
MSE	0.001
RMSE	0.032
MAPE	21.013
DW	1.965
Cp	2.000
AIC	-574.772
SBC	-569.910
PC	0.991

Figure 8 Scatterplot of regression analysis - 2014 data set

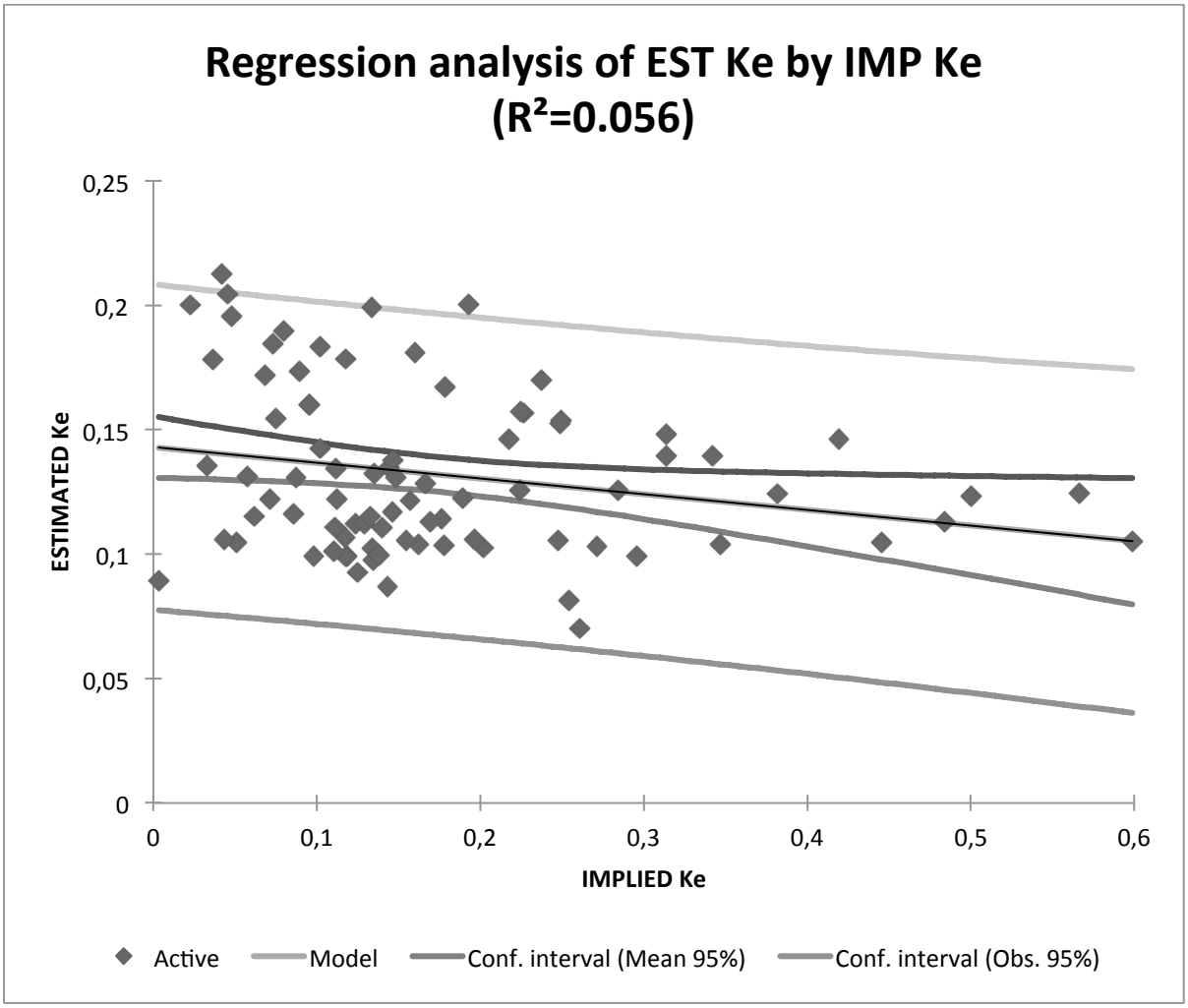


Table 18 Regression analysis - 2013 data set

Regression of variable ESTIMATED Cost of Equity Ke:	
Goodness of fit statistics:	
Observations	79
Sum of weights	79
DF	77
R²	0.011
Adjusted R²	-0.001
MSE	0.001
RMSE	0.033
MAPE	20.061
DW	2.014
Cp	2.000
AIC	-538.301
SBC	-533.562
PC	1.040

Figure 9 Scatterplot of regression analysis - 2013 data set

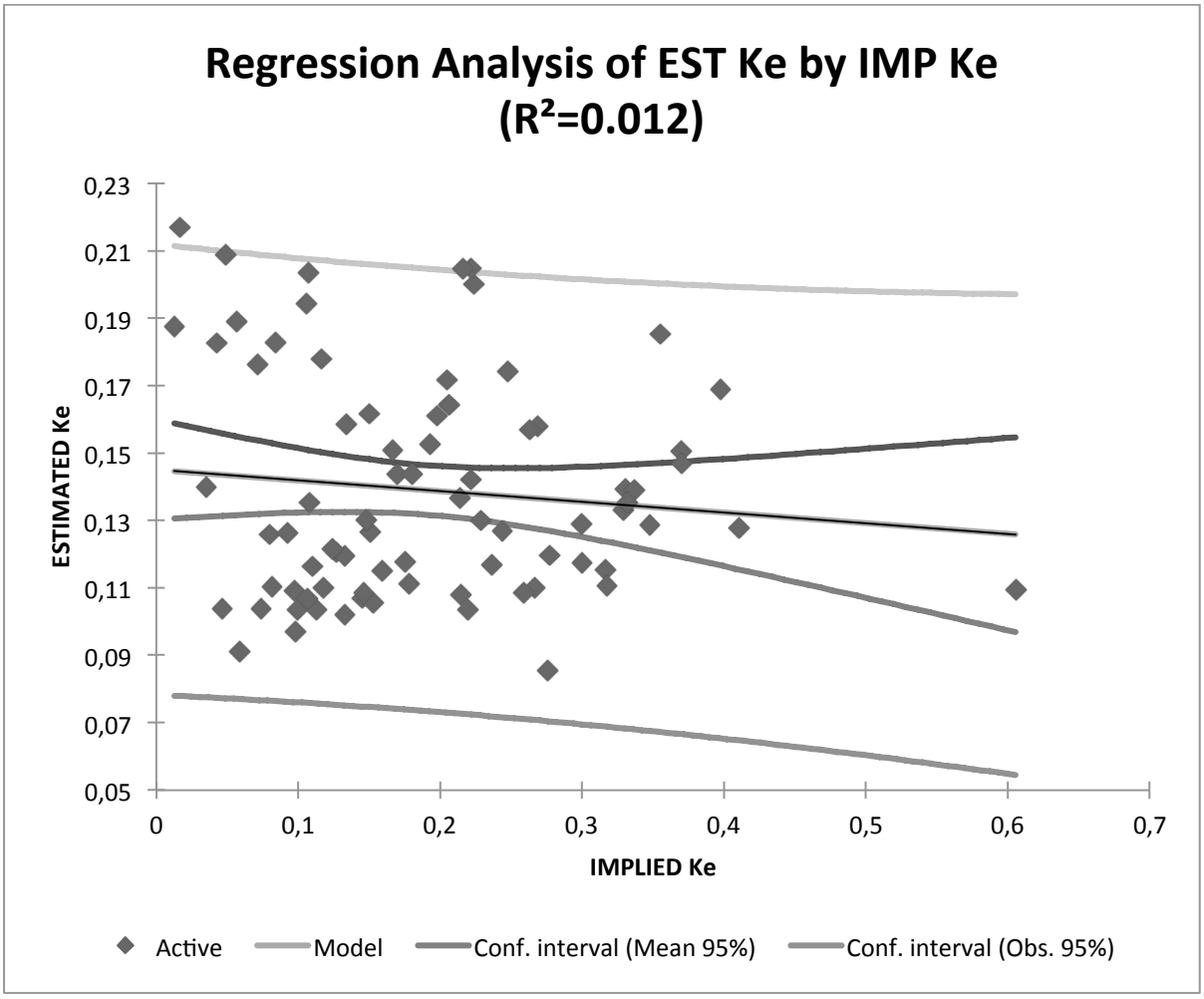


Table 19 Regression analysis - 2012 data set

Regression of variable ESTIMATED Cost of equity Ke:	
Goodness of fit statistics:	
Observations	72
Sum of weights	72
DF	70
R²	0.007
Adjusted R²	-0.008
MSE	0.001
RMSE	0.032
MAPE	16.682
DW	1.765
Cp	2.000
AIC	-491.871
SBC	-487.318
PC	1.050

Figure 10 Scatterplot of regression analysis - 2012 data set

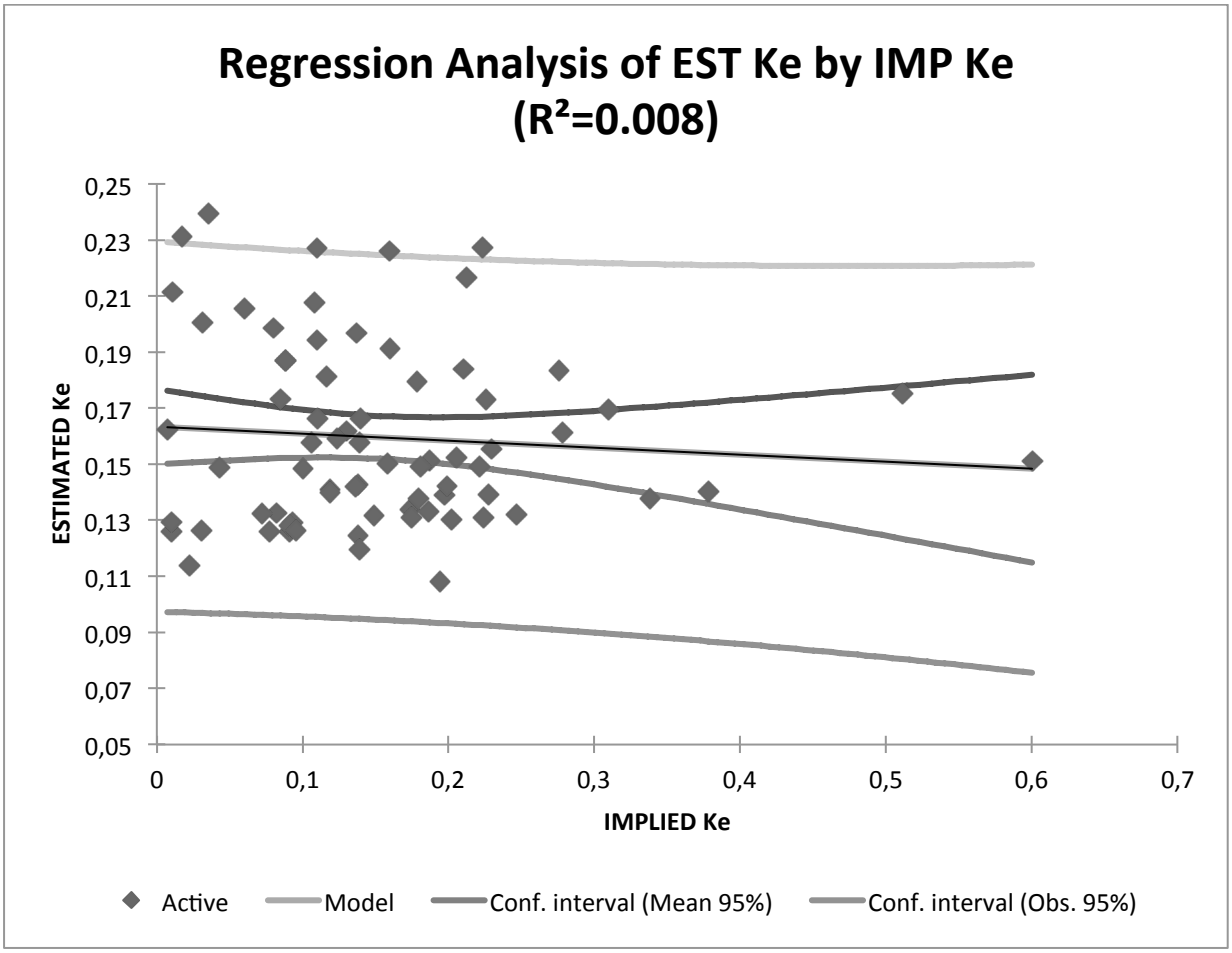


Table 20 Regression analysis - 2011 data set

Regression of variable ESTIMATED Cost of Equity Ke:	
Goodness of fit statistics:	
Observations	67
Sum of weights	67
DF	65
R²	0.012
Adjusted R²	-0.003
MSE	0.001
RMSE	0.032
MAPE	18.213
DW	1.612
Cp	2.000
AIC	-460.623
SBC	-456.214
PC	1.049

Figure 11 Scatterplot of regression analysis - 2011 data set

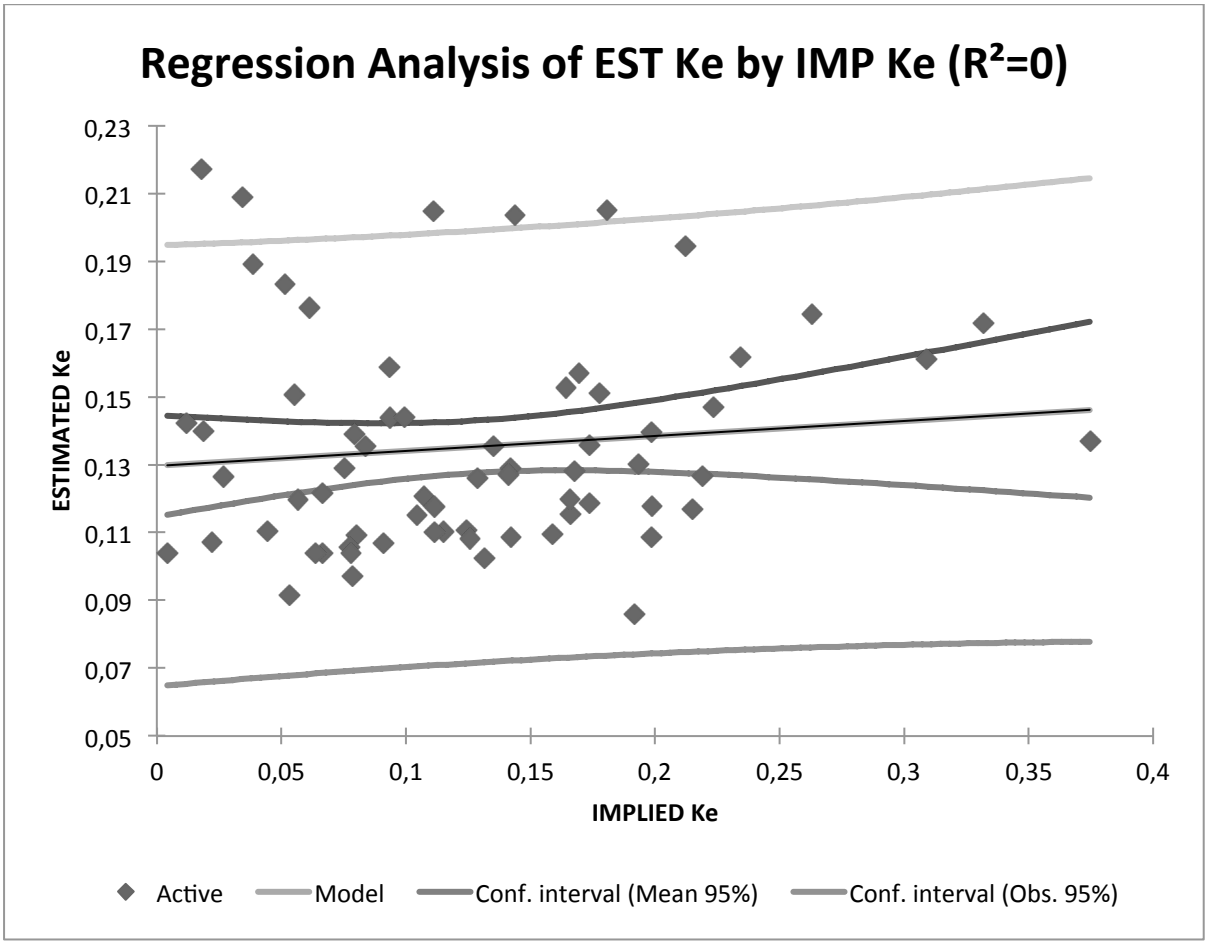


Table 21 Regression analysis - 2010 data set

Regression of variable ESTIMATED Ke:	
Goodness of fit statistics:	
Observations	66
Sum of weights	66
DF	64
R^2	0.003
Adjusted R^2	-0.013
MSE	0.001
RMSE	0.032
MAPE	18.155
DW	1.629
Cp	2.000
AIC	-453.318
SBC	-448.939
PC	1.060

Figure 12 Scatterplot of regression analysis - 2010 data set

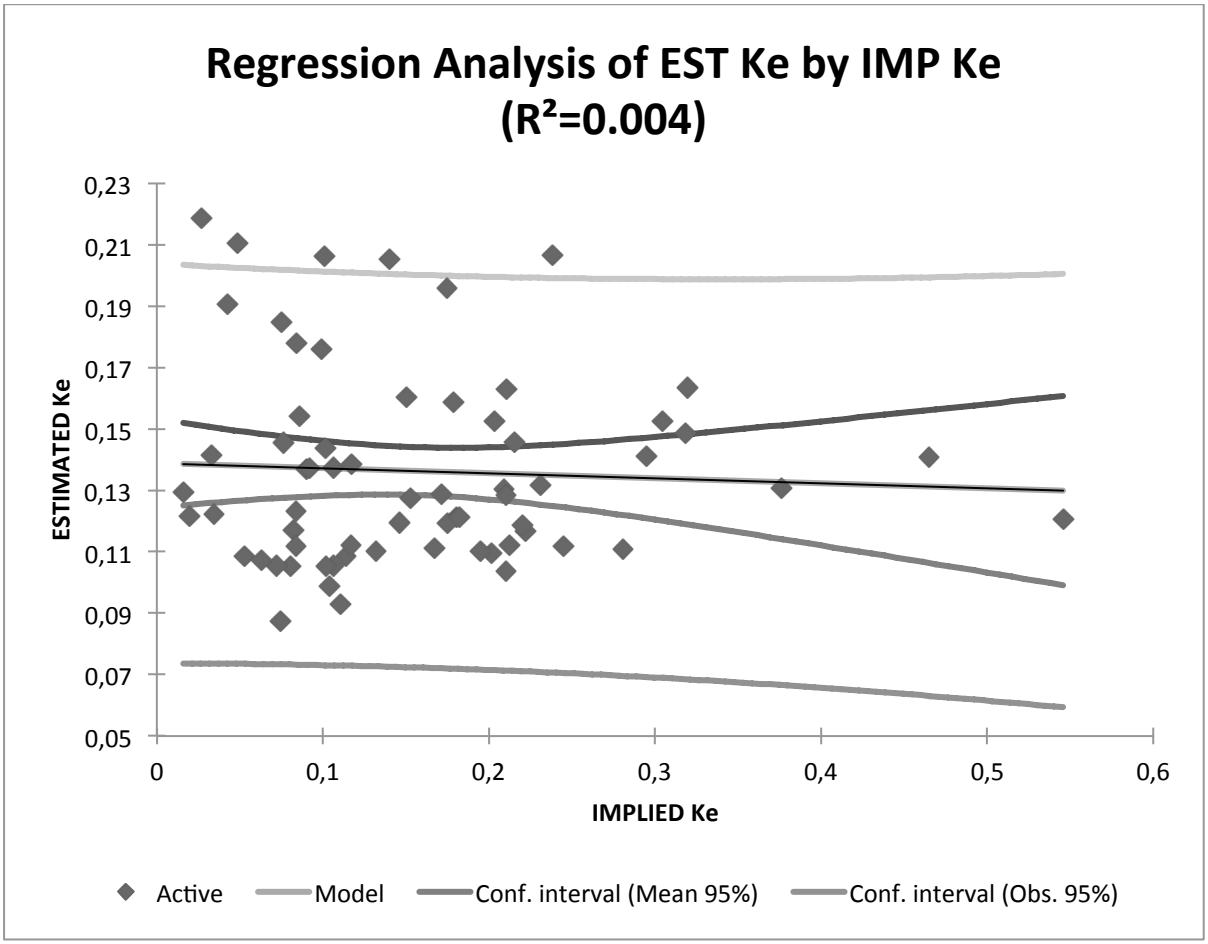
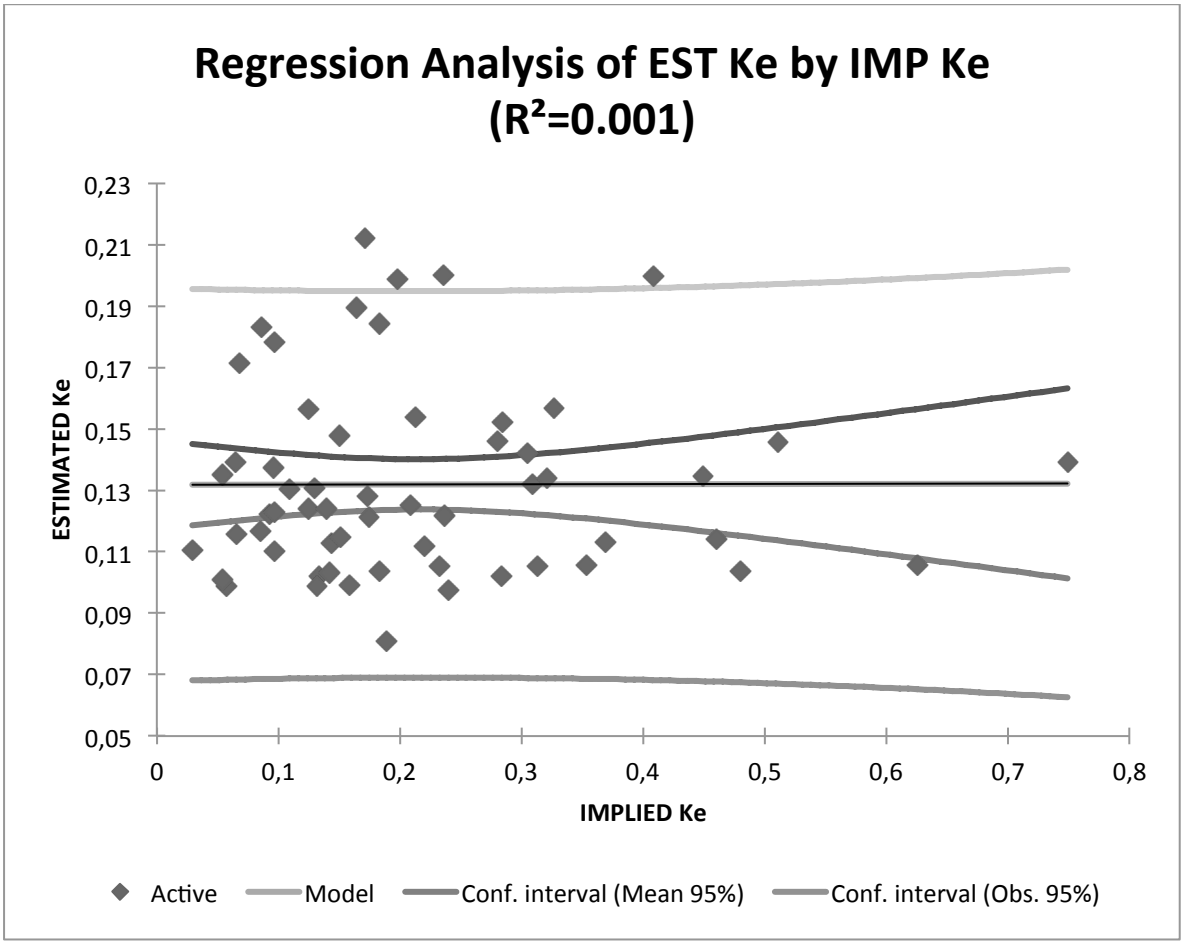


Table 22 Regression analysis - 2009 data set

Regression of variable ESTIMATED Ke:	
Goodness of fit statistics:	
Observations	58
Sum of weights	58
DF	56
R^2	0.000
Adjusted R^2	-0.018
MSE	0.001
RMSE	0.031
MAPE	18.368
DW	1.842
Cp	2.000
AIC	-400.469
SBC	-396.348
PC	1.071

Figure 13 Scatterplot of regression analysis - 2009 data set



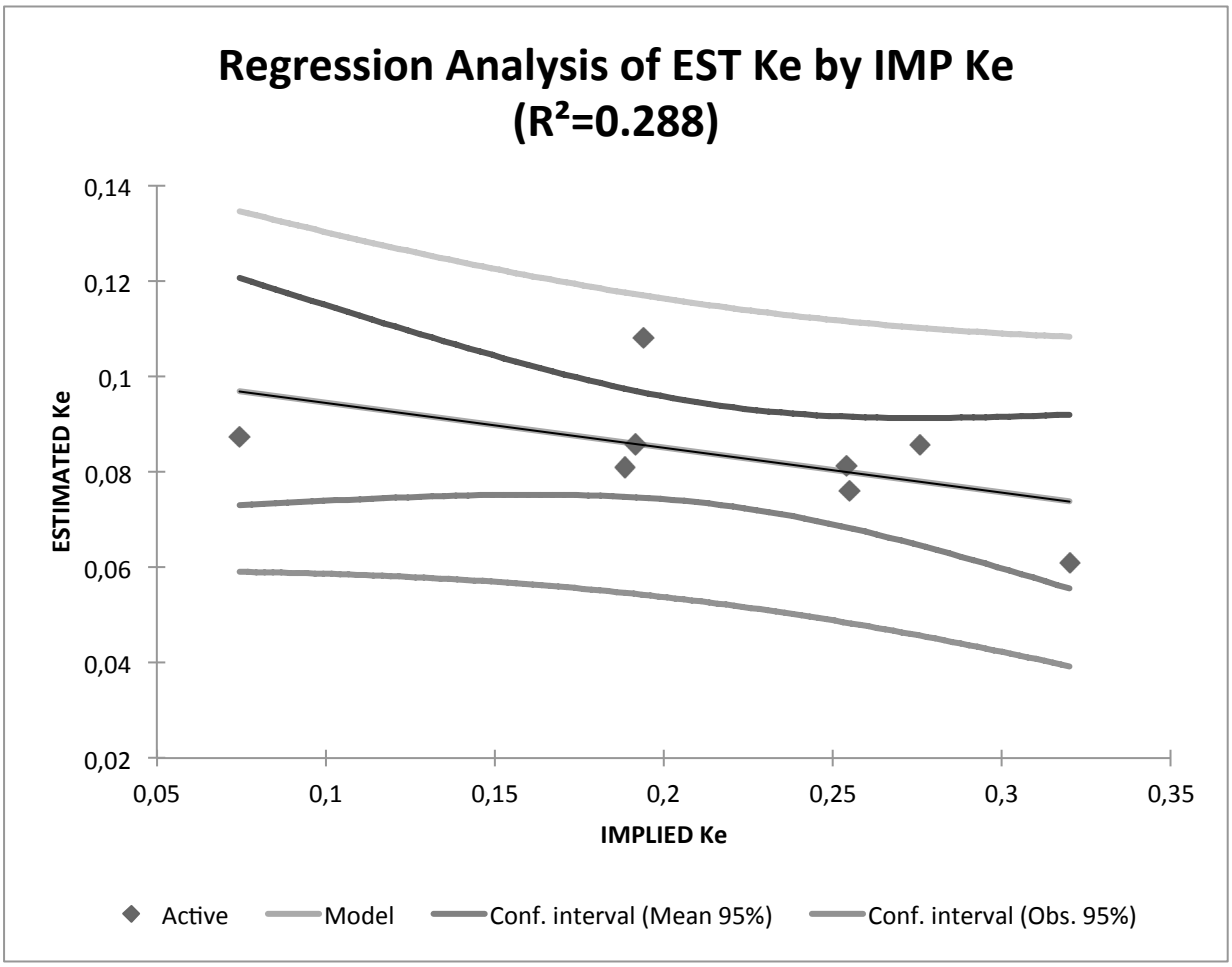
An illustration of the regression analysis that was conducted for one of the companies in the study is and is illustrated below. The electronic submission of this research report contains the other regression tests for the rest of the companies.

Table 23 Regression analysis - Company Astoria Investments Ltd - ARA

Regression of variable ESTIMATED Ke:	
Goodness of fit statistics:	
Observations	8
Sum of weights	8
DF	6
R²	0.286
Adjusted R²	0.167
MSE	0.000
RMSE	0.012
MAPE	9.357
DW	1.135
Cp	2.000

AIC	-69.069
SBC	-68.910
PC	1.190

Figure 14 Scatterplot of regression analysis - company ARA



The purpose of completing the regression analysis was so as to determine whether a correlation existed between the estimated costs of equity and implied costs of equity. An additional aim of the research to provide corroborative evidence to the legitimacy of the capital asset pricing model theory in the context of the South African equity market. On whether the hypotheses introduced in chapter three should be accepted or rejected, an illustration of the results if the statistical analysis is provided here-under.

Table 24 Hypotheses testing results

Sample	Observations	R^2	Decision
Entire data set	602	0.019	Reject H_0
2017 data points	86	0.010	Reject H_0
2016 data points	89	0.016	Reject H_0
2015 data points	84	0.055	Reject H_0
2014 data points	79	0.011	Reject H_0
2013 data points	72	0.007	Reject H_0
2012 data points	67	0.012	Reject H_0
2011 data points	66	0.003	Reject H_0
2010 data points	58	0.000	Reject H_0
Company ARA data points	8	0.286	Reject H_0

6) Results and Discussion

6.1) Introduction

The results that were obtained in the last chapter are discussed in more detail during this chapter. The discourse is presented with the research questions and hypothesis presented in chapter three as the context of the discussion. The ramifications of the result as well as some of the conjecture that can be drawn from the outcomes have been referenced to the literature review and theories that are applicable as discussed during chapter 2.

6.2) Determination of an implied cost of equity

Empiric testing of the capital asset pricing model has been attempted by researchers since the inception of the model over six decades ago. Many detractors offered evidence of flaws in the model, and others made additional assumptions and added factors of proposing modifications to the model. Sharpe and Lintner expanded upon Markowitz's model, by the addition of two key assumptions (Eugene F Fama & French, 2002). Complete agreement was the first assumption put forward and the second assumption was that no limits occurred in the lending and borrowing at a rate that is free of risk. Black (1972), had made an introduction to the notion of a zero betas model. Capital asset pricing model with three factors as well as four factor capital asset pricing models were subsequently developed, with further iterations of the model also being evaluated (Gregory & Michou, 2009).

That there are numerous methods and models that can be utilised to estimate the cost of equity is obvious. There are a number of methods to conduct empiric testing on the different aspects of the capital asset pricing model and by substituting some assumptions gives rise to new models inconsequentially (Ashton & Wang, 2013). Bearing in mind this situation described above, it is not unanticipated that estimations of equity risks premium as a factor of cost of equity estimates can vary from a negative number to more than twelve per cent between differing studies (Ashton & Wang, 2013). According to Botosan & Plumlee (2002) in their investigations, the market risk premium varied between one per cent to 6.6%, although the premium actually realised during the same time period was averaging 12.5%. The equity risk premium uncovered by Easton et al. (2002), and Gode & Mohanram (2003), was between 5 and 6 per cent, and Bogle (1999), Gebhardt et al. (2001), and Claus & Thomas (2001), as well as Pastor, Sinha, and Swaminathan (2008) estimated the market risk was between 2 and 4 per cent. Some of the researchers who have worked on this topic have purported a market risk premium that approximates zero, such as Mehra and Prescott (1985) as well as (Easton and Sommers (2007). The work proffered by Ashton & Wang (2013), have pegged the estimated cost of equity to be an estimation of between ten point

eight per cent and eleven point three per cent and the market risk premium has been estimated to be between three point one and three point nine per cent.

The values of the market risk and equity premium rates that have been cited above, are from research that was conducted predominantly in the United States, and the focus of this research report was primarily on companies included in the South African equity market context. It has been put forward during earlier discourse that the rates applicable to South Africa would be expected to be higher. It is thus important to examine studies conducted on companies listed on the Johannesburg Stock Exchange to find comparable rates.

6.3) Research Question Answers

Research question 1:

> "Is it possible to determine an implied cost of equity for South African financial services companies utilising market capitalisation values, DCF values and reconstructed capital asset pricing model equation?

It is conceded that the methodology employed in this research report was advanced in determining the implied cost of equity was another technique to empiric testing of the capital asset pricing model to ascertain a precise cost of equity for the South African context. Of the questions posed, the first one could be confirmed by establishing a determination of the implied cost of equity utilising the market value, the discount cash flow, and the rearranging of the capital asset pricing model equation to form a model. Although it necessitated a number of assumptions to be made, and adjustments made to the process, the outcomes were though-provoking.

The methodology employed in this research report was similar to the processes followed by Claus & Thomas (2001), wherein they assimilated United States equity market valuations to a present value of projected earnings with an estimation of an relevant discount rate. The concept of re-arranging the capital asset pricing model equation was first explored by Roll (1977), wherein he assembled a portfolio of companies and adjusted the variables in order for the portfolio was able to be arranged on the minimum variance efficiency frontier. The discord between the outcomes obtained from this research and the two aforementioned experiments are marked. Claus & Thomas (2001) provided evidence using the outcomes obtained from their study that the implied cost of equity was lesser than the estimated costs of equity. Roll (1977) made use of the study that he conducted to draw a conclusion implying that the capital asset pricing model was actually valid.

Research question 2:

> "Can a determination be made of the average implied costs of equity for the South African financial services companies expounding on the question above?"

The second question posed was comprised of two parts. The first aspect was now possible to be answered. An implied cost of equity mean was determined to be 17.05%. This valuation was significantly higher than the estimated cost of equity that was determined using the capital asset pricing model equation at 13.48%. The aspect of the question that relates to the intuitive perception of the implied costs of equity was onerous on the basis that the difference between the estimated cost of equity and the implied cost of equity was substantial.

The accuracy of the estimated cost of equity was gained from evidence of other research sources in its determination. This evidence was utilised to help determine whether the implied or estimated costs of equity made intuitive sense in the application of theory. Samouilhan (2007), during the course of his study determined that the day rate of his study was .0279 per cent, which is representative of 7.28 per cent, annualised rate. The rate has a very close approximation to the estimated costs of equity and is in support of the estimations. Studies conducted by Correia & Cramer (2008) in the same time period as Samouilan have proved a market risk premium that is even lower at 5.35 per cent.

A well regarded research study conducted Damodaran (2016), presented further evidence on global equity risk premiums. The research provides arguably one of the best preambles of a capital asset pricing model estimation of market risk premium for the South African context at 7.2 per cent. This is rate is representative of the over one hundred year period from 1900 to 2011 equity risk premium historically. This rate was also implemented during the body of work as the definition of an estimated cost of equity. Additional antecedents of estimations of markets risk premiums for the South African context are described below:

- PwC Valuation methodology survey 2017 has the range from twelve per cent and three per cent with the high and low average at six point six and four point seven per cent respectively (PwC Corporate Finance, 2017)
- Publication in the IESE Business School in 2013 – six point eight per cent (Fernandez, Aguirreamalloa, & Corres, 2013)
- The South African Financial Markets Journal – six point three per cent (Luis, 2013)

The estimated cost of equity, based upon evidence presented above, appears to be closer than the implied cost of equity determined during the course of this study, using intuition. The primary objection regarding the above mentioned assumption is that it appears to contradict the results obtained on the Johannesburg Stock Exchange over the past five

years. Referring back to the Borgman & Strong (2006) literature it is imperative that their belief was that the return on equity was equal to the long term costs of equity of a company. Claus & Thomas (2001) also purported that the costs of equity was equal to the equity returns on shares of a company. The theory underpinning the costs of equity appear to support the rationale that costs of equity would be higher for the South African equity market context.

Research question 3:

> "Was there a significant change in the implied costs of equity for South African financial services industry?"

The implied costs of equity mean, as compared to the estimated costs of equity mean, calculated for every year in the research is illustrated below:

Table 25 Estimated and implied costs of equity means for each year

YEAR	IMPLIED Ke	ESTD Ke
2017	18.12%	11.13%
2016	17.03%	12.67%
2015	17.57%	13.19%
2014	19.08%	13.90%
2013	15.33%	15.96%

There was determined again, which was expected, that correlation did not exist between the means of implied and estimated costs of equity for every year included in the study. The results of the correlation were relayed in chapter five. Another interesting perception that was observed from the results is that estimated costs of equity for South African equities has been decreasing as a result of decreasing risk free rates. Implied costs of equity rates have remained relatively constant, although the rates are high. This lends credence to the notion that higher implied costs of equity are more relevant currently.

Research question 4:

> "Can a determination be made of the implied market risk premium for South African financial services companies that was determined from the previously mentioned implied costs of equity found in this study?

By deducting the risk free rate for every year included from the means of the implied costs of equity for each of the years included in the study, an implied market risk premium is obtained for each of the years in the study. One drawback of this method is that the effect of the beta is ignored, however, an assumption is made for the beta of the market as a whole. It follows then that omitting the beta from the equation has no impact on the calculations. The outputs are illustrated hereunder:

Table 26 Implied market risk premium calculation

YEAR	IMPLIED Ke	RISK FREE RATE	IMPLIED MARKET RISK PREMIUM
2017	18.12%	6.00%	12.12%
2016	17.03%	7.50%	9.53%
2015	17.57%	8.03%	9.54%
2014	19.08%	8.47%	10.61%
2013	15.33%	10.72%	4.61%
AVERAGES	**17.43%**	**8.14%**	**9.28%**

The market premiums displayed are substantially higher than those of the estimated market risk premium. They are also significantly higher than those of estimates found in literature concerning the topic. The question around the validity of the capital asset pricing model is raised again, however the rates calculated empirically do proffer a better manifestation of actualised market risk premium in the context of the South African equity market context.

In spite of the fact that there is no evidence that validates a higher implied cost of equity rate, the rates do offer an important criterion for which portfolio mangers can measure returns of different investments or asset class's performance. Returns on investment for South African equity classes have been much higher over a long period in the study and the use of an estimated cost of equity approximating 13.48 per cent as a gauge could be misleading. In the above mentioned context, the implied cost of equity appears to offer a more appropriate benchmark for performance gauging.

6.4) Hypothesis

From the statistical analysis that was completed on the data, the hypotheses are to be rejected. The simple regression testing that was done was on the r^2 statistics proved to be acutely below expectations. This was an illustration of no existence of a correlation between the estimated cost of equity and the implied costs of equity regardless of how the data was

arranged, catalogued or interpreted. This brings into question once again if the capital asset pricing model is actually valid. Note should be taken that the lack of an existence of a correlation from the data may be attributed to factors beyond the scope of this study and may not be the reason to question the validity of the capital asset pricing model theory. Invalidating the capital asset pricing model involves too many variables in the research process and the numbers of assumptions that need to be drawn are overwhelming and make the invalidation of the theory non-definitive.

6.5) Other Observations

Of the different methodologies used in the various studies completed on empiric testing of cost of equity calculations, one of the key differences was the use of actual returns achieved versus forecasting earnings or returns. During the course of this study, results were obtained using a combination of both forecasted and observed returns. The observed returns for each of the years in the study were implemented to illustrate free cash flow calculations. The value of the calculation was subsequently marked up by a percentage that was fixed. Recently, a large amount of research has been supported using forecasted returns as opposed to actual returns (Levy, 2011), (Berger, 2011), (Borgman & Strong, 2006).

Severe variations that are observed in unforeseen circumstances in the equity market are one of the problems in utilising observed earnings for the basis of forecasting. An attempt was made to focus on the problem by eliminating anomalous free cash flow returns calculations, variations do occur. Attempting to smooth the revenue could potentially put forward a possible explanation to solving the dilemma. (McInnes, 2010), however a correlation could not be drawn between lower costs of equity and smoothed earnings.

The implied costs of equity were determined by using the current stock price and the equivalent market capitalisation of companies included in the study. Borgman & Strong, (2006), were of the opinion that using the present stock price was correct in the determination of the costs of equity, while Easton (2007) opined that noise of the price of the stock would influence the determination of costs of equity and suggested that different alternatives be used to determine the company valuation. This research report may have benefited from a longer time frame to view stock prices of the companies in the analysis and that using a stock price averaged over a time frame to obtain a value to be utilised in the estimation of costs of equity.

The discount cash flow valuations of companies utilised a discount rate that was positioned on the present equity and debt ratio or total capital and debt ratio of the corporation. In the work submitted by Correia & Cramer (2008) on valuation methodologies in the South African

context, they determined that more than three quarters of professionals who specialise in valuating companies, utilised a targeted equity and debt ratio instead of an actual equity and debt ratio. The PwC Corporate Finance valuation report (2017) determined that valuation professionals used one out of four differing debt to equity ratios.

7) Conclusion and Recommendations

7.1) Summation

The purpose of this study was to interrogate the capital asset pricing model and undertook, by statistical evaluation, to obtain an implied costs of equity for financial services corporations that are listed on the Johannesburg Stock Exchange. This type of study has been undertaken before, utilising different assumptions and alternates, however, studies that focus on emerging market, and in particular the South African equity market, are few and far between. The principal purpose of the research report was to uncover a possible new approach or perhaps an innovative difference to a current method, enabling a higher level of precision in cost of equity when evaluating company values and for portfolio management decision making in the South African context. The subsidiary purpose of the study attempted to put the capital asset pricing model through its paces in the context of JSE listed companies and drawing comparisons between estimated and implied costs of equity.

An exhaustive literature review was conducted around the capital asset pricing model and specific empiric tests were concluded on the cost of equity. The literature review focus was to evaluate previous work and studies in the South African equity market context. An in-depth analysis of the results determined as well as the methodologies employed in the studies was carried out. The approach taken in this research report differed from the methodologies employed in the previous studies and built upon the work completed by Ward & Muller (2012), on their empiric testing done on the capital asset pricing model on the Johannesburg Stock Exchange.

Evidently, from the literature review, opinions still are very divided in both the business world and in the academic world, as to the validity of the capital asset pricing model.

Company valuations done in business, and where valuation theories are taught in post graduate corporate finance classes, the free cash flow valuation method with the capital asset pricing model applied, is still the eminently prevalent method of valuation that is applied. According to PwC's biennial Valuation Methodology Survey for the 2016/2017 financial years, every respondent stated that the capital asset pricing model is the most frequently applied method for estimating costs of equity. In spite of the practical affirmation, there exists only a small body of evidence in published literature for the capital asset pricing model and some of the studies even purporting that the theory is invalid. The studies emanating from South Africa that were examined in the course of this report, denounced the application of the capital asset pricing model and its relevance and applicability to the South African equity markets.

The findings determined in this research report are in support of the previously mentioned studies, as no substantiation can be drawn that the capital asset pricing model is efficacious in predictions of the relationship between returns of an asset and the risk with any modicum of veracity in the context of the South African Equity Market. No correlations between the implied costs of equity determined from market values, and the estimation of costs of equity of the capital asset pricing model could not be found during the course of this study. The implication of the findings of this study that the implied costs of equity for the equity market in South Africa is likely decidedly greater when compared to the estimation of costs of equity bench mark, and could provide some value to both academia and businesses. The greater return that Johannesburg Stock Exchange listed companies have consistently provided over the recent past is in support of the findings. However, more empiric testing still needs to be conducted around the over-estimated costs of equity that appear to be closer to a rate that is accurate given high market return.

A higher than expected cost of equity would mean a higher discount rate for business valuations in the South African context. Future transactions such as mergers and acquisitions, and share incentive-schemes may be impacted by a higher discount rate used in company valuations by lowering equity valuations. It also has implications for decision making in capital expenditure projects for companies. Increased costs of equity has an implication towards higher market risks premium or equity-risk premium as company's declaration of returns could potentially be measure against an increased benchmark than previously.

Ibbotson and Sinquefield, commenting in "Stocks, Bonds, Bills, and Inflation (Borgman & Strong, 2006) had an interesting view on costs of equity and its estimation. They purported that it was a challenging task for financial analysts. They were of the opinion that there was no decisive method in approaching the problem. Due to the implications of costs of equity valuations and its effect on decision making, analysts should employ more than one method to ascertain the costs of equity (Ibbotson and Associates, 1997).

The literature reviewed in this research report has shown the value of the determination of implied costs of equity in the South African context despite various critiques against the costs of equity and the inability of empiric testing to determine an estimation of costs of equity accurately. The contribution to the existing body of work this research has made will hopefully provide some contribution to the limited work on the capital asset pricing model in the context of the South African equity market.

7.2) Future Research Recommendations

Limitations of this research report have been brought to the fore during the discussion in chapter 4. By addressing the limitations of the research methodologies, potential new research ideologies can be realised. Potential future research opportunities on the capital asset pricing model and empiric tests to the costs of equity that concentrate on the South African specific equity market context are covered by a quadrant of principled ideas.

Firstly, addressing the limitation concerned with the data that was utilised, the number of companies that were included in the analysis could be increased to include every company listed on the Johannesburg Stock Exchange. By creating template spreadsheets that are able to control for all variables, and enhancing the valuations process to be faster, the data collection process would be much more efficient. The effect of using smaller sized companies would make for interesting observations in the study of implied costs of equity. Groupings of larger market capitalisation versus smaller capitalisation portfolios could yield interesting results for size effects. Furthermore, the analysis of the companies could be conducted for a lengthier time frame.

There was a large gap in the data, where some companies and some years, in which the costs of equity could not be calculated, principally due to anomalous events or items in the financial reporting of the company for that specific year. During the process of data analysis and research an attempt was made abrogate for the abnormalities and even to exclude them entirely, however a more robust process could be designed to compensate for judgemental errors in future research studies. Potential studies may additionally benefit from smoothing out of earnings, or perhaps by using an average of the companies' returns over a 5 year period, comparable to the studies conducted in the United States (McInnes, 2010) to compensate for the issues of abnormality. Additionally, the use of an average of share pricing in the determination of the company's value in calculating the implied costs of equity as opposed to a share price specifically on a particular period will contribute to a more sensible and archetypal outcome due to the exclusion of external causes which could result in short term drastic share price movement based on emotions.

The secondary recommendation concerns the assumptions used in the study, with the main issues being around earnings. Rather than using a percentage that is fixed in determining the free cash flows, the possibility exists to utilise analyst's forecasting on the potential revenues of the various corporations. By utilising a targeted capital/debt ratio for a corporation make this a possibility, whereas using the actual debt to capital ratio as of the previous financial year end or, by perhaps using an averaged leverage ratio for a particular sector that a corporation is operating in. Additional energy could be expounded making sure that the market capitalisation modifications made for a company in term of debt and cash are correct. And lastly, additional time could be spent on development of a methodology for

calculating a precise cost of debt of each company to be used in the weighted average cost of capital as a discount rate, as opposed to using a cost of debt that is common for all the companies in the study. A more detailed analysis of the company's financial statements will be required in order to attain this for potential future research.

The third recommendation for potential future studies is to simultaneously analyse three vital variables for the determination of an implied costs of equity which are: market risk premium, risk free rate and the beta of the share. This idea has been attempted previously by P. Easton et al. (2002), but no such attempt has been made in the South African equity market context. By alternating the changes to one variable while maintaining the other two variables may yield interesting results. This type of empiric testing has been attempted in the United States, but no such study has been conducted on the South African equity market.

The fourth and final recommendation for potential future research work stems from the contribution of Borgman & Strong (2006), in which they purported that the return on equity of a corporation, and the costs of equity of a corporation, over the long term, should be equal. Prospective studies could be performed around the determination of the existence of a correlation between return on equity and costs of equity and if the possibility exists of determining an implied cost of equity from observational return on equity of the projected return on equity of a company.

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Appendices

Appendix 1

		31 January 2017	
Company Code	**Company Name**	**Market Cap**	**Share Price**
APF	Accelerate Prop Fund Ltd	R 6 501 534 019.20	R 6.60
AWA	Arrowhead Properties Ltd	R 9 258 208 713.00	R 8.92
ALP	Atlantic Leaf Prop Ltd	R 2 568 081 762.00	R 18.00
CRP	Capital & Regional Plc	R 6 840 815 950.00	R 9.74
DLT	Delta Property Fund Ltd	R 5 791 652 283.30	R 8.15
DIA	Dipula Income Fund A	R 2 099 853 730.00	R 10.00
EMI	Emira Property Fund Ltd	R 7 351 921 209.60	R 14.40
EQU	Equites Prop Fund Ltd	R 5 579 404 392.00	R 15.92
FFB	Fortress Inc Fund Ltd B	R 37 111 193 738.66	R 34.78
GRT	Growthpoint Prop Ltd	R 74 432 061 477.80	R 26.30
ILU	Indluplace Properties Ltd	R 2 483 689 542.10	R 10.30
HYP	Hyprop Inv Ltd	R 29 815 437 772.78	R 120.01
ITU	Intu Properties plc	R 61 356 222 203.04	R 45.28
IAP	Investec Australia Prop Fd	R 4 379 785 017.51	R 13.37
IPF	Investec Property Fund Ltd	R 10 953 542 605.20	R 15.60
GRT	Growthpoint Prop Ltd	R 74 432 061 477.80	R 26.30
L2D	Liberty Two Degrees	R 9 584 077 184.25	R 10.55
INP	Investec plc	R 62 655 021 343.75	R 95.35
MDP	Mara Delta Prop Hldg Ltd	R 2 000 988 051.80	R 17.90
NRL	Newpark REIT Ltd	R 650 000 006.50	R 6.50
OCT	Octodec Invest Ltd	R 6 025 869 204.48	R 23.04
ORE	Orion Real Estate Ltd	R 346 884 278.40	R 0.55
REB	Rebosis Property Fund Ltd	R 7 673 167 368.90	R 12.70
RPL	Redefine International P.L.C	R 11 812 543 639.44	R 6.52
RDF	Redefine Properties Ltd	R 62 076 295 487.40	R 11.14
RES	Resilient REIT Limited	R 47 051 772 107.34	R 117.26
SAC	SA Corp Real Estate Ltd	R 13 779 646 203.00	R 5.70
SAR	Safari Investments RSA Ltd	R 1 377 055 051.20	R 7.20
SCD	Schroder Eur REIT plc	R 2 446 007 406.94	R 18.29
SEA	Spear REIT Limited	R 807 169 302.45	R 9.45
SSS	Stor-Age Prop REIT Ltd	R 1 541 996 201.76	R 11.04
TEX	Texton Property Fund Ltd	R 3 158 960 834.40	R 8.40
TWR	Tower Property Fund Ltd	R 2 839 840 728.10	R 8.35
VKE	Vukile Property Fund Ltd	R 13 125 259 448.40	R 18.70
ACS	Acsion Limited	R 3 218 923 804.40	R 8.15
ANA	Adrenna Property Grp Ltd	R 27 957 401.00	R 0.50
ATT	Attacq Limited	R 13 483 669 986.00	R 18.00
BWN	Balwin Properties Ltd	R 3 494 225 180.80	R 7.40
CGR	Calgro M3 Hldgs Ltd	R 2 574 749 510.18	R 17.51

CCO	Capital&Counties Prop plc	R 38 710 068 095.25	R 45.75
EPP	Echo Polska Prop N.V.	R 11 457 302 758.60	R 19.55
FVT	Fairvest Property Hldgs	R 1 365 018 411.75	R 1.75
FDP	Freedom Prop Fund Ltd	R 84 310 032.17	R 0.07
GTC	Globe Trade Centre S.A.	R 13 208 212 918.60	R 28.70
ING	Ingenuity Property Inv	R 1 092 716 397.33	R 0.87
IHL	Inter. Hotel Prop Ltd	R 1 008 000 000.00	R 18.00
MSP	MAS Real Estate Inc.	R 8 502 242 896.24	R 22.34
NFP	New Frontier Prop Ltd	R 3 049 384 010.00	R 19.96
PPR	Putprop Ltd	R 259 099 218.20	R 5.80
RBA	RBA Holdings Ltd	R 111 346 820.98	R 0.74
SRE	Sirius Real Estate Ltd	R 7 095 785 340.80	R 8.32
STP	Stenprop Limited	R 5 077 136 094.80	R 17.71
TDH	Tradehold Ltd	R 4 266 447 386.96	R 21.34
VIS	Visual International Hldgs Ltd	R 16 219 031.15	R 0.07
CND	Conduit Capital Ltd	R 861 587 526.80	R 2.60
IDQ	Indequity Group Ltd	R 127 779 912.00	R 9.75
SNT	Santam Limited	R 27 646 507 164.21	R 240.13
CLI	Clientele Ltd	R 5 646 080 409.00	R 17.00
DSY	Discovery Ltd	R 74 432 453 229.44	R 115.07
LBH	Liberty Holdings Ltd	R 31 482 261 030.00	R 110.00
MMI	MMI Holdings Limited	R 38 892 996 255.10	R 24.70
RMI	Rand Merchant Inv Hldgs Ltd	R 57 822 990 426.32	R 38.92
SLM	Sanlam Limited	R 140 799 002 671.94	R 64.99
OML	Old Mutual plc	R 174 222 480 500.34	R 35.34
ADW	African Dawn Capital Ltd	R 12 716 533.06	R 0.58
AEE	African Equity Emp Inv Ltd	R 1 867 089 849.20	R 3.80
ACT	AfroCentric Inv Corp Ltd	R 3 819 659 789.92	R 6.89
AFH	Alexander Forbes Grp Hldgs	R 9 591 202 785.45	R 7.15
ACG	Anchor Group Limited	R 1 671 428 399.04	R 8.64
ARA	Astoria Investments Ltd	R 1 306 142 423.20	R 10.30
BK1P	BK One Limited Pref	R 2 449 282.30	R 0.10
BAT	Brait SE	R 41 159 961 746.00	R 79.00
CTA	CAPITAL APPRECIATION LTD	R 1 237 500 000.00	R 0.99
CML	Coronation Fund Mngrs Ld	R 23 335 098 094.42	R 66.71
DNB	Deneb Investments Ltd	R 748 969 186.00	R 1.75
ECS	Ecsponent Limited	R 102 494 699.56	R 0.11
EFG	Efficient Group Ltd	R 498 261 351.50	R 5.50
EPE	EPE Capital Partners Ltd	R 1 685 625 000.00	R 8.99
FGL	Finbond Group Ltd	R 1 829 306 109.60	R 2.40
FSR	Firstrand Ltd	R 281 596 297 650.20	R 50.20
GAI	Gaia Infrastruct Cap Ltd	R 479 805 000.00	R 8.70
GAM	Global Asset Mngment Ltd	R 216 630 300.00	R 4.00
GRP	Greenbay Properties Ltd	R 7 665 805 465.78	R 1.54
INL	Investec Ltd	R 28 538 411 888.24	R 94.76

INP	Investec plc	R 62 655 021 343.75	R 95.35
JSE	JSE Ltd	R 14 016 831 984.00	R 161.34
LNF	London Fin Inv Group plc	R 280 867 311.00	R 9.00
MMG	Micromega Holdings Ltd	R 1 091 693 345.50	R 9.50
NCS	Nictus Ltd	R 33 134 970.00	R 0.50
NIV	Niveus Investments Ltd	R 4 282 708 659.96	R 35.94
NVE	NVest Financial Hldgs Ltd	R 905 197 748.78	R 2.99
OAS	Oasis Crescent Prop Fund	R 1 144 314 195.75	R 20.25
PGL	Pallinghurst Res Ltd	R 3 117 855 787.10	R 4.10
PGR	Peregrine Holdings Limited	R 6 752 582 339.52	R 29.87
REM	Remgro Limited	R 1 669 250 950.00	R 1.00
PSG	PSG Group Ltd	R 52 359 037 197.12	R 226.88
KST	PSG Konsult Limited	R 9 889 308 194.48	R 7.48
PPE	Purple Group Ltd	R 469 407 430.41	R 0.53
RACP	RECM and Calibre Limited	R 1 227 660 000.00	R 25.90
REI	Reinet Investments S.C.A	R 55 431 789 809.40	R 28.29

Appendix 2

ESTIMATED Ke	IMPLIED Ke	ESTIMATED Ke	IMPLIED Ke	ESTIMATED Ke	IMPLIED Ke
6.09%	32.00%	16.43%	21.24%	10.15%	17.06%
7.59%	25.49%	17.93%	10.93%	10.68%	11.71%
8.12%	25.39%	18.46%	7.30%	11.12%	17.82%
8.56%	27.57%	18.90%	5.66%	13.37%	17.35%
10.81%	19.39%	21.15%	1.08%	10.42%	16.33%
8.58%	19.17%	18.92%	3.85%	11.92%	42.01%
8.74%	7.44%	19.08%	4.24%	12.45%	56.60%
8.09%	18.84%	18.43%	18.28%	12.89%	29.93%
9.58%	13.33%	12.61%	28.87%	15.14%	18.69%
11.08%	20.63%	14.11%	24.33%	12.91%	7.53%
11.61%	8.57%	14.64%	21.75%	13.07%	37.58%
12.05%	12.68%	15.08%	16.64%	12.42%	12.43%
14.30%	13.78%	17.33%	8.47%	8.47%	30.69%
12.07%	10.72%	15.10%	17.77%	9.97%	52.41%
12.23%	3.46%	15.26%	30.45%	10.50%	59.90%
11.58%	6.56%	14.61%	28.02%	10.94%	60.56%
7.89%	9.53%	9.10%	9.44%	13.19%	24.67%
9.39%	10.96%	10.60%	7.49%	10.96%	15.88%
9.92%	11.86%	12.59%	29.09%	11.12%	16.72%
10.36%	9.93%	14.09%	23.90%	11.47%	27.28%
12.61%	0.97%	14.62%	41.90%	12.97%	15.14%
10.38%	0.42%	15.06%	36.97%	13.50%	14.38%
10.54%	8.05%	17.31%	22.56%	13.94%	33.03%
9.89%	5.78%	15.08%	5.53%	16.19%	13.02%
8.45%	20.01%	15.24%	20.30%	13.96%	19.83%
9.95%	11.56%	14.59%	51.05%	14.12%	29.49%

10.48%	5.06%	7.87%	11.53%	13.47%	44.93%
10.92%	9.71%	9.37%	11.41%	13.77%	14.66%
13.17%	14.89%	9.90%	11.76%	14.21%	22.19%
10.94%	7.99%	10.34%	11.28%	14.23%	1.18%
11.10%	28.06%	12.59%	9.09%	14.39%	10.15%
10.54%	15.10%	14.95%	12.83%	13.74%	9.60%
12.04%	11.91%	16.45%	20.00%	10.40%	27.90%
12.57%	28.42%	16.98%	23.73%	11.90%	39.66%
13.01%	22.85%	17.42%	24.73%	12.43%	38.12%
15.26%	20.57%	19.67%	13.68%	12.87%	34.75%
13.03%	19.32%	17.44%	26.28%	15.12%	60.03%
13.19%	23.09%	17.60%	9.90%	12.89%	14.19%
12.54%	20.84%	8.65%	17.07%	13.05%	20.89%

ESTIMATED Ke	IMPLIED Ke	ESTIMATED Ke	IMPLIED Ke	ESTIMATED Ke	IMPLIED Ke
12.40%	13.98%	12.11%	17.42%	14.12%	11.85%
11.90%	13.61%	16.95%	8.04%	11.89%	17.37%
13.40%	32.79%	18.45%	4.53%	12.05%	54.57%
13.93%	34.18%	18.98%	7.94%	11.40%	46.01%
14.37%	16.95%	19.42%	10.56%	14.41%	11.63%
16.62%	13.95%	21.67%	21.21%	15.91%	11.61%
14.39%	9.35%	19.44%	21.23%	16.88%	39.73%
14.55%	7.63%	19.60%	17.47%	19.13%	16.00%
13.90%	6.44%	18.95%	16.37%	10.56%	27.01%
9.47%	26.47%	6.66%	8.47%	12.06%	28.70%
10.97%	15.73%	8.16%	6.66%	12.59%	22.38%
11.50%	6.19%	8.69%	14.30%	13.03%	14.82%
11.94%	13.28%	9.13%	5.84%	11.66%	3.83%
14.19%	13.62%	11.38%	2.24%	12.19%	7.10%
11.96%	5.66%	9.15%	5.31%	12.63%	9.24%
12.12%	18.04%	9.31%	11.04%	14.88%	4.25%
13.97%	13.57%	9.05%	14.13%	12.65%	2.67%
15.47%	20.37%	10.55%	20.19%	12.16%	1.99%
16.00%	9.51%	11.08%	11.12%	9.70%	11.90%
16.44%	20.58%	11.52%	31.67%	10.23%	13.37%
18.69%	8.84%	13.77%	33.83%	10.67%	10.61%
12.59%	7.43%	11.54%	16.59%	12.92%	9.33%
13.12%	5.76%	11.70%	8.23%	10.69%	9.10%
13.58%	17.34%	11.05%	2.92%	10.85%	11.39%
13.74%	10.64%	10.19%	25.25%	10.20%	28.33%
11.19%	14.52%	11.69%	16.80%	16.30%	19.70%
12.69%	34.94%	12.22%	11.21%	17.80%	22.56%
13.22%	13.49%	12.66%	15.09%	18.33%	10.17%
13.66%	21.41%	14.91%	22.12%	18.77%	1.26%
15.91%	12.34%	12.68%	21.89%	18.30%	8.59%
13.68%	37.45%	12.84%	21.03%	7.90%	13.05%
13.84%	11.72%	12.19%	23.66%	9.40%	9.44%

13.19%	30.89%	9.17%	18.96%	9.93%	9.79%
10.11%	21.10%	10.67%	23.36%	10.37%	7.37%
11.61%	11.66%	11.20%	12.36%	12.62%	3.03%
12.14%	15.69%	11.64%	10.97%	10.39%	6.65%
12.58%	7.98%	13.89%	19.71%	10.55%	7.18%
14.83%	10.03%	9.40%	21.13%	13.34%	25.53%
12.60%	12.86%	10.90%	13.32%	14.84%	24.51%
12.76%	15.25%	11.43%	17.61%	15.37%	24.93%

ESTIMATED Ke	IMPLIED Ke	ESTIMATED Ke	IMPLIED Ke	ESTIMATED Ke	IMPLIED Ke
15.81%	26.86%	10.58%	35.31%	16.14%	27.78%
9.29%	15.57%	8.53%	22.71%	13.91%	7.93%
10.79%	18.21%	10.03%	25.59%	14.07%	46.48%
11.32%	16.92%	10.56%	24.72%	13.42%	32.07%
11.76%	17.54%	11.00%	26.65%	8.09%	17.62%
14.01%	37.85%	13.25%	8.24%	9.59%	11.80%
11.78%	19.86%	11.02%	11.48%	10.12%	11.04%
11.94%	14.60%	11.18%	24.47%	10.56%	15.28%
11.29%	36.86%	10.53%	23.25%	12.81%	9.12%
13.64%	40.22%	10.22%	26.17%	10.58%	7.73%
15.14%	22.20%	11.72%	25.07%	10.74%	6.28%
15.67%	22.61%	12.25%	18.91%	10.09%	5.36%
16.11%	19.80%	12.69%	24.36%	6.32%	3.19%
18.36%	27.58%	14.94%	18.05%	7.82%	2.73%
16.13%	30.89%	12.71%	14.11%	7.91%	8.52%
16.29%	21.04%	12.87%	17.12%	9.41%	13.81%
15.64%	12.48%	12.22%	9.26%	9.94%	13.79%
9.28%	50.88%	7.74%	18.42%	10.38%	4.63%
10.78%	40.82%	9.24%	11.86%	12.63%	9.54%
11.31%	48.37%	9.77%	13.41%	10.40%	7.79%
11.75%	29.98%	10.21%	13.29%	10.56%	10.65%
14.00%	11.85%	12.46%	13.80%	9.91%	15.87%
11.77%	11.13%	10.23%	13.13%	14.62%	27.11%
11.93%	17.50%	10.39%	21.03%	16.12%	23.20%
11.28%	14.36%	9.74%	23.99%	19.22%	5.23%
8.22%	13.37%	17.54%	5.85%	20.72%	5.19%
9.72%	13.78%	19.04%	4.00%	21.25%	4.17%
10.25%	20.19%	19.57%	4.80%	21.69%	1.68%
10.69%	14.54%	20.01%	22.42%	23.94%	3.51%
12.94%	1.02%	8.56%	11.85%	21.71%	1.81%
10.71%	2.21%	10.06%	13.28%	21.87%	2.71%
10.87%	5.28%	10.59%	4.35%	21.22%	17.10%
10.22%	13.35%	11.03%	8.15%	19.22%	5.23%
8.58%	17.94%	11.05%	4.44%	20.72%	5.19%
10.08%	27.85%	11.21%	11.70%	21.25%	4.17%

10.61%	19.62%	10.56%	62.53%	21.69%	1.68%
11.05%	31.75%	11.42%	26.16%	23.94%	3.51%
13.30%	18.62%	12.92%	21.82%	21.71%	1.81%
11.07%	12.43%	13.45%	11.15%	21.87%	2.71%
11.23%	21.22%	13.89%	33.67%	21.22%	17.10%

ESTIMATED Ke	IMPLIED Ke	ESTIMATED Ke	IMPLIED Ke	ESTIMATED Ke	IMPLIED Ke
11.81%	27.54%	11.06%	13.97%	10.87%	14.20%
12.34%	49.99%	11.50%	15.92%	11.03%	19.46%
12.78%	41.05%	13.75%	17.96%	10.38%	18.27%
15.03%	15.81%	11.52%	10.43%	13.23%	20.03%
12.80%	16.75%	11.68%	22.21%	14.73%	17.63%
12.96%	1.58%	11.03%	9.67%	15.26%	24.86%
12.31%	9.68%	12.79%	38.70%	15.70%	26.31%
3.08%	24.20%	14.29%	29.63%	17.95%	17.85%
8.32%	22.45%	14.82%	31.34%	15.72%	16.93%
9.82%	19.58%	15.26%	19.31%	15.88%	17.85%
10.35%	17.76%	17.51%	51.16%	15.23%	28.45%
10.79%	21.46%	15.28%	16.42%	10.83%	13.73%
13.04%	20.21%	15.44%	8.62%	12.33%	14.91%
10.81%	12.56%	14.79%	15.00%	12.86%	16.62%
10.97%	20.18%	18.01%	25.40%	13.30%	32.91%
10.32%	14.15%	19.51%	23.61%	15.55%	22.94%
4.98%	12.95%	20.04%	19.29%	12.83%	17.33%
6.48%	14.68%	20.48%	22.19%	9.21%	14.98%
7.01%	26.07%	22.73%	22.32%	10.71%	15.21%
11.29%	9.42%	20.50%	18.07%	11.24%	12.89%
12.79%	9.62%	20.66%	23.83%	11.68%	23.64%
13.97%	13.57%	20.01%	23.56%	13.93%	22.75%
15.47%	20.37%	12.35%	3.16%	11.70%	21.48%
16.00%	9.51%	13.85%	1.72%	11.86%	22.02%
16.44%	20.58%	8.29%	23.46%	11.21%	22.01%
18.69%	8.84%	9.79%	34.66%	11.06%	9.46%
15.31%	10.82%	10.32%	27.14%	12.56%	9.98%
16.81%	10.95%	7.89%	31.30%	13.09%	8.73%
17.34%	8.93%	9.39%	27.02%	13.53%	10.79%
17.78%	11.65%	9.92%	29.56%	15.78%	10.59%
20.03%	3.13%	10.36%	21.95%	13.55%	8.39%
9.67%	21.23%	12.61%	7.74%	13.71%	9.03%
11.17%	7.93%	10.38%	6.36%	13.06%	10.92%
11.70%	14.61%	10.54%	10.20%	12.21%	24.44%
12.14%	12.42%	9.89%	13.18%	13.71%	14.60%
12.16%	6.65%	8.38%	12.99%	14.24%	10.19%
12.32%	8.38%	9.88%	13.20%	14.68%	37.02%
11.67%	8.50%	10.41%	16.17%	16.93%	30.97%

9.03%	15.59%	10.85%	14.61%	14.70%	22.33%
10.53%	14.75%	13.10%	17.47%	14.86%	31.80%

ESTIMATED Ke	IMPLIED Ke	ESTIMATED Ke	IMPLIED Ke	ESTIMATED Ke	IMPLIED Ke
14.21%	30.49%	10.02%	16.11%	15.19%	19.07%
14.70%	11.89%	10.55%	15.44%	15.72%	22.46%
16.20%	13.75%	10.99%	11.80%	16.16%	15.01%
16.73%	17.84%	13.24%	7.23%	18.41%	21.03%
17.17%	20.49%	11.01%	11.14%	16.18%	23.44%
19.42%	10.98%	11.17%	8.36%	16.34%	31.94%
17.19%	33.18%	10.52%	31.29%	15.69%	32.67%
11.06%	23.63%	17.88%	14.69%	11.92%	20.17%
12.56%	18.26%	19.38%	13.99%	13.42%	26.33%
13.09%	14.80%	19.91%	13.34%	13.95%	31.37%
13.53%	33.20%	20.35%	10.73%	14.39%	18.04%
15.78%	13.87%	22.60%	15.97%	16.64%	11.04%
13.55%	13.50%	20.37%	14.38%	14.41%	9.94%
13.71%	9.19%	20.53%	13.99%	14.57%	21.52%
13.06%	12.98%	19.88%	19.81%	13.92%	74.92%
9.49%	12.68%	17.98%	15.06%	18.42%	7.12%
10.99%	14.76%	19.48%	7.66%	19.92%	6.07%
11.52%	13.27%	20.01%	2.25%	20.45%	4.51%
11.96%	27.70%	20.45%	21.58%	20.89%	4.90%
14.21%	19.91%	22.70%	10.98%	23.14%	1.74%
11.98%	16.57%	20.47%	11.11%	20.91%	3.44%
12.14%	18.24%	20.63%	10.07%	21.07%	4.87%
11.49%	15.15%	19.98%	40.81%	15.79%	4.85%
15.14%	11.13%	8.45%	28.60%	17.29%	4.24%
16.64%	8.17%	9.95%	28.19%	17.82%	3.63%
17.17%	6.82%	10.48%	44.51%	18.26%	4.30%
17.61%	7.11%	16.05%	26.76%	15.82%	13.16%
19.86%	7.99%	17.55%	22.43%	17.32%	11.90%
17.63%	6.11%	18.08%	15.98%	17.85%	11.78%
17.79%	8.42%	18.52%	35.48%	18.29%	8.41%
17.14%	6.81%	20.77%	10.83%	20.54%	6.02%
8.38%	29.28%	13.40%	12.33%	18.31%	5.15%
9.88%	4.14%	14.90%	8.10%	18.47%	7.50%
10.41%	34.65%	15.43%	7.49%	17.82%	9.71%
10.85%	25.85%	15.87%	13.38%	11.51%	3.49%
13.10%	22.38%	18.12%	11.65%	13.01%	4.11%
10.87%	19.84%	15.89%	9.34%	13.54%	3.31%
11.03%	13.18%	16.05%	15.05%	13.98%	3.51%
10.38%	48.01%	15.40%	21.28%	16.23%	0.72%
8.52%	7.82%	13.69%	32.57%	14.00%	1.86%
14.16%	3.30%	6.91%	1.52%	8.94%	0.32%

13.51%	5.41%	8.41%	2.01%		

Appendix 3

Appendix 3 is the linear regression analysis for the years included in the study as well as the companies that made up part of the sample. The spreadsheets are submitted as part of the electronic submission included with this report.

Appendix 4

Appendix 4 is an illustration of the free cash flow valuations template spread sheet. The spreadsheet is submitted as part of the electronic submission included with this report.

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