THE IMPACT OF MACROECONOMIC VARIABLES ON THE EQUITY MARKET RISK PREMIUM IN SOUTH AFRICA

BY

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DECLARATION

I, **Obadire Ayodeji Michael (16003735),** hereby declare that the dissertation for the Masters of Commerce in Cost and Management Accounting at the University of Venda, hereby submitted by me, has not been previously submitted for a degree at this institution or any other, that it is my own work in design and in execution, and that all reference materials contained therein has been duly acknowledged.

Signature …………………………...   Date…………………………………

Obadire Ayodeji Michael (16003735)

DEDICATION

This research is dedicated to my parents, siblings, future wife and future kids. Thank you for the amazing support that you gave me throughout my studies. Thanks for believing in me through thick and thin.

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First and foremost, all glory return back to God Almighty who has been my strength through the years and my hope for years to come, my source of inspiration and my sustainer. May your name be praised.

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ABSTRACT

The relationship between the Equity Market Risk Premium (MRP) and macroeconomic variables has been a subject of extensive discussion in the finance literature. The MRP is a central component of the main asset pricing models which are used to estimate the cost of equity which is mainly used in investment appraisal, performance measurement and valuation of equity assets. Past studies have identified inflation rate, interest rate, foreign exchange rate and political risk as the key macroeconomic variables that determine the size of the MRP. The test of the impact of these variables on the MRP have however been based mainly on data from developed countries and a few emerging countries. To the researcher's knowledge, there are no studies that have investigated the impact of these macroeconomic variables on the MRP in South Africa. It is necessary to test the impact of these variables in the context of South Africa as these variables vary across countries. Using time series secondary data that was obtained from the SARB database, JSE database and World Bank database for the period 2002 to 2017, this study investigated the impact of these variables on the MRP in South Africa. A total of 192 observations per series of the inflation rate, interest rate, foreign exchange rate, political risk, JSE-ALSI and 91-days Treasury bill was used in the study. The data used were tested for possible misspecification errors that could arise from using a time series secondary data and the regression model was fitted using the Ordinary Least Square (OLS) estimator. The misspecification tests and models were both implemented on STATA 15 software. The results shows that inflation rate, interest rate and foreign exchange rate have a negative impact on the MRP whilst political risk has a positive impact on the MRP. Furthermore, the result shows that the inflation rate is the only variable amongst other variable tested that has a significant influence on the MRP for the study period. The study, therefore, concludes that inflation rate has the highest impact on the MRP in the context of South Africa. The study recommends that inflation rate should be monitored and kept within its target of 3-6% amongst other variables tested in order to increase investors' confidence in the security market and also foster economic growth. The main limitations to the study were the limited data sources and insufficient funds.

Keywords: MRP, macroeconomic variables, JSE-ALSI, risk-free security, regression model, OLS estimator.

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LIST OF ACRONYMS AND ABBREVIATIONS

ALSI	All Share Index
ALTx	Alternative Public Equity Exchange
APM	Arbitrage Pricing Model
APT	Arbitrage Pricing Theory
CAPM	Capital Asset Pricing Model
FET	Fisher Effect Theory
GDP	Gross Domestic Product
IFET	International Fisher Effect Theory
JSE	Johannesburg Securities Exchange
MFM	Multifactor Model
MRP	Market Risk Premium
OTC	Over-the-Counter
PPP	Purchasing Power Parity
Rf	Risk-free Rate
Rm	Market Return
WACC	Weighted Average Cost of Capital
ZAR/USD	South African Rand/United State Dollars

CHAPTER ONE: INTRODUCTION

1.1 Background to the study

The growth of stock markets in emerging economies has become one of the most important topics in the area of financial and economic development (Muchiri, 2012). According to Adjasi (2009), stock markets provide a platform for the efficient acquisition of capital through sales of shares by publicly quoted companies which serves as an alternative to debt financing. The funds raised in the stock market can be used by firms to finance profitable projects. However, the providers of these funds expect a return as a compensation for investing their money in risky equity securities. As a result of the riskiness of equity, the investors would expect a premium over investing in risk-free securities. According to the Capital Asset Pricing Model (CAPM) of Sharpe (1962) and Lintner (1965), this premium is made up of the riskiness of the individual security which is measured by beta, multiplied by the overall risk premium of investing in equities in general. The overall risk premium of investing in equities, in general, is called the Equity Market Risk Premium (MRP) (Goetzmann & Watanabe, 2009).

Maysami and Sim (2001) define the MRP as the excess return of equity market portfolio over risk-free securities. It is the compensation required by investors for holding risky equity securities. Goetzmann and Ibbotson (2005) and Mehra and Prescott (2008) define the MRP as the return earned by a broad market index in excess of what is earned by relatively risk-free security. Also, Siegel (2005) and Welch (2014) define the MRP as the difference between the expected returns on market portfolio and risk-free assets.

According to Bancel and Mittoo (2014), the MRP is a key input into the asset pricing models that are used to estimate the cost of equity which is one of the components of the firm's Weighted Average Cost of Capital (WACC). The firm's WACC is mainly used in investment appraisal, performance measurement and valuation of equity assets. Damodaran (2012) argues that the company's WACC which is used to appraise investments is affected by the MRP used to calculate it. According to Arnott and Bernstein (2002), MRP is a central component of asset pricing models such as the capital asset pricing model (CAPM), the Arbitrage Pricing Model (APM) and the Multi-Factor Model (MFM). These asset pricing models make use of MRP in computing the expected returns on equity assets. Bruner, Eads, Harris and Higgins (1998) found that 85% of the best managed companies used the CAPM. The CFO survey of Graham and Harvey (2001) revealed that 73.5% of the surveyed CFOs use the CAPM. These surveys, thus, confirm CAPM as the most popular model amongst its peers because of its simplicity in generating a discount rate by summation of several asset-related risk components in order to derive a return at which investors are willing to invest in such asset (Bancel & Mittoo, 2014).

According to Arnott et al. (2002), Burger (2012), Choudhry (2001), Damodaran (2012), Doong, Yang and Wang (2005), Goetzmann and Watanabe (2009), Lettau, Ludvigson and Wachter (2008), Jun (2013), Maysami and Sim (2001), Moolman and Du Toit (2005), Nijam, Ismail and Musthafa (2015) and Westlund, Sheludchenko and Tahmidi (2011), MRP is affected and influenced by various macroeconomic fundamentals such as interest rate, inflation rate, oil price/barrel, exchange rate, price for risk, expected return, discount rate, risk appetite, consumption preference, political risk, money supply, gross domestic product (GDP), government external borrowing, catastrophic risk, available information, liquidity, government policies, dividend-price ratio, dividend yield, earnings-price ratio, stock variance, net equity expansion, term spread, treasury bill rate, default yield spread and default return spread. However, a number of leading researchers from Canada, Germany, Sweden, Indonesia, Bangladesh, Philippines, South Korea, Taiwan, Thailand and Malaysia such as Brandt and Wang (2003), Burger (2012), Choudhry (2001), Doong et al. (2005), Goetzmann and Watanabe (2009), Harris and Marston (2015), Lettau et al. (2008), Maysami and Sim (2001), Stulz (1986) and Westlund et al. (2011) identified inflation rate, interest rate, foreign exchange rate, government external debt, GDP growth rate and political risk as the key and significant factors that affects the MRP.

Maysami and Sim (2001) investigated the cause and effect relationship of macroeconomic factors such as foreign exchange rate, inflation rate and interest rate on the MRP in Malaysia and Thailand. They concluded that only foreign exchange rate has a significant influence on MRP. On the other hand, Westlund et al. (2011) studied the effect of macroeconomic variables such as exchange rate, money supply, GDP growth rate, net lending, net borrowing and interest rate on the MRP in Sweden, Germany and Canada using multiple linear regression models. They concluded that growth in GDP was the only macroeconomic variable which has a significant relationship with the MRP in the three countries. The effect of money supply, net lending, net borrowing and interest rate were found to be insignificant.

1.2 Statement of the problem

Although earlier studies such as those of Bancel and Mittoo (2014), Damodaran (2012), Nijam et al. (2015), Rajni and Mahendra (2007) and Westlund et al. (2011), have dealt at length with the MRP puzzle, focusing on factors that affect the MRP, however, the data used in these prior studies were drawn mainly from developed countries and a few from emerging countries. To the knowledge of the researcher no study focused on the impact of macroeconomic variables on the MRP in South Africa. According to Goetzmann and Ibbotson (2005), the relationship that exists between macroeconomic variables and the MRP across countries may vary due to the differences in the impact of macroeconomic fundamentals such as country size, technological advancement, political stability and country wealth. These macroeconomic fundamental differences amongst countries, therefore, justify a separate study of the effect of macroeconomic variables on the MRP in South Africa; as findings from studies using data from developed countries may not be applicable in South Africa. The findings of Doong et al. (2005) and Mohammad (2011) showed that the MRP is influenced by macroeconomic variables such as foreign exchange rate, inflation rate and interest rate. Hence, it is important to understand the variables that affect the MRP in the context of South Africa. The impact of macroeconomic variables such as inflation rate, interest rate, foreign exchange rate and political risk on the MRP in South Africa remains an open empirical question that was investigated in this study.

1.3 Aim of the study

This study seeks to investigate the impact of macroeconomic variables namely inflation rate, interest rate, foreign exchange rate and political risk on the MRP in South Africa.

1.4 Objectives of the study

The specific objectives of the study are to:

i. Examine the impact of inflation rate on the MRP in South Africa;
ii. Examine the impact of interest rate on the MRP in South Africa;
iii. Examine the impact of foreign exchange rate on the MRP in South Africa;
iv. Determine the impact of political risk on the MRP in South Africa; and
v. Establish which of these macroeconomic variables has the greatest impact on the MRP in South Africa.

1.5 Research hypotheses

The hypotheses for the study are given as follows:

Hypothesis 1: Inflation rate has a significant negative impact on the MRP in South Africa;

Hypothesis 2: Interest rate has a significant negative impact on the MRP in South Africa;

Hypothesis 3: Foreign exchange rate has a significant negative impact on the MRP in South Africa;

Hypothesis 4: Political risk has a significant negative impact on the MRP in South Africa; and

Hypothesis 5: Inflation rate has the greatest impact on the MRP in South Africa.

1.6 Significance of the proposed study

This study investigated the impact of macroeconomic variables namely interest rate, exchange rate, inflation rate and political risk factor on the MRP in South Africa. It ascertains which of these macroeconomic variables has the greatest impact on the MRP in South Africa for the period 2002 to 2017. Above all, it contributed to the existing literature on the MRP puzzle and serve as a pioneer study as there are no prior studies that focused on the impact of macroeconomic variables on the MRP in South Africa.

1.7 Delimitations and assumptions

The study was limited to the following macroeconomic variables; inflation rate, interest rate, foreign exchange rate and political risk affecting the MRP in South Africa as an emerging market. In order to get the estimate of the MRP, the study used the difference of monthly returns on the Johannesburg Securities Exchange-All Share Index (JSE-ALSI) and yields on the short-term government bonds. The period of the current study is limited to 16 years from 2002 to 2017 because the historical data of total return index on the JSE database only goes as far back as 2002. The other time series data were obtained from the South Africa Reserve Bank database, Stats SA and the World Bank database.

1.8 Organisation of the study

The study was structured as follows:

Chapter one: Introduction. This chapter introduces the study. It gives a brief background to the study, the research problem, aims of the study, research questions, significance of the study and organisation of the study.

Chapter two: Literature review. This chapter highlights the findings of a number of researchers whose work was significant and relevant to the study of factors affecting the MRP. It also links the current study to previous studies and highlights the various criterions used in selecting the macroeconomic variables that was tested in the study.

Chapter three: Research methodology. The chapter presents the methodology used to collect data and the sources where the data was obtained. It presents the empirical model for testing the macroeconomic variables and the MRP. The chapter highlights the statistical errors associated with the time series secondary data and how they were handled in this study.

Chapter four: Data analysis and discussion of findings. This chapter presents the results of data analysis as well as a discussion of the findings. It also links the results of the study to those in previous studies.

Chapter five: Conclusion and recommendations. This chapter concludes the research. Conclusions were drawn from the analysis of data and the research findings. It concludes on the impact of inflation rate, interest rate, foreign exchange rate and political risk on the MRP in the context of South Africa. The chapter highlights the limitations, recommendations and suggestion for future studies.

1.9 Definition of terms

The following terms were defined as applicable to the current study:

1.9.1 Equity market risk premium

For the purpose of this study, equity market risk premium is referred to as the MRP. The concept MRP is defined as the excess return of equity market portfolio over risk-free securities which is the compensation required by investors for holding risky equity securities (Goetzmann & Ibbotson, 2005; Mehra & Prescott, 2008; Welch, 2014).

1.9.2 Macroeconomic variables

Macroeconomics is a branch of economics dealing with the performance, structure, behavior and decision making of an economy as a whole rather than individual market. Macroeconomic variables are external environmental factors that affect and influence individual investors, businesses and corporate organisation at large. These include the inflation rate, interest rate, money supply, Gross Domestic Product (GDP), Government external debt and foreign exchange rate (Gillepie, 2011; Gikungu, 2012).

1.9.3 Equity market

The equity market is referred to as the stock market, where equity instruments are traded. Equity instruments are traded either in an organised market or over-the-counter (OTC). The formal exchange for equities in South Africa is the Johannesburg Securities Exchange (JSE) which connects the buyer to the seller. The JSE equity market data are important component in computing the MRP (Nkala, 2012; JSE, 2017).

1.9.4 Treasury bill

Treasury bills are government short-term bonds and are considered the safest possible investment which provides what is referred to as the risk-free rate of return. Treasury bills are short-term investments that mature in 91 days or usually less than a year (Abugri, 2012).

1.10 Summary of the chapter

This chapter introduced the topic by providing information on the background of the research area. It highlighted the problem statement, research objectives, research hypotheses and the delimitations and assumptions of the study. The chapter also provided the reasons for the need to conduct this study and highlighted the definition of terms used in the study.

The next chapter provides a review of literature with the aim of emphasising the significance of the current study based on the information provided in relation to the current study. It highlights the current advances in research on the subject of macroeconomic variables and the MRP.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter provides literature review on macroeconomic variables and the MRP and provides an insight into the research area. It starts by presenting the concept of MRP; it outlines its importance in asset pricing models and explains how it is calculated. The chapter also discusses the macroeconomic variables that affect the MRP and the empirical criterion used to select the variables as determinants of MRP, as well as the theoretical framework that underpin the study. A brief overview of the South African equity market was also presented with the historical trend of the selected macroeconomic variables from the period 2002 to 2017. It concludes with a summary of the chapter and then introduces chapter three.

2.2 Concept of MRP

A number of leading authors including Ryan (2007), Reilly and Brown (2012), McGuigan, Kretlow and Moyer (2009) and Ross, Westerfield and Jaffe (2002) refer to MRP as the risk premium for investing in the market portfolio instead of the risk-free security. According to Fama and French (2002) and Zenner, Hill, Clark and Mago (2008), the MRP is defined as the difference between the return expected on the market portfolio as a whole and the risk-free rate. As a theoretical concept, the MRP reflects the equilibrium price of equity market risk. It is the higher yield in relation to the risk-free yield that an investor expects to achieve from an investment whose return is uncertain (Damodaran, 2012). Thus, the MRP is an expression of the circumstance that equities are expected to yield higher returns than government bonds since otherwise; no investor would risk its capital (Zenner et al., 2008).

Sharpe (1962) and Lintner (1965) highlight the two components of the MRP in their CAPM model which is the return on market portfolio and the yield on risk-free asset which is mathematically expressed as “Rm – Rf”, where Rm is the overall market return and Rf is the risk-free rate. Hence, if the risk-free yield is assumed to be known, represented by the government short-term treasury bill, it serves as a sufficient condition for being free of risk, thus, any changes in the market return of portfolio will consequentially affect the MRP (Fama & French, 2002).

2.2.1 The importance and application of MRP

According to Damodaran (2012), the MRP is an important input into the asset pricing models which are used to estimate the cost of equity, which is a component of the firm's Weighted Average Cost of Capital (WACC). The firm's WACC is mainly used in business valuation, financial analysis, equity assets valuation, performance measurement and capital budgeting decisions (Bancel & Mittoo, 2014; Goetzmann & Ibbotson, 2005; Zenner et al., 2008). Furthermore, the cost of equity with the investors' required rate of return can also be used by investors to make investment decisions among a variety of investment assets such as equities, fixed income securities and other asset classes such as gold and real estate (Fernandez, Aguirreamalloa & Corres, 2011; Siegel, 2005). Zenner et al. (2008) asserted that if the MRP increases whilst the firm's equity beta remains unchanged, the firm's cost of equity and hence its WACC will increase as the cost of equity is affected by the MRP.

The main equity asset pricing models that make use of the MRP are the Capital Asset Pricing Model (CAPM), Arbitrage Pricing Model (APM) and the Multi Factor Model (MFM). The CAPM states that the cost of equity is equal to the risk-free rate plus the MRP multiplied by the company beta (a measure of systematic risk) which yields the total risk premium. Beta factor in the CAPM measures the risk of individual stock and not the market risk as a whole (Damodaran, 2012). The APM is an extension of the CAPM which is related to the multi-factor model. In the APM model, the betas are estimated against individual MRP to yield the total risk premium (Damodaran, 2012).

MRP plays a significant role in the CAPM by representing the market risk premium for investment in equities as opposed to risk-free securities. In addition, MRP represents a risk premium for individual (unspecified) market risk factors in APM and also represents risk premium for individual (specified) market risk factors in MFM. All of these models require the MRP and asset betas in order to estimate the investors' required rate of return on equities. The three models are summarised in Table 1 below.

Table 1: MRP in asset pricing models

The capital asset pricing model (CAPM)	Expected Return = Risk free rate + β_{asset} (MRP)
The arbitrage pricing model (APM)	Expected Return = Risk free rate + $\sum\beta_j$ (MRP)
The multi-factor models (MFM)	Expected Return = Risk free rate + $\sum\beta_j$ (MRP)

Source: Damodaran (2012).

Bollerslev, George and Hao (2009) argue that for the MRP to be determined, the return on the stock market portfolio and risk-free asset to be used must be identified. For the purpose of this study, the stock market portfolio will be the JSE-ALSI. Similarly to the stock market, the risk-free security will be represented by the yield of the short-term government bond (Collins, 2006).

2.2.2 Estimation of MRP

The MRP has been a major concern in the financial and economic sector for many decades. It has commanded the attention of both professional economist and investment practitioners due to lack of consensus on its estimation (Graham & Harvey, 2010). Donaldson and Mehra (2008) identified two methods that can be used to estimate the MRP which is the historical risk premia method and estimate of current stock prices method. Using historical risk premia to estimate MRP assumes that what has happened in the past is representative of what might be expected in the future and using estimate of current stock prices assumes that it is possible to project the MRP from surveys of stock price movement or some other projection model. However, using historical risk premia or current stock price estimates require several assumptions that can make MRP estimation challenging (Bancel & Mitoo, 2014). The historical risk premia method requires assumptions about which risk-free security to use, length of the sample period and whether to use geometric average or arithmetic average of the historical stock returns. Generally, Siegel (2005) argues that the estimation of the MRP yields a maximum value if arithmetic mean of historical stock returns is used and a lesser value if the geometric mean of historical stock returns is used and these estimate also relies largely on the risk-free security used; a short-term government bond yield a higher value of MRP compared to a long-term government bond. Also, the estimate of current stock price method requires assumptions about future cash flows such as dividends and earnings and the projected growth rates that are inherent in current stock prices. The difference arising from these assumptions makes it difficult to arrive at a uniform method of calculating the MRP. Donaldson and Mehra (2008) identified various difficulties in quantifying MRP such as high market concentration, low liquidity, high volatility which often occur in emerging markets like South African market and the unreliability of historical data for computing the MRP. Nonetheless, most MRP models use historical data and assume the past provides the best indication of what the future holds.

2.3 Factors that affect the MRP

According to Amtiran, Indiastuti, Nidar and Masyita (2017), Arnott and Bernstein (2002), Burger (2012), Choudhry (2001), Damodaran (2012), Doong et al. (2005), Lettau et al. (2008), Jun (2013), Maysami and Sim (2001), Moolman and Du Toit (2005), Nijam et al. (2015), Tandiontong, Mathius and Rusdin (2015) and Westlund et al. (2011), the MRP is affected by a number of macroeconomic factors such as inflation rate, interest rate, exchange rate, GDP growth rate, money supply and unemployment; and political risk factors such as change in government policies, foreign debt and credit rating. Changes in these factors can, therefore, affect the MRP. Goetzmann and Ibbotson (2005) also identified other factors that affect the MRP which includes risk aversion, consumers' preference, information, liquidity, catastrophic risk, and country's market size. However, a number of leading researchers including Amtiran et al. (2017), Brandt and Wang (2003), Burger (2012), Goetzmann and Watanabe (2009), Lettau et al. (2008), Maysami and Sim (2001), Nijam et al. (2015), Stulz (1986), Tandiontong et al. (2015) and Westlund et al. (2011) have identified macroeconomic factors such as inflation rate, interest rate, foreign exchange rate and political risk as the key macroeconomic factors that play a significant role in affecting the MRP and are considered and discussed in this study.

2.3.1 Inflation rate

Gillepie (2011) defined inflation as the sustained increase in the general level of prices for goods and services in a country. If the annual inflation rate is 2% for example, this means that the average price level increased by 2% during the specified year. Inflation measures the change in average price level on a year to year basis.

In South Africa, the level of inflation is generally measured by the consumer price index (CPI), wholesale price index (WPI), and implicit price index (deflator GDP) (Li, 2003). According to Gillepie (2011), CPI compares the price of a typical basket of consumer goods and services with the price of the same basket the year before. The items in the typical basket of consumer goods and services used to calculate the CPI are regularly reviewed to make sure that they match the current spending patterns of consumers.

A study by Muchiri (2012) and Gikungu (2012) investigates the impact of macroeconomic factors on the performance of Nairobi Securities Exchange (NSE) in Kenya. The results show that the inflation rate had a positive but insignificant effect on MRP due to the positive effect of inflation on the returns of NSE. Brandt and Wang (2003) argue that changes occurring to inflation rate affect the decision about investment and consumption which determines the MRP. They conclude that the MRP tends to increase if inflation increases and decreases when inflation decreases because inflation rate and the MRP are positively related. Arnold (2008) reported that an increase in the inflation rate causes increase in the MRP which increases the cost of equity for firms and deters investment, spending and saving decisions of investors.

Also, Ugur and Ramazan (2005) in their study investigating the effect of inflation on stock returns in Turkey from 1986 to 2000, concluded that there is a negative relationship between inflation and MRP owing to the negative impact of inflation on stock returns. Similarly, Mohammad (2011) uses multiple regression models to test the impact of changes in selected microeconomic and macroeconomic variables on the MRP in Bangladesh. He examines monthly data for all the variables under study covering the period from July 2002 to December 2009. The study finds a negative relationship between the MRP and the inflation rate, which supports the findings of Ugur and Ramazan (2005). Other studies such as those of Basil and Copeland (1982) and Connolly and Dubofsky (2015) also argue that MRP decreases during periods of high inflation and vice versa.

This study adopts the CPI (rate of change in consumer prices) on a monthly basis as a measure of inflation from 2002 to 2017. In line with previous findings, this study expects inflation rate to significantly affect the MRP and also have the greatest impact on the MRP in South Africa (Amtiran et al., 2017; Arnold, 2008; Brandt & Wang, 2003; Connolly & Dubofsky, 2015; Mohammad, 2011).

2.3.2 Interest rate

According to the South African Reserve Bank (SARB, 2014), interest rates are costs for loanable funds; that is, prices of funds invested, lent out or borrowed for various periods of time. The supplier or lender of funds usually wants to earn an income and the user or borrower will generally be prepared to pay for the right to use such accumulated funds. These rates reflect the interaction between exchanges of money and are typically noted on an annual basis (Patterson & Lygnerud, 1999).

Interest rates are generally divided into two which are the short-term and long-term interest rates. According to the SARB (2014), the short-term interest rate is known as money market rate and is generally measured by Repurchase rate (Repo), South African Benchmark Overnight rate on deposits (SABOR), Johannesburg Interbank Average rate (JIBAR) and Prime Lending rate. However, the long-term rates are known as capital market rates and are generally measured by 3-5 years average bond yield, 5-10 years average bond yields and 10 years and longer average bond yields. According to Udoka and Anyingang (2012), the money market is a segment of the financial market in which financial instruments with high liquidity and short maturities are traded. The money market is used by participants as a means of borrowing and lending in the short term, from several days to less than a year.

Studies by Muchiri (2012) and Gikungu (2012) examined the impact of macroeconomic variables on the performance of Nairobi Securities Exchange (NSE) in Kenya. The results show that interest rate had a negative but insignificant effect on the returns on NSE which in turn affects the MRP negatively. Stulz (1986) investigated asset pricing and expected inflation in the USA. He verified that increase in inflation can lead to a decrease in the MRP. Given to his empirical fact that nominal interest rates are strongly positively correlated to inflation, he then concludes that the negative effect of inflation rate on MRP can cause a negative relation between the MRP and the interest rates.

Harris and Marston (2015) obtained similar results in their study of the shareholders risk premia using the Standard and Poor (S&P) 500 as a proxy for the market portfolio and the yield on the US Government long-term bonds, they found a negative relationship between interest rates and MRP based on the data from 1982 to 1991. Similarly, the study of Bowman and Shay (1999) on MRP and interest rates in New Zealand showed that the MRP varies over time with changes in interest rate. They concluded that the MRP varies inversely with interest rates with evidence that suggests that a 1% decrease in interest rate implies about a 35-50% increase in the MRP in New Zealand.

Uddin and Alam (2007) also examined the linear relationship between stock returns and interest rate, as well as changes in stock returns and changes of interest rate in Bangladesh. They find for all of the cases that interest rate has a significant negative relationship with stock returns and changes of interest rate have significant negative relationship with changes of stock returns. They conclude that MRP is negatively related to interest rate following the study of Bowman and Shay (1999), Gikungu (2012), Harris and Marston (2015) and Muchiri (2012).

This study adopts the money market rate which is measured by the prime lending rate on a monthly basis for the period of 2002 to 2017 because it is a good measure of opportunity cost of capital. In line with previous findings, this study expects inflation rate to significantly affect the MRP in South Africa (Bowman & Shay, 1999; Gikungu, 2012; Marston, 2015; Muchiri, 2012; Tandiontong et al., 2015).

2.3.3 Foreign exchange rate

Rube and Samantha (2003) defined the exchange rate as the amount at which one currency can be traded in terms of another; it is also the value that a currency has compared to another currency. The importance of exchange rate in foreign trade among countries or investors cannot be overemphasised as it is the most important price index in a country's international economic activity and also plays a significant role in pricing international activities.

According to Arthur and Sheffrin (2003), foreign exchange rate changes are associated with the risk of a currency appreciating or depreciating against another currency in a short span of time. Such movement in the currency is linked directly to the inflation and interest rate factors which cause fluctuations and affects general business activities such as exports, imports and investments.

Arize and Malindretos (2014) stated that exchange rate systems can be divided into two categories, fixed exchange rate systems and flexible exchange rate systems. Fixed exchange rates are set by the government of particular country and are generally measured by reserve currency standards and gold exchange standards. However, according to the SARB (2014), the flexible exchange rate systems are set by the market factors such as demand, supply, interest rate, inflation rate and national income with or without the influence of the government and are generally measured by nominal effective exchange rate, Rand per US Dollar, Rand per British Pounds, Rand per Euro, Rand per Japanese Yen and Rand per Chinese Yuan.

Changes in exchange rate may, however, be perceived as a risk signal for equity returns which consequentially affects the MRP (Bahmani-Oskooee & Hegerty, 2007). Moreover, the finding of Burger (2012) verifies that increase in exchange rate; that is, currency depreciation causes a decline in market returns and invariably affects the MRP negatively. Doong et al. (2005) investigated the relationship between the MRP and the exchange rates in six Asian countries which includes Indonesia, Malaysia, Philippines, South Korea, Thailand and Taiwan from the period 1989 to 2003 using the Granger causality test. According to their results, they conclude that there is a significantly negative relationship between the MRP and the exchange rates due to the depreciating effects of exchange rate for all the countries except Thailand. Muchiri (2012) and Gikungu (2012) arrived at a similar conclusion in their study in Kenya that increase in exchange rate has a significant negative impact on MRP due to the depreciating effects of exchange rate on the market returns of NSE. Kyung-Chun (2008) also argued that a depreciating currency causes a decline to the market returns which consequentially causes a decrease in the MRP.

The study of Mohammad (2011) also supported the findings of Doong et al. (2005) and Kyung-Chun (2008). He used multiple regression models to test the impact of changes in selected microeconomic and macroeconomic variables on MRP in Bangladesh. He examined monthly data for all the variables under study covering the period from July 2002 to December 2009. The study finds a negative relationship between the MRP and the exchange rate.

Also, Bhattacharya and Mookherjee (2001) analysed the causal relationship between the stock market and three macroeconomic variables which includes exchange rate, foreign exchange reserves and trade balance in India, using the Granger non-causality model. The results suggest that there is no causal effect or linkage between MRP and the three variables tested.

This study adopts the flexible exchange rate system which is measured by the average monthly rate of ZAR/USD for the period of 2002 to 2017. In line with previous findings, this study expects exchange rate to significantly affect the MRP in South Africa (Amtiran et al., 2017; Bahmani-Oskooee & Hegerty, 2007; Doong et al., 2005; Kyung-Chun, 2008).

2.3.4 Political risk

The World Bank Group (2011) broadly defines political risk as the probability of disruption of the operations of enterprises by political forces or events. Brink (2004) also defines political risk as the type of risk faced by investors and corporations that significantly affect the profitability of businesses and returns from an investment as a result of the political systems in action. In a country, political risk is largely determined by uncertainty over the actions of the government, political institutions and of the minority groups such as separatist movements (Neethling, 2016).

In the latest world competitiveness report released by the World Economic Forum (WEF) 2016-2017, South Africa slightly improved both its score and ranking (47th, up two). It has been relatively less affected by commodity price falls than other economies in the region and has registered marginal improvements in almost all aspects of competitiveness. However, a number of shortcomings may limit South African competitiveness going forward. Infrastructure development has stalled, both in transport and electricity, with power shortages experienced in 2016/17; institutional quality has also diminished, due to increase in political uncertainty, less transparency and business leaders having less trust in politicians (WEF, 2016).

Brink (2004) and Lim (2011) segment political risk into three key components, namely: macro, micro and sovereign. Macro political risks are those risks which are country specific and affect all foreign multinationals seeking to invest in the host country in the same way, while micro-political risk factors are those elements which are specific to industry and may vary across different industries and on the other hand, sovereign political risk entails events such as political coups, grand corruption, the expropriation or nationalisation of property, war damage, and the inconvertibility of financial assets (Brink, 2004; Lim, 2011; Ling & Hoang, 2010).

Political risk as reported by the South Africa national budget (2014/15) is generally measured by relative size of government external debt to GDP, rampant inflation, credit rating, level of unemployment, poverty level and slow growth rate per GDP. According to Pastor and Veronesi (2011), political risk factors such as government policy affects MRP in both developed and developing countries. They argued that the banking crisis of 2008 caused the US and European governments to pass different policies, which affected the market and caused stock prices to fall with a decreased market returns which consequentially affect the MRP. Also, Nielsen and Risager (2001) asserted that the shift in economic policy, for instance, the introduction of the firm fixed exchange rate policy, liberalisation of the financial markets and changed taxation rules such as the introduction of real interest tax, made stocks more attractive than bonds from a taxation point of view. These all paved way to higher MRP following the increase in market returns.

Goetzmann and Watanabe (2009) assert that equity market consistently relies on the opinion and forecasts of public and private sector about the direction of economy. Their analysis of the historical data for over 50 years shows that stock returns have positive relationship with forecasted growth of GDP and a negative relationship with external debt to a percentage of GDP. Westlund et al. (2011), based their research on the findings of Goetzmann and Watanabe (2009) and tested

GDP growth rate on the MRP in Canada, Germany and Sweden and found that growth in GDP has a significant positive relationship with MRP in the three countries.

This study adopts the ratio of government external debt to GDP on a monthly basis from the period 2002 to 2017 as a proxy to measure the political risk (Nel, 2009). This monthly data was derived from the transformation of the quarterly data available on the Stats SA database using the Cubic Spline Interpolation technique. External debt expressed as a ratio of GDP provides a measure to assess the external financial development and trends in the performance of an economy based on its political stability. It is a useful indicator for identifying liquidity problems and political risk (SARB, 2016). In line with previous findings, this study expects that the ratio of government external debt to GDP will significantly affect the MRP in South Africa (Goetzmann & Watanabe, 2009; Westlund et al., 2011).

2.4 Theoretical framework

The theoretical framework reviews some theories that explain the relationship between macroeconomic variables, namely; inflation rate, interest rate and foreign exchange rate and attempts to link these theories to the MRP. This section explores whether or not existing theories such as the Fisher Effect Theory, International Fisher Effect Theory and the Purchasing Power Parity Theory suggest any relationship and interdependence between these macroeconomic variables and their effect on the MRP.

2.4.1 Fisher Effect Theory (FET)

The FET was originally proposed by Irving Fisher in the late 1950s. The theory describes the relationship between inflation, real interest rates and nominal interest rates. According to the FET, the nominal interest rate is equal to the real interest rate adjusted for inflation rate (Fama & French, 2002). The theory suggests that local interest rate reflects a real expected return adjusted for inflationary expectations. Furthermore, when money is internationally mobile and market imperfections are eliminated, local interest rates will be equal to the international real return adjusted for domestic inflationary expectations (Buckley, 2004). Algebraically, the following two equivalences are implied in an international setting

$$\frac{is - i\varepsilon}{1 + i\varepsilon} = \frac{\rho s - \rho\varepsilon}{1 + \rho\varepsilon}$$

Where: is depicts the real interest rate of the foreign country, for example the USA,

$i\varepsilon$ represents the local real interest rate, for example South Africa

ρs is the inflation rate in the foreign country, USA in this example

$\rho\varepsilon$ is the local inflation rate in South Africa.

According to Harris and Marston (2015), the relationship between inflation rates, nominal interest rate and real interest rate affect market prices negatively. Connolly and Dubofsky (2015) argue that an increase in inflation rate increases the level of riskiness of investor's return on equity which causes a decline in market returns. More so, an increased interest rate causes a decline to stock prices which causes a decline in market returns (Peng & Zervou, 2015). Therefore, based on the FET, changes in inflation rate affect the nominal interest rate; that is, an increase in inflation results in a higher nominal interest rate (Buckley, 2004). The increase in both inflation and interest rates, therefore, causes a decline in market returns. The decreased market returns consequentially causes a decrease in the MRP. This, therefore, explains the indirect relationship that exists between the FET and the MRP.

2.4.2 International Fisher Effect Theory (IFET)

The IFET is an important theory in the field of economics and finance that shows the relationship and interdependence between interest rates and exchange rates (Utami & Inanga, 2009). The IFET was named after the U.S economist Irving Fisher in the late 1960's. Shalishali (2012) opines that the appreciation or depreciation of exchange rates of two countries is proportionally related to the differences in their nominal interest rates. The IFET suggests that the currency of any country with a relatively higher interest rate will depreciate because high nominal interest rates reflect a high expected rate of inflation (Victor, 2005; Buckley, 2004). According to Utami and Inanga (2009), the IFET is based on the analysis of interest rates associated with present and future risk-free investments such as the treasury bills, which is used to predict currency movements.

The link between the interest rate differentials between two countries and the changes in exchange rates is represented below (Buckley, 2004):

$$\frac{is - i\varepsilon}{1 + i\varepsilon} = \frac{St - S0}{S0}$$

Where: is depicts the real interest rate of the foreign country, for example the USA,

$i\varepsilon$ represents the local real interest rate, for example South Africa

St is the currency in the foreign country, USA Dollar in this example

S0 represents the Rand, the local currency in South Africa.

According to Kyung-Chun (2008) and Burger (2012), the market returns are affected by the level of changes in interest rate and the exchange rate. Shalishali and Ho (2002), argues that as a country's interest rate increases relatively to the interest rates of other countries, its exchange rate against those countries depreciates. Therefore, based on the IFET, changes in interest rate differentials of two countries affect their exchange rates; thus, an increased interest rate of a particular country causes the currency of that particular country to depreciate against the currency of the comparative country (Buckley, 2004). The increase in both interest rate and exchange rate, therefore, causes the actual market returns to fall. The decreased market returns consequentially causes a decrease in the MRP. This, therefore, explains the indirect relationship that exists between the IFET and the MRP.

2.4.3 Purchasing Power Parity (PPP) Theory

The PPP theory, also called "law of one price", is an economic theory that links inflation rates of two countries to their exchange rates (Shalishali, 2012). According to Buckley (2004), the PPP theory relates movement in inflation rates between two countries to currency appreciation or depreciation between them. Arthur and Sheffrin (2003) suggest that one of the factors affecting prices, market returns, and the world economy is exchange rates fluctuations. They further argue that these exchange rate fluctuations create market inefficiencies which distort market prices in the two countries. Bernat and Bueno (2011) opine that the long term profitability of investment, export opportunities and the price competitiveness of imports are all impacted by movements in exchange rates which is influenced by the countries' level of inflation; hence international investors or companies pay keen attention to countries' inflation rates. Mathematically, the PPP theory is stated as follows:

$$\frac{St - S0}{S0} = \frac{\rho s - \rho \varepsilon}{1 + \rho \varepsilon}$$

Where: St is the currency in the foreign country, USA Dollar in this example.

S0 represents the Rand, the local currency in South Africa.

ρs is the inflation rate in the foreign country, USA in this example

$\rho\varepsilon$ is the local inflation rate in South Africa.

According to Arthur and Sheffrin (2003) and Shalishali (2012), changes in inflation rates and exchange rates of two countries affect their market prices. Shalishali and Ho (2002), argues that as a country's inflation rate increases relatively to the inflation rates of other countries, its exchange rate against those countries depreciates. Therefore, based on the PPP, changes in inflation rate of two countries affect their exchange rates; thus, an increased inflation rate of a particular country causes the currency of that particular country to depreciate (Buckley, 2004; Victor, 2005). The depreciating currency and an increase in inflation, therefore, causes the actual market returns to fall, which consequentially causes a decrease in the MRP and vice versa. This, therefore, explains the indirect relationship that exists between the PPP and the MRP.

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The IFET and the PPP theories try to explain changes in exchange rates using changes in nominal interest and inflation rates differentials between two countries. These two theories stem from the basic FET which links the nominal interest rate to both the real interest rate and the inflation rate. Thus, the triangular relationship between interest rate, inflation rate and foreign exchange rate can be summarised in Figure 1 below.

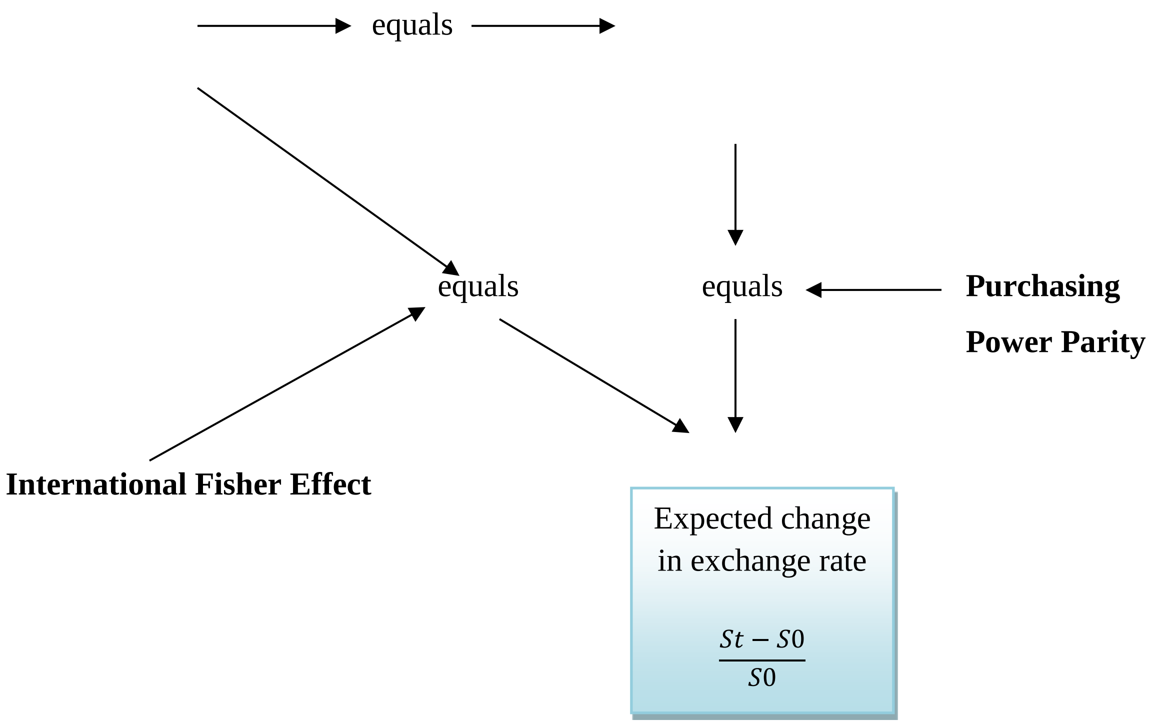
Fisher Effect

Differences in interest rates

$$\frac{is - i\varepsilon}{1 + i\varepsilon}$$

Differences in inflation rates

$$\frac{\rho s - \rho\varepsilon}{1 + \rho\varepsilon}$$



Source: Buckley (2004) **Figure 1: Relationship between the interest rate, inflation rate and the exchange rate.**

The FE, IFE and the PPP theories show how inflation rate, interest rate and foreign exchange rate are related. On one hand, the FET suggests that the rate of inflation and real rate of interest rate are represented in the nominal interest rates. On the other hand, the IFET and the PPP theory expand on the FET; suggest that currency changes are proportionate to the difference between the two countries' interest rate and the inflation rate respectively (Utami & Inanga, 2009). Therefore, based on the FET, IFET and PPP theory, inflation rate, interest rate and exchange rate are interrelated and thus, impact one another. This implies that the changes in inflation rate affects interest rate and the changes in interest rate and inflation rate differentials of two countries also affect their exchange rates (Fama & French, 2002; Buckley, 2004).

According to Amtiran et al. (2017) and Connolly and Dubofsky (2015), an increase in inflation rate, interest rate and exchange rate causes a decrease to the actual market returns because the market prices are negatively affected. The decrease in market return, thus, causes the MRP to reduce. This, therefore, explains the indirect relationship that exists between the FET, IFET, PPP theory and the MRP.

2.5 An Overview of the South African Equity Market

The equity market which is often referred to as the stock market is the market for trading equity instruments. In most countries, equity instruments are traded in an organised market as opposed to being over-the-counter (OTC). Trading in an organised market is properly managed in terms of risks, clearing and settlement (Faure, 2005). According to Nkala (2012), the formal equity market plays a significant role in the financial market system and the economy in terms of providing a facility for the issue of equity (shares) by companies in the primary market, thereby channelling savings into productive investment, as well as for the trading of these instruments in secondary market, that is, secondary activities.

According to Collins (2006), the formal exchange for equities in South Africa is the JSE Limited (Equities Division), which is licensed in terms of the Securities Services Act 2004 (SSA). The JSE's equity market connects buyers and sellers interested in exposure to South African listed companies, dual listed companies from across the globe and a variety of listed products. The JSE equity market consists of the main board and the alternative public equity exchange board for small and medium-sized companies (AltX). This provides companies and investors with a myriad of listing and investment opportunities to cater for their specific needs. The JSE equity market has been in operation for more than 100 years. The JSE equity market data are important component in computing the MRP (Nkala, 2012; JSE, 2017).

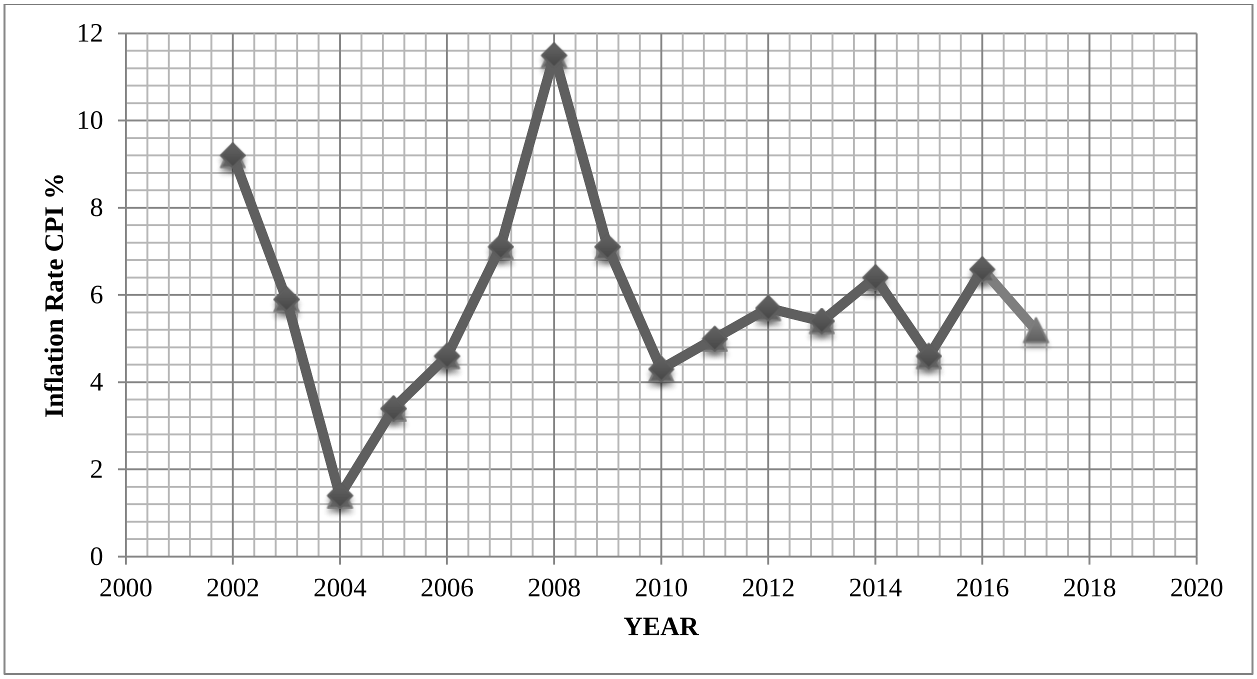
Through the JSE equity market, investors are also able to trade on a variety of products which include warrants, exchange traded products such as exchange-traded funds and exchange-traded notes, specialised products and much more to name but a few. The companies that are listed on the main board of the JSE are classified under various groups according to industry, super-sectors, sectors and sub-sectors. The JSE equity market consists of more than 800 securities currently available on the market with approximately 400 companies that are listed on the main board and the AltX board with approximately 60 equity market member firms, authorised to trade on the market (JSE, 2017). However, the JSE equity market does not have the full range of sub-sectors because it is an emerging market. A full complement of the 104 subsectors is found on markets of well-developed countries (Nkala, 2012).

The World Bank Group (2012) describes an emerging market as a nation with a rapid growth of social and business activity, that is, rapid industrialisation. Nakata and Sivakumar (1997) reported in their study that emerging market economies will be amongst the top 10 wealthiest countries in the world, supplying more than half of the total global output by 2020. This among many other reasons has caused the attention of investors to shift to emerging market economies (Girard & Rahman, 2007). However, investing in an emerging market requires a lot of attention because of the high level of risk in its macroeconomic fundamentals such as inflation rate, interest rate, political stability and exchange rate, as reported by Green (2006) and Kouznetsov (2009).

2.6 Trend of South Africa macroeconomic variables and returns on the JSE-ALSI.

In order to get a deeper insight into the economic and financial background of South Africa for the period under study, the dynamics of economic indicators and JSE-ALSI needs to be discussed, hence, are presented and discussed in the paragraphs that follow.

Figure 2 presents the historical data of inflation rate measured by the CPI from the period 2002 to 2017.

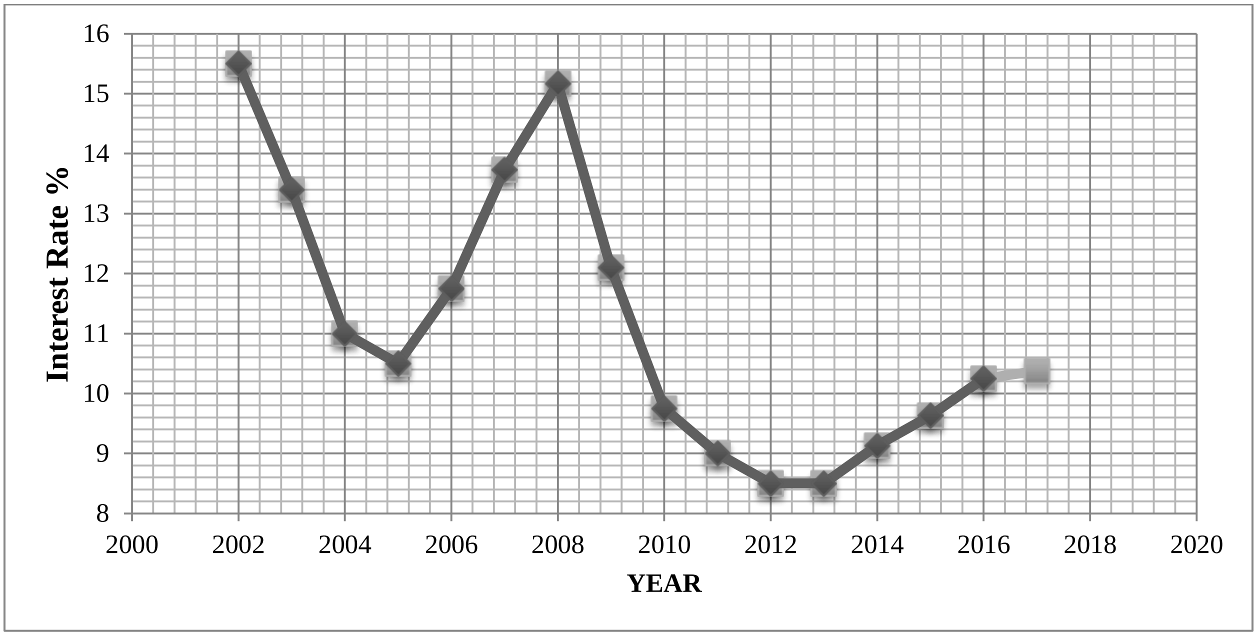


Source: World Bank (2018) **Figure 2: Historical data of inflation rate from 2002 to 2017.**

As shown in Figure 2, consumer prices have risen steadily over the study period. Inflation in South Africa (measured by the 12-month rate of change in consumer prices) had managed to have a continued downward trend up until the global US economic crisis and in the terror attacks in the US in early 2002. The subsequent sharp jump in inflation was brought about by rapidly rising oil prices and the dramatic fall in the rand exchange rate (Figure 3) brought about by the withdrawal of foreign investment and fears of further global economic fallout. The subsequent strengthening of the rand exchange rate brought about a sharp decline in inflation up until 2004 (Hirsch, 2005 & Hancocks, 2010).

The adoption of an inflation targeting framework in South Africa in the year 2000 allowed for proper monitoring and control of monetary aggregates and interest rates which keep inflationary pressure in check. Inflation remained according to South African standards, at quite modest levels until mid-2007 when global inflationary pressures and especially rising global oil and food prices pushed South African consumer price index significantly above the 6 percent inflation target ceiling. Inflation had already begun to decline up until 2010 when the global crisis impacted in late 2008 which was caused by the upward price pressures of a much weaker rand exchange rate. The inflation rate increased from 2011 to 2016 due to the economic financial crisis and political instability which later declined slightly in 2017 (Hancocks, 2010; SARB, 2017).

Figure 3, presents the historical data of interest rate measured by the prime lending rate from 2002 to 2017.

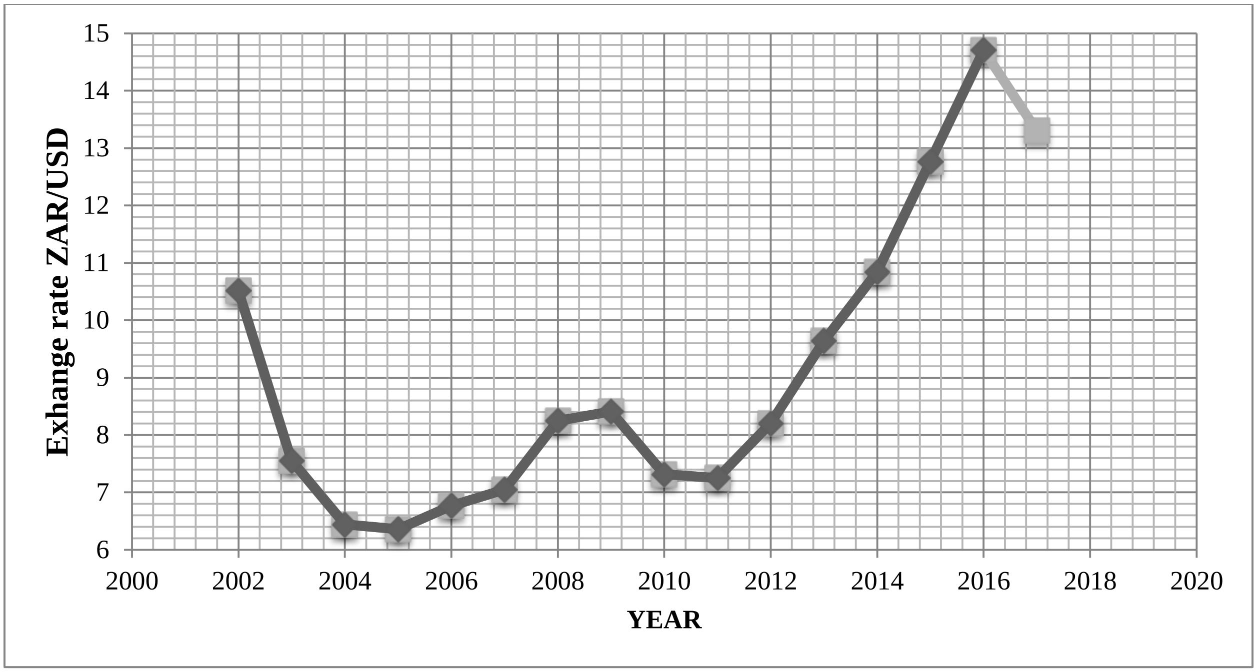


Source: SARB (2018) **Figure 3: Historical data of interest rate from 2002 to 2017.**

As shown in Figure 3, the Asian crisis in 1998 had an effect on the South African prime interest rate until 2002, the crisis forced SARB to drastically increase interest rates to try to insulate the South African economy from further global economic fallout. Tight monetary conditions were employed to ease the high-interest rate caused by the Asian crisis and the general trend in interest rates falls down towards mid-2002. Thereafter, the introduction of inflation targeting in the year 2000 gradually pushed interest rate lower till 2005 (Frankel, 2007; Hancocks, 2010).

Interest rates fell sharply towards the start of 2009, correctly anticipating the lower inflation and cuts in short-term rates that started at the end of 2008. This continued apace in 2009 as the global financial crisis pushed oil prices much lower and domestic inflation started to fall so also the short-term interest rate decline to as low as 8.5% in 2013, however, the interest rate started increasing gradually up until 2017 due to the economic financial crisis (Hancocks, 2010; SARB, 2017).

Figure 4, presents the historical data of exchange rate measured by the ZAR/USD from 2002 to 2017.

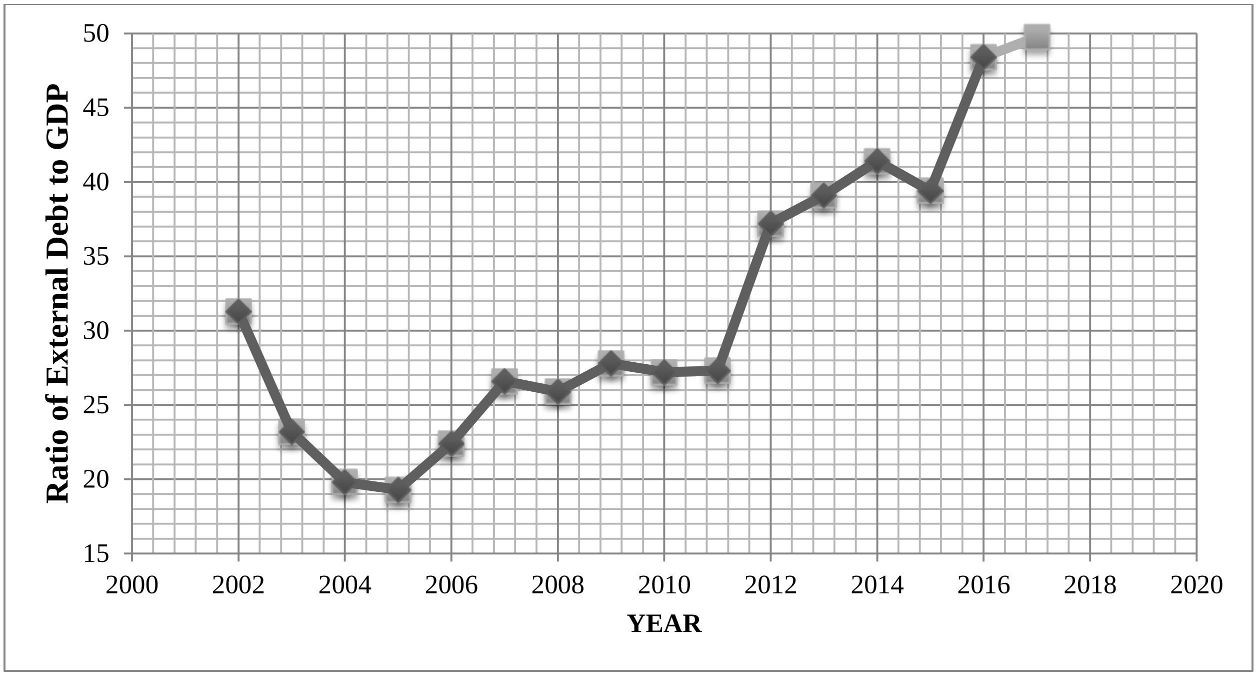


Source: SARB (2018) **Figure 4: Historical data of exchange rate from 2002 to 2017.**

Figure 4 presents a strong visual reference to the changes that occurred in the Rand value over the course of this study. It should be noted that an increase in the ZAR/USD exchange rate represents a weakening of the South African Currency. The financial shocks caused by the East Asian and Russian debt crises that affected the emerging markets in mid-2000 made the rand depreciated sharply against the dollar up until 2002. The sale of a large number of South Africa's foreign reserves and a sharp rise in short-term interest rates (Figure 3) in 2002 failed to stabilise the shocks to the currency. This depreciating trend in the value of the rand continued until early 2003 (Aron et al., 2009; Hancocks, 2010).

A favourable balance of payments situation in mid-2003 (because of firm commodity prices and substantial foreign capital inflows into the South African equity markets) boosted a recovery of the Rand. The ZAR/USD exchange rate subsequently recovered, strengthening to its pre-2002 levels by 2004 and remained at around this level until 2009 when the global financial crisis caused a sharp weakening and causes the ZAR/USD value to depreciate till 2016, however, the currency appreciated in 2017 (Hancocks, 2010; SARB, 2017).

Figure 5, presents the historical data of political risk measured by the ratio of government external debt to GDP from 2002 to 2017.

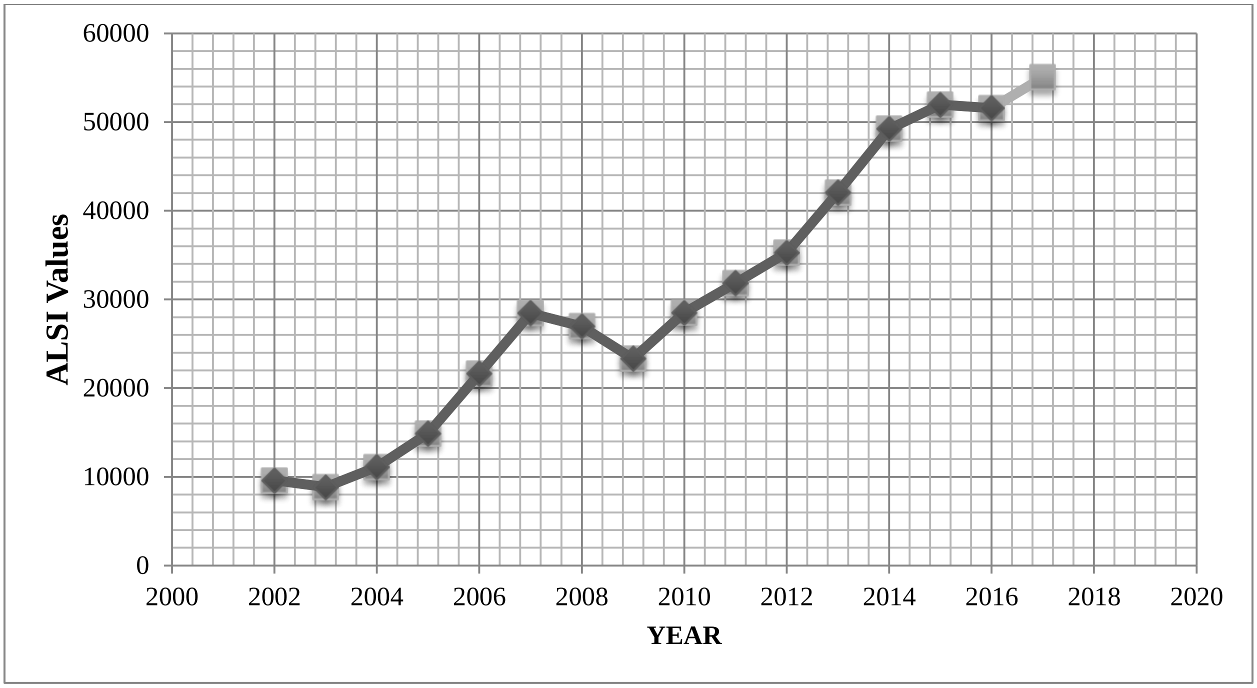


Source: SARB (2018) **Figure 5: Historical data of ratio of external debt to GDP from 2002 to 2017.**

Figure 5 presents a strong visual reference to the changes that occurred in the external debt expressed as a percentage of GDP over time in the course of this study. The trend in the external debt followed a consistent decrease from 2002 up until 2005 as a result of stable economy due to a lower and decreased interest rate and inflation rate in the period (Stanlib, 2014).

There was a rapid increase in government debt from late 2008 to 2017. The ratio of government external debt to GDP rises from as low as 19.3% in the year 2005 to 49.6% in 2017. This figure represents the largest debt level (as a ratio of GDP) that South Africa has experienced in almost twenty years due to financial crisis and political instability in the country (SARB, 2017).

Figure 6, presents the historical market return data on the JSE from 2002 to 2017.



Source: JSE (2018) **Figure 6: Historical market return data on the JSE from 2002 to 2017.**

As shown in Figure 6, the return on the JSE recorded a modest increase from 2002 to 2007 due to the relatively low and stable interest and inflation rate during that period, but declined towards the end of 2008 till 2009 as a result of the economic recession that South Africa experienced in that time. The total market return on the JSE increased toward the early stage of 2010 until 2015 (IDC, 2017).

However, against the backdrop of a weaker economic performance in 2016, the JSE recorded a decline of about 0.1% during 2016, ending the year at a reading of 51,568 index points after having fallen in 2015, this fall in the index point was as a result of the high-interest rate, depreciating exchange rate and high inflation rate among others at the end of the year 2015 towards 2016 as shown in Figure 1, 2 and 3; however, the JSE recorded a slight increase in market returns in 2017 (IDC, 2017).

2.7 Summary of the chapter

This chapter gave a review of previous literature about macroeconomic variables and the MRP. It defined the MRP and highlighted its importance and application. It proceeded to give a review of variables that affect the MRP and the empirical criterion commonly used by researchers to determine if such variable affect the MRP or not. The chapter presented an overview of the South

African equity market as well as the historical trend of the macroeconomic variables and returns on the JSE for the period 2002 to 2016. The next chapter discusses the methodology, statistical test and models used in achieving the research objectives.

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research methodology that was followed in conducting the current study. According to Mouton (2012), research methodology encompasses the entire strategy of the study from the identification and assessment of the problem to the final phase of data analysis, interpretation, conclusion and recommendations. He further argued that research methodologies are the principles underpinning the researcher's choice of a broad approach to conduct research. A description of the research design is discussed in this chapter as well as the data sources, empirical model and data analysis procedure that were employed.

3.2 Research design

The research design is an overall plan for obtaining answers to questions being studied, and handling difficulties encountered during the research (Neuman, 2011). The research design used in this study is quantitative in nature. De Vos et al. (2011) state that the purpose of a quantitative research is to describe phenomena and explore the relationship between variables, thus, data can be collected without making any changes or introducing any new treatment to the historical data. This method is suitable because the researcher's role is limited to data collection, analysis and interpretation through an objective perspective (Collins, 2010; Zikmund, 2003). According to Sekaran and Bougie (2009), quantitative research design uses structured tools to generate numerical data and uses both descriptive and inferential statistics to interpret, organise and represent the collected data. With this design, the researcher attempted to investigate and test the impact of macroeconomic variables such as inflation rate, interest rate, exchange rate and political risk on the MRP.

3.2.1 Research philosophy

The research was based on a post positivism philosophy. This research philosophy is an amendment and a critique to the shortcomings associated with logical or pure positivism. According to Saunders, Lewis and Thornhill (2007), post positivism philosophy is not a rejection but a reformation to positivist assumptions of the independent researcher and the researched variables which pursues objectivity. McNabb (2008) classified research philosophy based on positivism philosophy, interpretive philosophy or realism philosophy. Positivism philosophy is a highly structured methodology that evaluates result with the help of statistical methods. This philosophy is suitable because the research is context based and it aligns with the research problem. Research philosophy is important in the development of the research background and research knowledge (Saunders et al., 2007).

3.2.2 Data validity and reliability

Validity serves the role of checking on the quality of data and results while reliability is concerned with whether the findings of the research are repeatable (De Vos et al., 2011). To enhance data validity and reliability data were collected from different well known and reliable institutions such as the SARB, World Bank, JSE and other sources such as Stats SA and CEIC. To reduce errors during data collection the data was collected directly from the sources releasing them; thus enhancing both internal and external validity.

Reliability refers to the extent to which data results can be replicated; it is a measure of consistency in quantitative research (Neuman, 2011). Reliability provides that different researchers, working on the same data should be able to obtain the same results provided they use the same methodology. In this study, the research design, data collection methods, and data analysis techniques have been clearly documented and explained to enhance the study replicability in a different environment.

3.3 Data sources

The study used time series data that was obtained from the SARB database, World Bank database, JSE database, Stats SA database and CEIC database. The data on inflation rate (consumer price index) was obtained from the World Bank database. The data on interest rate (prime lending rate), exchange rate (ZAR/USD), treasury bills rates were obtained from the SARB database. The JSE-ALSI data was obtained from the JSE database whilst the political risk which was measured by the ratio of government external debt to GDP was available in yearly basis from the SARB database and quarterly basis on the Stats SA and CEIC database. All the time series data were available in annual, quarterly and monthly format except for the political risk data which was only available on quarterly and annual basis.

Furthermore, the annual data points were too few to carry out a regression analysis; therefore, the quarterly data with the aid of bootstrapping could be used to fit the regression model. Varian, (2005) explain bootstrapping as a metric test that relies on random sampling with replacement, which generally falls in the class of data resampling, especially for limited samples. Bootstrapping improves the quality of estimates by improving its accuracy, limiting bias, variance and standard error (Varian, 2005). Hence, the study conducted a pilot study to test if the bootstrapping could improve the reliability of the estimates and yield a significant result. However, the results of the bootstrap regression analysis on the quarterly data were insignificant (The result of the bootstrap regression analysis is available in Annexure B). Given these insignificant results, therefore, the study used the monthly data set which increased the number of data points and thus, suitable to be fitted in the regression model. Given to the situation that the ratio of external debt to GDP which is used to measure the political risk is only available on quarterly and annual basis, the study, therefore, transformed the political risk data set from quarterly to monthly.

The study employed the cubic spline interpolation technique to transform the political risk quarterly data into a monthly data. The cubic spline interpolation technique is a scientific approach constructed by piecing together cubic polynomials on different intervals (Luo & Shevchenko, 2014). Constructing a cubic spline involves interpolating a cubic polynomial between each pair of consecutive points. Cheney and Kincaid (2012) argue that cubic spline interpolation is only relevant and suitable when fitting points larger than five. This interpolation technique avoids and/or reduces the problem of over fitting that could arise from other interpolation techniques such as least square, exponential spline, cardinal spline or ordinary interpolation (Buchanan, 2010). According to Ehrgott, Klamroth and Schwehm (2004), the cubic spline interpolation technique is used widely in finance to transform data into a uniform time interval in regression modeling, yield curves, forward curves forecast, amongst others.

A number of studies such as those of Ehrgott et al. (2004), Fehr and Habermann (2005), Habermann and Kindermann (2007), Ilyasov (2014), Luo and Shevchenko (2014) and Pavel and Xiaolin (2017) in the field of financial economics and financial engineering used this technique to transform time series data into a uniform time interval for the purpose of result reliability.

After transformation, the final sample consisted of 192 observations, and this was sufficient to fit the regression model. (See Annexure D for the final monthly time series data that was used for the study).

Before fitting the regression model, the study outlined four models of which the suitable model was selected to fit the regression analysis and thus, conducted misspecification tests in order to avoid unreliable results or estimates.

3.4 Empirical model and data analysis

Empirical research has over the past relied on regression model to test the relationship between macroeconomic variables and MRP. According to Lettau et al. (2008), Henkel et al. (2011), Westlund et al. (2011) and Jun and Yuchen (2013), the multiple regression models is the appropriate model to test the relationship between the macroeconomic variables and the MRP. The advantage of the regression model is that it shows the type of relationship and significance that exists between variables, which could either be a positive or a negative relationship. Hence, model adopted in the study is described as:

$R_m - R_f = \beta_0 + \beta_1 INFR + \beta_2 INTR + \beta_3 FXER + \beta_4 EXDB + \varepsilon_t$ -- (1)

Where R_m denotes the market rate of return; R_f denotes the risk-free rate of return; β_0 represents the intercept; β_{1-4} represents the coefficient of the variables; INFR denotes the inflation rate; INTR represent the interest rate; FXER denotes the foreign exchange rate; EXDB represents the ratio of external debt to GDP and ε_t represents the error term.

According to Gujrati and Porter (2009), Nijam et al. (2015) and Talla (2013), choosing the best regression model that fits a time series data, it is necessary to reclassify the linear-linear regression model represented in equation (1) above into Linear–Log, Log–Log and Log-Linear models which will be regressed and compared based on model selection statistics criteria.

$R_m - R_f = \beta_0 + \beta_1 \text{ Log } INFR + \beta_2 \text{ Log } INTR + \beta_3 \text{ Log } FXER + \beta_4 \text{ Log } EXDB + \varepsilon_t$ ----------------- (2)

$Log\ R_m - Log\ R_f = \beta_0 + \beta_1 \text{ Log } INFR + \beta_2 \text{ Log } INTR + \beta_3 \text{ Log } FXER + \beta_4 \text{ Log } EXDB + \varepsilon_t$ ----(3)

$Log\ R_m - Log\ R_f = \beta_0 + \beta_1 INFR + \beta_2 INTR + \beta_3 FXER + \beta_4 EXDB + \varepsilon_t$ ------------------------------(4)

To select the most appropriate model for our time series data, the following statistical tests such as Adjusted R^2, estimated F statistics, Variance Inflation Factor (VIF) and Durbin-Watson statistic (DW) was carried out. These model selection criteria cover for the misspecifications that could arise from multicollinearity, autocorrelation and non-stationarity of time series data (Nijam et al., 2015). The regression model was fitted using the ordinary least square (OLS) estimator and was implemented in STATA 15 software. STATA 15 was used for analysing the data because it allows for the analysis of time series econometric data with multiple variables and also gives the model selection statistics criteria at a glance (See Annexure A for a comprehensive definition of variables).

3.5 Statistical tests

The nature of the model and the transformed time series data (political risk) may result in possible misspecification errors, therefore, the following statistical tests were performed to eliminate these errors.

3.5.1 The Multicollinearity test

The existence of multicollinearity in multiple linear regression leads to higher standard errors for individual estimates which leads to wrong understanding of coefficient's statistical significance (Koop, 2005). The effect of multicollinearity in this study was tested by Variance Inflation Factor (VIF) which determines how much the standard error of estimated parameters is influenced by the existence of multicollinearity. As a general rule, if the VIF of a variable exceeds 10 (VIF>10), it indicates that the variables are multicolinear. However, the tolerance measure can also be used which is the reciprocal of VIF. If the tolerance is less than 0.10 (1/VIF<0.10), it indicates that the variables are multicolinear and must be removed from the model to avoid misspecification (Mugumisi & Mawanza, 2014). Thus, the data complied with the multicollinearity test after been differenced to their 1st level as the VIF of the independent variables were less than 10.

3.5.2 Autocorrelation test

Time series historical data are prone to misspecification errors arising from the autocorrelation of the right-hand side variables (Nijam et al., 2015). To avoid the misspecification of the model, this study test for autocorrelation using the Durbin-Watson statistic (DW). The DW statistic is a number that tests for autocorrelation in the residual from a statistical regression analysis. The DW statistics is always between 0 and 4. As a general rule, a value between the ranges of 1.5 and 2.5 means there is no autocorrelation in the variables. A value approaching 0 indicates positive autocorrelation and values towards 4 indicate negative autocorrelation (Nijam et al., 2015; Olweny & Omondi, 2011). The data complies with the autocorrelation test as the DW test value falls within the ranges of 1.5 to 2.5.

3.5.3 Stationarity test

When dealing with time series data, it is important to examine the existence of non-stationarity in the data series. A non-stationary data generates the problem of spurious regression between unrelated variables; hence, both the left hand side and right hand side variables of the regression model must be made stationary to avoid the problem of spurious regression (Olweny & Omondi, 2011). In order to address the issue of non-stationarity, the unit root test was carried out. There are numerous unit root tests and one of the most popular among them is the Augmented Dickey-Fuller (ADF) test that was used for this study. The decision criteria involve comparing the computed ADF test-statistics with the critical value for an identification of a unit root. Generally, if the ADF test-statistics is higher than the critical value tested at 1%, 5%, and 10% significant levels; it denotes that the time series data is non-stationary and must be differenced until it becomes stationary (Olweny & Omondi, 2011; Sigauke et al., 2014; Talla, 2013). The data was not stationary at level; however, the data complied with the stationarity test and became stationary after it has been differenced to its 1st level.

3.5.4 Normality and other descriptive tests

The Jarque-Bera (JB) test statistic was used to determine whether the variables follow a normal distribution. The JB test of normality is an asymptotic test that computes the skewness and kurtosis measures and uses the following test statistic:

$$JB = n\left[\frac{2S}{6} + \frac{2}{24}(K-3)\right] \text{--} (5)$$

Where n = sample size, S = skewness coefficient, and K = kurtosis coefficient

As a general rule, for a data to follow a normal distribution, the coefficient of skewness must be 0 and the coefficient of kurtosis must be 3. Furthermore, the measure of central tendency such as the Mean, Minimum, Maximum and Standard deviation will be computed to describe the nature of the time series data (Joanes & Gill, 1998; Olweny & Omondi, 2011).

3.6 Ethical Consideration

De Vos et al. (2011) define ethics as a set of moral principles and values that is concerned with the degree to which research procedures adhere to professional, legal and social obligations. Collins (2010) and Patton (2002) defined research ethics as a system of moral conduct observed during a research process where behavioural rules and expectations about the most acceptable concern towards experimental subjects, respondents, employees, employers and sponsors are morally put into consideration. As the current research does not directly deal with interaction with experimental subjects, human or any confidential information, the ethical consideration are limited to the validity and reliability of the data obtained from the World Bank database, SARB database and JSE database. These data are publicly available for any interested individual for research or information purposes. Data sources are clearly indicated within the document and where data modification was essential; the same has been clearly indicated.

3.7 Summary of the chapter

The chapter briefly discussed the research design. It then highlighted the sources of data for the study. It illustrated the empirical model, statistical tests and data analysis procedure that was used in the study. The next chapter presents the analysis and discussion of the research findings.

CHAPTER FOUR: DATA ANALYSIS AND DISCUSSION OF FINDINGS

4.1 Introduction

This chapter presents and discusses the descriptive statistics and empirical findings of the study. It starts by presenting the descriptive statistics in the form of tables. This is then followed by the presentation and discussion of the results of the empirical model selection. Lastly, the chapter presents and discusses the empirical test results of the study.

The objective of this study was to examine the impact of selected macroeconomic variables on the MRP in the context of South Africa. In this study, the MRP is the dependent variable, and based on previous studies, four macroeconomic variables namely inflation rate (INFR), interest rate (INTR), foreign exchange rate (FXER) and political risk (EXDB) were used as predictor variables. The study uses monthly data for all the variables under study covering the period 2002 to 2017 which makes a total of 192. The data for this study are consumer price index, prime lending rate, ZAR/USD, ratio of government external debt to GDP, JSE-ALSI and 91-days treasury bill and were obtained from SARB database, World Bank database, JSE database, Stats SA database and CEIC database.

4.2 Descriptive statistics

In order to get an understanding of the data sample, descriptive statistics are an important first step in the analysis of the time series data. The descriptive statistics of the study are presented in Table 2.

Table 2: Descriptive statistics

Table 2 presents the descriptive statistics for the selected macroeconomic variables and the MRP for the period 2002 to 2017. The time series datasets use the monthly data series and the transformed political risk data obtained from the SARB database, World Bank database, JSE database, Stats SA database and CEIC database. To eliminate the problem of spurious regression that arises from the use of non-stationary time-series data, all variables were differenced in their 1st level, making the time-series data suitable for the purpose of the current study. The variables in the table are defined as follows: **MRP** denotes the dependent variable equity market risk premium and the independent variables are; **INFR** which refers to the inflation rate, **INTR** which refers to the interest rate, **FXER** which refers to the foreign exchange rate, and **EXDB** which represents the political risk. All the variables are defined in annexure A.

Variables	No. of Obs	Mean	Min.	Max.	Std. Dev.	Skewness	Kurtosis
MRP	192	9.672	-46.809	66.350	20.182	-0.477	3.514
INFR	192	5.402	-1.999	14.007	2.961	-0.027	3.894
INTR	192	11.122	8.500	17.000	2.295	1.016	3.093
FXER	192	9.087	5.724	16.325	2.616	0.883	2.659
EXDB	192	31.230	18.078	50.836	9.648	0.553	2.074

The descriptive statistics in Table 2 shows a positive mean value for all the variables under study (MRP, INFR, INTR, FXER, and EXDB). This means that on average, for the period under study, South African MRP is 9.672 with a standard deviation of 20.182. This result implies that on average, the compensation expected from investing in risky equity securities over the risk-free security in South Africa for the period under study is 9.672.

The descriptive statistics also indicate that the macroeconomic variables (INFR, INTR, FXER, and EXDB) under study between 2002 to 2017 have positive means of 5.402, 11.122, 9.087 and 31.230 respectively. The result shows that the EXDB has the highest mean of 31.230 with the highest corresponding standard deviation of 9.648, which means that EXDB is more volatile compared to the other macroeconomic variables tested in the study.

Furthermore, the descriptive statistics show that on average, the inflation rate of 5.402% was slightly below the inflation target of 6.0% which is the standard target for South Africa inflation rate as adopted in the inflation targeting framework in the year 2000 (SARB, 2016) and the average prime lending rate of 11.122% is relatively equal to the interest rate in 2004 which was relatively low as the implementation of inflation targeting in the year 2000 pushed interest rate lower

(Hancocks, 2010; SARB, 2016). The descriptive statistics also show that, on average, the ZAR/USD of 9.087 is relatively equal to the exchange rate in the year 2013 which was high and was as a result of the global financial crises that caused a sharp weakening in the ZAR/USD up until 2016. The ratio of government external debt to GDP of 31.230% implies that the government borrowings increased rapidly over time compared to the country's GDP for the period under study.

The coefficient of skewness indicates whether the variables are skewed to the left; that is, negative or to the right; that is, positive. The descriptive statistics show that the dependent variable (MRP) is skewed to the left; that is, negatively skewed while the independent variables (INTR, FXER, EXDB) are skewed to the right, except for inflation rate which is skewed to the left. This implies that the variables are asymmetrically distributed where the mean, median and mode do not occur at a regular frequency or at the same point (Joanes & Gill, 1998).

Kurtosis is a measure of the heaviness of the tails of a distribution (Joanes & Gill, 1998). A normal distribution curve has a kurtosis of 3, heavy tailed distribution curve have a kurtosis greater than 3 and light tailed distribution curve have a kurtosis less than 3. The kurtosis of MRP (3.514) and INFR (3.894) are higher than 3 which implies that the variables follows a heavy-tailed distribution, thereby exhibiting one of the important characteristics of financial and economic time series data, namely that of leptokurtosis; FXER (2.659) and EXDB (2.074) are lesser than 3 which implies that they have light tailed distributions and follow a platykurtic distribution while INTR (3.093) follows mesokurtic distribution (Sigauke et al., 2014; Wesonga, 2016). Hence, the study transformed the time series data by differencing it to its 1st level in order for the data to follow a normal distribution which is suitable to fit the regression model.

4.3 Empirical Findings

This section presents the results of the empirical model selection criteria used in selecting the suitable regression model and the results of the linear-linear regression model which was fitted using the ordinary least square (OLS) estimator.

The model selection test was done in two stages. In stage one, the four models namely: linear-linear, linear-log, log- log and log-linear were regressed and compared based on the selection criteria and the most appropriate model was therefore selected. In stage two, the selected model from stage one was tested for possible misspecifications errors. The following tests were carried out in stage two: stationarity test, multicollinearity test and autocorrelation test. The selected model from stage one, after being tested and cleared for misspecification errors in stage two was then fitted using the OLS estimator.

4.3.1 Empirical model selection

Empirical research has over the past relied on regression models to test for the relationship between macroeconomic variables and the MRP (Lettau et al., 2008; Westlund et al., 2011; Nijam et al., 2015; Wesonga, 2016). According to Gujrati and Porter (2009), Nijam et al. (2015) and Talla (2013), in order to select the most appropriate time series model, the standard linear-linear regression model must be reclassified into Linear–Log, Log–Log and Log-Linear model and then regressed and compared based on model selection criteria. The logarithm of the time series data was taken in its natural form in order to transform the standard linear-linear regression model into the Linear–Log, Log–Log and Log-Linear model which was then regressed and compared. The model selection criteria consists of adjusted R^2, estimated F statistics, Variance Inflation Factor (VIF); which was used to check for the multicollinearity and Durbin-Watson statistic (DW) test; which was used to check for autocorrelation. The general rule for the appropriate model is that the model should have the highest adjusted R^2, highest estimated F statistics, VIF < 10, and DW equal or close to 2 (Nijam et al., 2015). Table 3 summarises key statistics of each model regressed.

Table 3: Key statistics of regression model selection

Table 3 presents the results of model selection criteria which are based on Adjusted R^2, VIF, DW, estimated F value and the p-value. The selection criteria in the table considers the regression equation with the highest

Adjusted R^2, highest F-value with significance of $P<0.05$ as the most appropriate model to fit the time series data for the current study (Nijam et al., 2015). This table shows each regression model equation on one column and the corresponding selection values for each equation on the other columns. The markings ***, **, and * indicate significances at 99, 95 and 90 % levels respectively. The models were fitted using OLS estimator. All the variables are defined in annexure A.

Equation	Models	P<0.05	F-value	Adj R^2	VIF	DW
Linear-Linear	$R_m - R_f = \beta_0 + \beta_1 INFR + \beta_2 INTR + \beta_3 FXER + \beta_4 EXDB + \varepsilon_t$	0.000***	32.85	40.01%	2.33- 9.40	0.23
Linear-Log	$R_m - R_f = \beta_0 + \beta_1 \, Log\, INFR + \beta_2 \, Log\, INTR + \beta_3 \, Log\, FXER + \beta_4 \, Log\, EXDB + \varepsilon_t$	0.000***	27.73	35.89%	2.33- 998.75	0.24
Log- Log	$Log\, R_m - Log\, R_f = \beta_0 + \beta_1 \, Log\, INFR + \beta_2 \, Log\, INTR + \beta_3 \, Log\, FXER + \beta_4 \, Log\, EXDB + \varepsilon_t$	0.000***	14.45	21.98%	2.33- 998.75	0.91
Log-Linear	$Log\, R_m - Log\, R_f = \beta_0 + \beta_1 INFR + \beta_2 INTR + \beta_3 FXER + \beta_4 EXDB + \varepsilon_t$	0.000***	13.50	20.75%	2.33- 9.40	0.89

According to the key statistics of regression model selection results, the linear-linear regression model was found to be the most appropriate model amongst other models based on the model statistics selection criteria presented in Table 3 above. The Linear-Linear model is the model with the highest F-value of 32.85 significant at $p<0.05$ with the highest adjusted R^2 value of 40.01% and a mean VIF lesser than 10. Hence, the linear-linear regression model was adopted for the study and the other regression models namely linear-log, log-log and log-linear presented in Table 3 above were eliminated and not considered as they were not appropriate for the current study based on the model statistic selection criteria adopted.

4.3.2 Tests for possible misspecifications of model

The section discusses the different tests that were performed before the adopted linear-linear regression model was run. The study tested for, and corrected possible misspecifications that could arise from the time series data and the transformed political risk time series data used, as indicated in the previous chapter. The specific tests done were the stationarity, multicollinearity and autocorrelation tests.

4.3.2.1 Test for Stationarity

An important concern in time series data analysis is to know whether a series is stationary (do not contain a unit root) or non-stationary (contains a unit root). A non-stationary time series data generates the problem of spurious regression between unrelated variables; hence, both the left-hand side and right-hand side variables of the regression model must be balanced to avoid the problem of spurious regression (Olweny & Omondi, 2011; Talla, 2013). Therefore, in order to address the issue of non-stationarity and avoid the problem of spurious regression in the selected linear-linear regression model from table 3 above, the Augmented Dickey-Fuller test (ADF) was used to test for stationarity.

The decision criteria involve comparing the computed ADF test-statistics with the critical values for an identification of a unit root. As a general rule, if the ADF test-statistics is higher than the critical value and Mackinnon approximate p-value > 0.05; it denotes that there is a unit root and the variable is not stationary, hence, unsuitable for the regression model. The results of this test are presented in Figure 7 and Table 4.

A visual inspection of Figure 7 shows that monthly data of MRP are not stationary. Furthermore, the results of the ADF test in Table 4 shows non-stationarity in the MRP monthly data series. Since the computed ADF test-statistics (-2.603) is greater than the critical values at 1% and 5% significant levels.

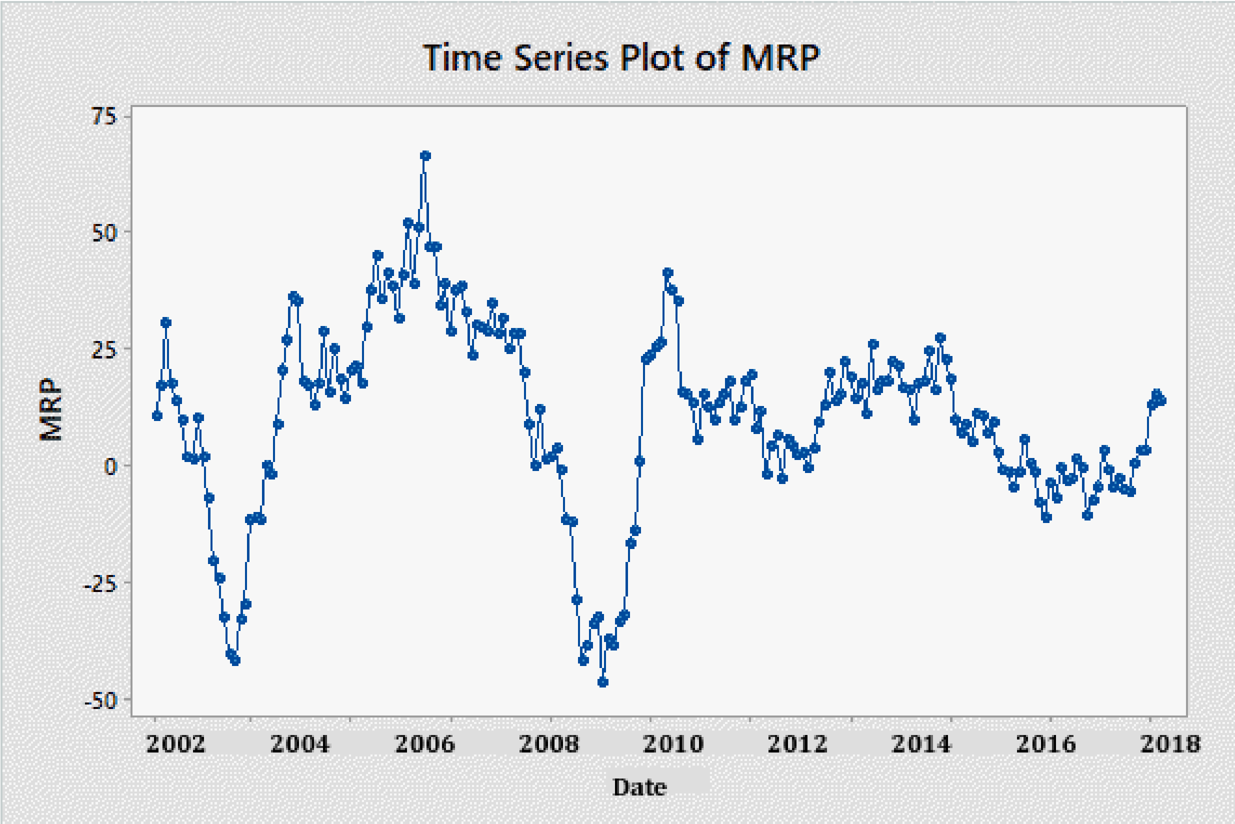


Figure 7: Time series plot of MRP (Non-stationary)

Table 4: Results of the ADF stationarity test at level

Table 4 presents the result of the unit root test of the MRP time series data consisting of 192 observations. The unit root test was done using the Augmented Dickey-Fuller (ADF) test. Table 4 shows the ADF values, critical value and the corresponding inferences. The ADF test-statistics p-values are presented in parentheses. The markings ***, **, and * indicate significances at 99, 95 and 90 % levels respectively. All the variables are defined in annexure A.

	ADF Test Statistic	1% Critical value	5% Critical value	10% Critical value
	-2.603	-3.480	-2.884	-2.574
P-Value Inference No of obs.	(0.092) Non-stationary 192			

The stationarity test results as per the ADF test presented in table 4 showed that the MRP time series data is non-stationary because it contains a unit root. This implies that the variables follow a random walk with drift and no time trend. Hence, to eliminate the unit root identified in the MRP data series, the series was differenced to its 1st level in order to make it stationary.

A plot of the MRP series given in Figure 8 shows periods of high volatility, occasional extreme movements and volatility clustering. The plot indicates that MRP data series is stationary after taking the 1st level difference and the ADF test results in Table 5 confirms the stationarity of the MRP series data. Since the computed ADF test-statistics (-14.809) is lesser than the critical values at 1%, 5% and 10% significant levels respectively.

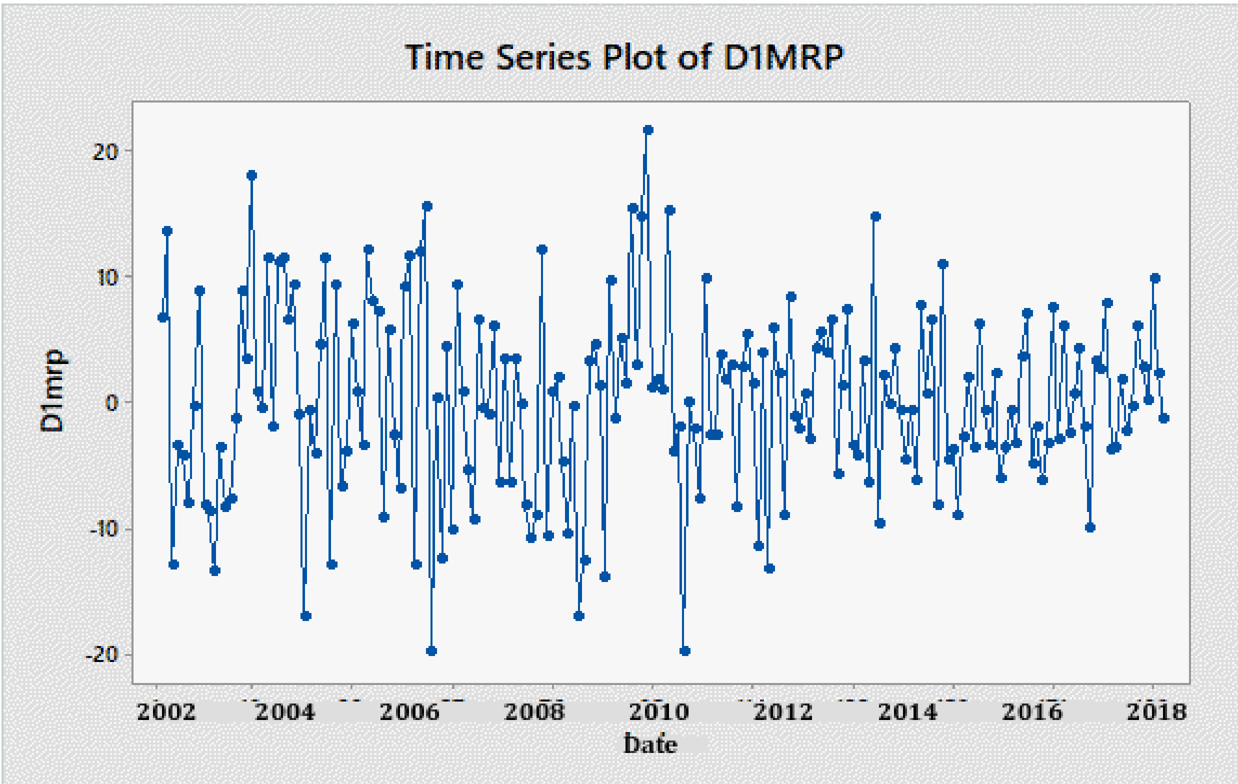


Figure 8: Time series plot of MRP (Stationary)

Table 5: Results of the ADF stationarity test at 1st level differencing

Table 5 presents the result of the unit root test of the MRP time series data consisting of 192 observations. The unit root test was done using the Augmented Dickey-Fuller (ADF) test. Table 5 shows the ADF values, critical value and the corresponding inferences. The ADF test-statistics p-values are presented in parentheses. The markings ***, **, and * indicate significances at 99, 95 and 90 % levels respectively. All the variables are defined in annexure A.

	ADF Test Statistic	1% Critical value	5% Critical value	10% Critical value
	-14.809***	-3.480	-2.884	-2.574
P-Value Inference No of obs.	(0.000) Stationary 191			

A visual inspection of Figure 9 shows that monthly data of the independent variables INFR, INTR, FXER, and EXDB are not stationary. Furthermore, the results of the ADF test in Table 6 shows non-stationarity in the time series data.

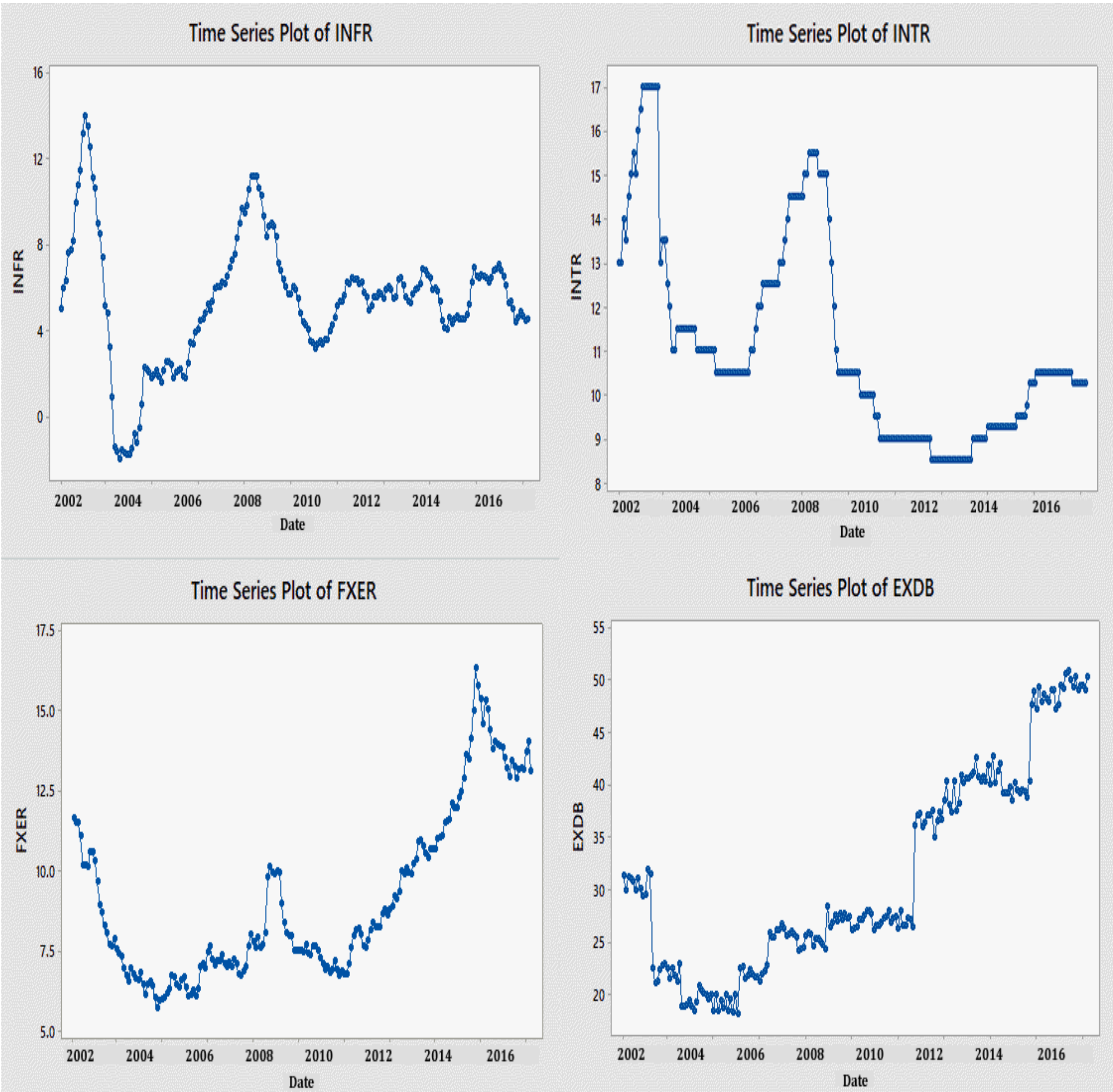


Figure 9: Time series plot of the independent variables (Non-stationary)

Table 6: Results of the ADF stationarity test at level

Table 6 presents the result of the unit root test of the macroeconomic time series data, each consisting of 192 observations. The unit root test was done using the Augmented Dickey-Fuller (ADF) test. Table 6 shows the ADF values, critical value and the corresponding inferences. The ADF test-statistics p-values are presented in parentheses. The markings ***, **, and * indicate significances at 99, 95 and 90 % levels respectively. All the variables are defined in annexure A.

INFR	ADF Test Statistic	1% Critical value	5% Critical value	10% Critical value
	-1.366	-3.480	-2.884	-2.574
P-Value Inference No of obs.	(0.598) Non-stationary 192			
INTR	ADF Test Statistic	1% Critical value	5% Critical value	10% Critical value
	-1.348	-3.480	-2.884	-2.574
P-Value Inference No of obs.	(0.606) Non-stationary 192			
FXER	ADF Test Statistic	1% Critical value	5% Critical value	10% Critical value
	-0.552	-3.480	-2.884	-2.574
P-Value Inference No of obs.	(0.881) Non-stationary 192			
EXDB	ADF Test Statistic	1% Critical value	5% Critical value	10% Critical value
	-0.295	-3.480	-2.884	-2.574
P-Value Inference No of obs.	(0.962) Non-stationary 192			

The stationarity test results as per the ADF test presented in Table 6 revealed that all the variables are non-stationary because they contain unit roots. This implies that the variables follow a random walk with drift and no time trend. These results are similar to the results of Olweny and Omondi (2011) and Talla (2013). Hence, to eliminate the unit roots identified in the independent time series data (INFR, INTR, FXER and EXDB) above, the data were differenced at 1^{st} level to make the data suitable for the linear-linear regression model adopted from Table 3 above.

A plot of the independent time series data (INFR, INTR, FXER, and EXDB) in Figure 10 shows periods of high volatility, occasional extreme movements and volatility clustering. The plot indicates that the data series is stationary after taking the 1st level difference and the ADF test results in Table 7 confirms the stationarity of the MRP series data.

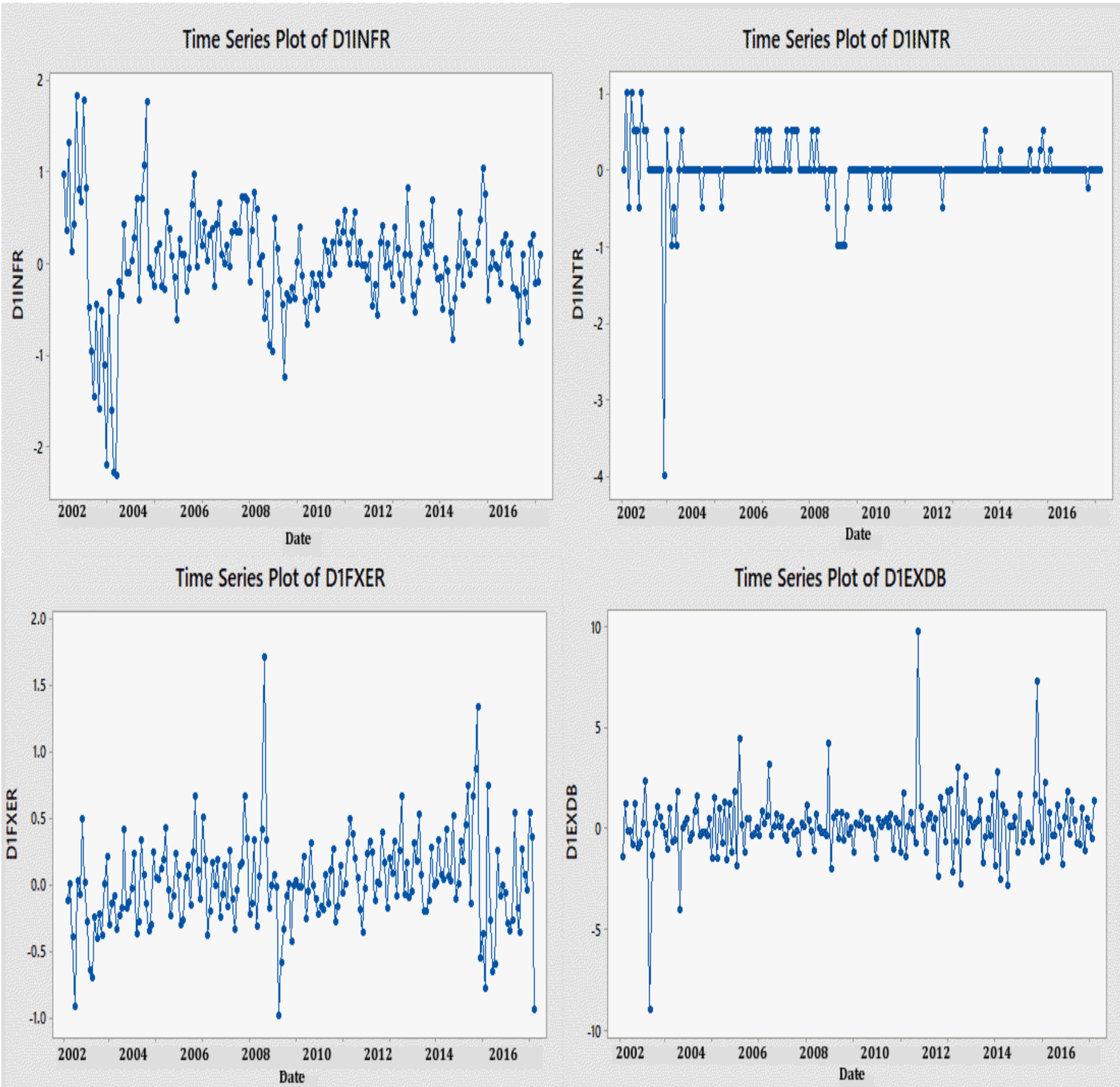


Figure 10: Time series plot of the independent variables (Stationary)

Table 7: Results of the ADF stationarity test at 1st level differencing

Table 7 presents the result of the unit root test of the macroeconomic time series data, each consisting of 192 observations. The unit root test was done using the Augmented Dickey-Fuller (ADF) test. Table 7 shows the ADF values, critical value and the corresponding inferences. The ADF test-statistics p-values are presented in parentheses. The markings ***, **, and * indicate significances at 99, 95 and 90 % levels respectively. All the variables are defined in annexure A.

INFR	ADF Test Statistic	1% Critical value	5% Critical value	10% Critical value
	-7.596***	-3.480	-2.884	-2.574
P-Value Inference No of obs.	(0.000) Stationary 191			
INTR	ADF Test Statistic	1% Critical value	5% Critical value	10% Critical value
	-12.467***	-3.480	-2.884	-2.574
P-Value Inference No of obs.	(0.000) Stationary 191			
FXER	ADF Test Statistic	1% Critical value	5% Critical value	10% Critical value
	-10.309***	-3.480	-2.884	-2.574
P-Value Inference No of obs.	(0.000) Stationary 191			
EXDB	ADF Test Statistic	1% Critical value	5% Critical value	10% Critical value
	-16.112***	-3.480	-2.884	-2.574
P-Value Inference No of obs.	(0.000) Stationary 191			

The stationarity test results as per the ADF test presented in Table 7 revealed that all the variables became stationary at their 1st level; that is, they do not contain a unit root since the computed ADF test-statistics is lesser than the critical values at 1%, 5% and 10% significant levels respectively. Therefore, there is no stationarity problem that is associated to this particular model. The next test that was done was the multicollinearity test.

4.3.2.2 Multicollinearity test

To avoid possible misspecification that could arise from the existence of multicolleration in the predictor variables which could lead to wrong understanding of the coefficient's statistical significance, the study tested for multicollinearity using the variance inflation factors (VIF). As a general rule, if the VIF of a variable exceeds 10 (VIF>10), it indicates that the variables are multicollinear. However, the tolerance measure can also be used which is the reciprocal of VIF. If the tolerance is less than 0.10 (1/VIF<0.10), it indicates that the variable is multicollinear and such variable should be eliminated (Mugumisi & Mawanza, 2014). The results of these tests are shown in Table 8.

Table 8: Results of the Multicollinearity test

Table 8 presents the result of the multicollinearity test of the predictor variables consisting of 192 observations. The test was done using the variance inflation factors for the linear-linear regression model. It shows the variables under investigation in one column and the corresponding VIFs for each in another column. All the variables are defined in annexure A.

Variable	No of obs.	VIF	1/VIF
INFR	192	1.13	0.8872
INTR	192	1.11	0.8984
FXER	192	1.01	0.9911
EXDB	192	1.01	0.9919
Mean VIF		**1.06**	

The multicollinearity test results shown in Table 8 revealed that there is no multicollinearity among the variables used in the linear-linear regression model, since none of them had a tolerance or reciprocal of VIF less than 0.10. Therefore, there is no existence of multicollinearity in the independent variables associated to the selected model. The last possible misspecification test that was done was the autocorrelation test.

4.3.2.3 Autocorrelation test

By its nature, time series model are prone to misspecification arising from the autocorrelation of the right-hand side variables (Nijam et al., 2015). To avoid the misspecification of the model, the study tested for autocorrelation using the Durbin-Watson statistic (DW) test. The acceptable range of the DW test value is between 1.5 and 2.5 (Olweny & Omondi, 2011). The results of this test are shown in Table 9.

The autocorrelation test results as per the DW test statistics shown in Table 9 showed that there is no autocorrelation among the independent variables since the DW statistic value is approximately

2.2. Therefore, there was no autocorrelation in the independent variables associated to the selected model.

Table 9: Results of the Autocorrelation test

Table 9 presents the results of the autocorrelation test of the predictor variables consisting of 192 observations. The test was done using the Durbin-Watson statistic (DW) test.

Durbin-Watson d- statistic (5, 191)	**2.208**
No of obs.	192

From the model selection, the linear-linear regression model at its 1st level differencing was selected as the appropriate model to fit the time series data for the study. Also, as no unit roots were identified, no multicollinearity and autocorrelation identified in the selected model, the study, therefore, proceeds by fitting the selected model using the OLS estimator.

4.3.3 Ordinary Least Squares Regression Results

The linear-linear regression model was estimated using the OLS estimator. The study had a data point of 192 observations which is a monthly data for the period 2002 to 2017. The OLS estimator was used in fitting the selected model because it is suitable for estimating data points with uncorrelated predictors with its linearity in estimating unknown parameters (Williams et al., 2013). The time series data were pretested to avoid spurious regression and was differenced at 1st level in order to make the variables stationary. The original linear-linear regression model shown in equation 1 was transformed, and the transformed regression model is summarised below.

$$_{\boldsymbol{D1}}R_m - R_f = \beta_0 + \beta_{1\boldsymbol{D1}}INFR + \beta_{2\boldsymbol{D1}}INTR + \beta_{3\boldsymbol{D1}}FXER + \beta_{4\boldsymbol{D1}}EXDB + \varepsilon_t \quad \text{---------------------------------} (6)$$

Where:

$_{\boldsymbol{D1}}$ is the 1st level differencing.

The model output is summarised in Table 10.

Table 10: Model Regression results

Table 10 shows the model regression results for the transformed variables. The linear-linear regression model is stated as $_{\boldsymbol{D1}}R_m - R_f = \beta_0 + \beta_{1\boldsymbol{D1}}INFR + \beta_{2\boldsymbol{D1}}INTR + \beta_{3\boldsymbol{D1}}FXER + \beta_{4\boldsymbol{D1}}EXDB + \varepsilon_t$. The regression model was fitted using the OLS estimator. The markings ***, **, and * indicate significances at 99, 95 and 90 % levels respectively. The variables in the table are defined as follows: *INFR* denotes inflation rate which is measured by consumer price index, *INTR* denotes interest rate which is measured by prime lending rate, *FXER* denotes foreign exchange rate which is measured by *ZAR/USD* and *EXDB* denotes political risk which is measured by ratio of government external debt to GDP.

Variable	Coefficient	t-Statistic	P-value
β_0	-0.0074	-0.01	0.989
INFR	-2.6108	-2.71	0.007***
INTR	-0.2940	-0.21	0.830
FXER	-1.5737	-1.03	0.305
EXDB	0.2557	0.76	0.447
R-squared	0.0534		
Adjusted R^2	0.0330		
F-statistic	2.62 (0.0363)		
MSE	7.4129		
No of obs.	191		

The selected model's regression results shown in table 10 show that inflation rate, interest rate and foreign exchange rate has a negative impact on MRP, whilst political risk factor has a positive impact on the MRP for the study period covering 2002 to 2017. This is represented in the equation below:

$$_{D1}R_m - R_f = -0.0074 - 2.6108\,(INFR) - 0.2940\,(INTR) - 1.5737\,(FXER) + 0.2557\,(EXDB) + 7.4129 \text{-------} \quad (7)$$

Firstly, the results indicate that inflation rate is negatively and significantly correlated with MRP, which means that there is an inverse relationship between inflation rate and the MRP, where an increase in inflation causes a decrease in MRP and a decrease in inflation causes an increase in MRP. The general argument from past studies such as those of Brandt and Wand (2003) documented that MRP tends to increase if perceived inflation increases than anticipated and vice versa. The results of the current study, however, contradict previous studies as previous studies considered perceived inflation while the current study considered the effect of actual inflation on MRP. The results of this study are consistent and similar with the findings of Basil and Copeland (1982) who argued that MRP may narrow or decrease during periods of high inflation. Similarly, Connolly and Dubofsky (2015) argue that MRP decreases as US treasury bond rates increases, and moved inversely with inflation; that is, higher inflation leads to a lower MRP. Further analysis of past studies such as those of Amtiran et al. (2017), Geske and Roll (1983), Nijam et al. (2015) and Tandiontong et al. (2015) support the notion that, in recent years of increased inflation, the MRP declines. The results of this study show that MRP decreases as inflation increases and vice versa because increase in inflation causes an increase in the relative riskiness of investors' return on equity which explains a large part of market return decline. Sustained increase in inflation results in a higher interest rate which adversely affects the market prices and thus, reduces the actual market returns. Based on the FET, changes in inflation rate affect the interest rate; that is, an increase in inflation results into a higher interest rate. Gultekin (1983) and Tandiontong et al. (2015) argue that the increase in inflation rate affects market prices which cause a decrease to the actual market returns that investors receive per unit of investment. Although the real yield on government bonds is also reduced as a result of the sustained increase in inflation, the reduction in market returns, however, outweighs the fall in the government bond yield. As a result of this, the study, therefore, argues that MRP decreases as the inflation rate causes the actual market returns to decrease beyond government bond yields. Hence, as the study findings reveals that inflation rate has a significant negative impact on the MRP in South Africa, the hypothesis which states that inflation rate has a significant negative impact on the MRP in South Africa is thereby supported.

Secondly, the results indicate that interest rate is negatively correlated with MRP, which implies that there is an inverse relationship between interest rate and the MRP, where an increase in interest causes a decrease in MRP and vice versa. The findings from past studies such as those of Fama and French (2002) and Tandiontong et al. (2015) shows that, a reduced interest rate which is used to correct inflation causes a push (an increase) to the MRP. The relationship between interest rate and inflation rate, is thus, related to the FET. According to Fama and French (2002), the relationship between interest rate and inflation rate was originally proposed by Irving Fisher. Fisher asserted that the interest rate consists of a "real" rate plus the expected inflation rate. The movement in interest rate, thus, affects the market prices and the actual market returns. According to Peng and Zervou (2015), an increase interest rate is used in controlling inflation (an increase in price caused by too much money chasing too few goods) through monetary policies. In regards to this, the increased interest rate shrinks the supply of money available for purchasing or investing either by individuals or by companies. Conversely, when interest rate is reduced, more money is available for investors or individuals for purchases or investment in either risky equity securities or government bonds. The results of this study are consistent and similar with the findings of Harris and Marston (2015) who argued that interest rate affects MRP negatively based on their study of the shareholders risk premia for the period 1982 to 1991 in the US. Similarly, the study of Bowman and Shay (1999) on MRP and interest rates in New Zealand showed that the MRP varies over time with changes in interest rate. Their study concluded that the MRP varies inversely with interest rates with evidence that suggests that a 1% decrease in interest rate implies about 35-50% increase in the MRP in New Zealand. Other previous studies such as those of Uddin and Alam (2007) and Gikungu (2012), concludes that a reduction in interest rate causes the MRP to increase and vice versa. The results of this study show that MRP moves in an inverse direction as interest rate, which implies that MRP has a negative relationship with interest rate; this follows the finance and economics rule of thumb. This result is attributed to the fact that an increase in interest rate affects the company's estimated amount of future cash flow, which lowers the price of the company stock. Hence, when company experiences decline in their stock price, the whole market or the key indexes goes down. With the lowered expectation in the growth and future cash flow of the company, investors will get lesser returns from investing in risky equity securities, making stock ownership less desirable. Furthermore, investing in equities can be viewed as too risky compared to other investments. However, the increasing effect of interest rate on government bonds such as treasury bills usually allow a corresponding increase in the rate of return on treasury bills and bonds, making these investments more desirable. Thus, the increase in interest rate causes a drastic decline on market returns and a corresponding increase in the risk-free securities such as the treasury bill yield, which consequentially leads to a decrease in the MRP. This means that, the premium available for compensating the investors for investing in risky equity securities declines due to higher interest rates (Uddin & Alam, 2007; Harris & Marston, 2015). Furthermore, depending on the data and sample examined and the time period covered in this study, the results showed that the relationship that exists between interest rate and the MRP for this study is not statistically significant. Hence, the hypothesis which states that interest rate has a significant negative impact on the MRP in South Africa is thereby not supported.

Thirdly, the results indicate that foreign exchange rate is negatively correlated with MRP, which implies that there is an inverse relationship between foreign exchange rate and the MRP. This means that currency depreciation, that is, an increase in foreign exchange rate causes a decrease in

MRP and vice versa. According to Victor (2005), movements in foreign exchange rates is as a result of changes in interest and inflation rate differentials between two countries which is explained by both the IFE and the PPP theories. These theories suggest that currency of any country with a relatively higher interest rate and inflation rate will depreciate against the currency of country with a relatively low inflation and interest rates (Buckley, 2004; Shalishali & Ho, 2002). The results in Table 10 show that MRP decreases as foreign exchange rate increases. This is because the ZAR depreciated against the US dollars as a result of the persistent increase in inflation and a sharp rise in the interest rates during the period under study. The results implies that, as a result of the currency depreciation, that is, increase in foreign exchange rate, the government increases its interest rate to protect its currency from further depreciation which causes bond price to fall and bond yield to rise. However, with the increase in interest rate, the stock price movement is affected and the actual market returns on stocks declines. This study, therefore, argues that with a depreciating currency, the actual market returns decreases while the bond yields increases which consequentially causes the MRP to decrease (Kyung-Chun, 2008; Tandiontong et al., 2015). This result is similar with the early evidences of Doong et al. (2005) and recent evidences of Kyung-Chun (2008), Mohammad (2011), Burger (2012), Tandiontong et al. (2015) and Amtiran et al. (2017), whose studies found a negative relationship between exchange rate and the MRP. Also, based on the data and sample examined and the time period covered in this study, the results showed that the relationship that exists between the foreign exchange rate and the MRP for this study is not statistically significant. Hence, the hypothesis which states that foreign exchange rate has a significant negative impact on the MRP in South Africa is thereby not supported.

Fourthly, the results in Table 10 show that political risk has a positive relationship with the MRP in South Africa. These results are similar to the findings of Goetzmann and Watanabe (2009) and Westlund et al. (2011). The results show that the ratio of government external debt to GDP coefficient is positive, which means that an increased political risk causes an increase to MRP and vice versa. In regards to this, investors (local and foreign) that are attracted to invest in the country's capital market will demand a higher return on their investment to compensate them of the high political risk in the country. As a result of this, market return increases above government bond yields and thus, causes MRP to increase. Nielsen and Risager (2001) suggest that political risk emerges from uncertainty in government policies, persistent increase in inflation rate, interest rate and depreciating currency. The changes in foreign exchange rates as a result of the movements in interest and inflation rates are explained by both the IFE and PPP theories (Buckley, 2004). Nielsen and Risager (2001) further argued that an increase in these variables (interest, inflation and foreign exchange rate), thus, impact the political risk negatively which in turn causes decline in market prices, actual market returns and consequentially causes a decline to the MRP and vice versa. These uncertainties influence the multinational corporations and results in more uncertain investment outcomes as a result of the monetary and fiscal policy in place. However, this study found that political risk does not have a significant impact on the MRP in South Africa for the period under study. This is because government external debt and GDP seem not to significantly influence investors in making their investment decisions of investing in risky equity securities or government bonds which consequentially have no significant impact on the MRP. Hence, as the study findings revealed that political risk has a positive but insignificant impact on the MRP in South Africa, the hypothesis which states that political risk has a significant negative impact on the MRP in South Africa is thereby not supported.

Furthermore, the results in Table 10 shows that inflation rate amongst other macroeconomic variables tested in the study have the highest impact on MRP compared to other macroeconomic variables in the context of South Africa for the study period. This is because inflation rate is the only factor that has a significant impact on MRP for the study period with $p<0.05$ and a t-statistic value of -2.71. This study, therefore, argues that inflation rate has the greatest impact on the MRP in South Africa. Hence, the hypothesis which states that inflation rate has the greatest impact on the MRP in South Africa is thereby supported.

Lastly, the results in Table 10, show that the independent variables (inflation rate, interest rate, exchange rate and political risk) jointly explain the variance of the dependent variable (MRP) because the result shows an R-squared value of 5.34% with an F-value of 2.62 with a joint significant value of 0.036 ($p<0.05$). This implies that the independent variables jointly affect the MRP in South African context. This study, therefore, argues that the selected macroeconomic variables have an impact on the MRP in South Africa.

Table 11: Summary of hypotheses findings

Table 11 shows the summarised results of the hypotheses tested in the study.

Hypotheses	Hypotheses statement	Decision

1	Inflation rate has a significant negative impact on the MRP in South Africa	Accepted
2	Interest rate has a significant negative impact on the MRP in South Africa	Rejected
3	Foreign exchange rate has a significant negative impact on the MRP in South Africa	Rejected
4	Political risk has a significant negative impact on the MRP in South Africa	Rejected
5	Inflation rate has the greatest impact on the MRP in South Africa	Accepted

4.4 Summary of chapter

The chapter presented the results from the analyses which were performed on the data collected from the SARB database, World Bank database, Stats SA database, CEIC database and JSE database. The chapter also provided the interpretation of the results from the data analysis. The results from the analysis were presented in two parts, descriptive statistics and the empirical findings. The study results were compared to those in the literature in order to draw meaningful interpretations. The study ends by concluding on the hypotheses as the study confirms the acceptance or rejection of the stated hypotheses. The next chapter concludes the study.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter concludes the study. The conclusions were drawn from the test results which were discussed and presented in the previous chapter. The chapter also discusses the limitations which the study was subjected to and which may have affected the results of the study. It ends by making recommendations for policy and practical implications and for future studies.

The objective of the study was to investigate the impact of inflation rate, interest rate, foreign exchange rate and political risk on the MRP in South Africa. The study used consumer price index, prime lending rate, ZAR/USD and ratio of government external debt to GDP to measure inflation rate, interest rate, foreign exchange rate and political risk respectively and the difference between the JSE-ALSI and the 91-days treasury bill yield was used to measure the MRP on a monthly basis for the period 2002 to 2017.

5.2 The impact of inflation rate, interest rate, foreign exchange rate and political risk on the MRP in South Africa.

Firstly, the results of the study show that inflation rate, interest rate and foreign exchange rate are negatively correlated with MRP. This means that there is an inverse relationship between inflation rate, interest rate, foreign exchange rate and the MRP, where an increase in inflation rate, interest rate and foreign exchange rate causes a decrease in MRP and vice versa. These results are in line with finance theories such as the FET, IFET, and PPP theory. This implies that MRP declines during periods of increased inflation, increased interest rate and depreciating currency, that is, increase in foreign exchange rate. According to Shalishali and Ho (2002), the changes in inflation rate and interest rate differentials affect the exchange rate which is related to the IFET and the PPP theory. Thus, the ZAR depreciates against the US dollars because of the persistent increase in inflation and a push in interest rate. The increase in inflation rate and foreign exchange rate affects both actual market returns and government bond yields negatively; however, the market returns decreases more compared to the government bond yields which are risk free. Also, the interest rate causes a drastic decline on market returns and a corresponding increase in the risk-free securities such as the treasury bill yield, which consequentially leads to a decrease in the MRP. Based on these results, the study concludes that inflation, interest and foreign exchange rate has a negative impact on MRP. The results of the study were found to be consistent with the findings of Amtiran et al. (2017), Basil and Copeland (1982), Bowman and Shay (1999), Burger (2012), Connolly and Dubofsky (2015), Doong et al. (2005), Gikungu (2012), Harris and Marston (2015), Kyung-Chun (2008), Mohammad (2011), Nijam et al. (2015), Tandiontong et al. (2015) and Uddin and Alam (2007), who concluded that MRP decreases during periods of increased inflation, interest and foreign exchange rate. Conversely, these results are in contradiction with the findings of Brandt and Wand (2003) and Arnold (2008).

Lastly, the results show that political risk is positively correlated with MRP. This means that there is a direct relationship between political risk and the MRP. This implies that an increase in political risk causes a corresponding increase to the MRP. Based on these results, the study concludes that political risk has a positive but insignificant impact on MRP. The results of this study are consistent with the findings of Goetzmann and Watanabe (2009) and Westlund et al. (2011), who concluded that political risk has a positive impact on MRP but are in contradiction with the findings of Brink (2004) and Neethling (2016).

5.3 Which of the macroeconomic factors has the greatest impact on the MRP in South Africa?

The results of the study showed a high and negative significant relationship between inflation rate and the MRP amongst other macroeconomic variables that were tested in the study namely; interest rate, foreign exchange rate and political risk because inflation rate is the only variable which shows a statistical significant effect on the MRP for the study period. Based on these results, the study concludes that inflation rate has the greatest impact on the MRP in the context of South Africa for the period under study.

5.4 Limitations of the study

The main limitations which the study was subjected to are limited data sources and insufficient funding and are discussed below.

5.4.1 Limited data sources

The study was limited to monthly data available from 2002 to 2017. The study could not obtain JSE-ALSI data prior 2002 due to the unavailability of data from the JSE database which is a major parameter in estimating the MRP. As a result of this, other variables were limited to 2002 in order to have uniformity in the variables' data point for the study period. Previous studies used a longer time period and a larger sample size because longer time period would give more data points which could yield a better analysis and improve the results.

5.4.2 Insufficient funding

The study was limited to four macroeconomic variables spanning from 2002 to 2017. The predictor variables in the regression model could have been extended to include other relevant factors. However, other relevant variables that could be included in the model are largely available on purchase from Thompson Reuter DataStream and or ICRG from PRS group. These datasets are not freely available online and are expensive to acquire as an individual student researcher. Thus, including other predictor variables in the regression model could give an insight into other variables that could significantly affect the MRP in the South African context.

Despite these limitations, this study was able to gather the available data, tested and cleared it for misspecification errors that could arise as a result of the time series data. The analysis, however, yielded a significant, reliable and meaningful result. With regards to this, the study serves as a pioneer study that explores the impact of selected macroeconomic variables on the MRP in the context of South Africa.

5.5 Recommendations

The findings of this study have some important policy and practical implications. Firstly, inflation rate seems to be a very significant factor affecting the MRP for it is the only factor that was found to have a significant negative effect on the MRP. Therefore, the study recommends that the SARB should maintain the effective implementation of the inflation target policy of 3–6% which was adopted in 2000 in order to stabilise inflation rate fluctuation and keep the inflation rates within target. This will increase investors’ confidence in the security market and will have a significant impact on the performance of the JSE returns. Thus, foster economic growth.

Also, other factors such as foreign exchange rate and interest rate should be carefully monitored because the inflation rate, interest rate and foreign exchange rate are entwined and all have negative impact on the MRP. Thus, a stabilized and lower interest rate will help improve the liquidity and financial performance of the general public and specifically of the company’s which will improve the market returns and increase the compensation expected by the investors in investing in risky equity securities. Hence, policy makers should focus on how interest rates will be kept within acceptable margins.

Thirdly, the reserve bank of South Africa should try to maintain a healthy exchange rate by designing monetary policies which enhance stability in forex market. Increased exchange rate has a negative impact on the market returns which consequentially affects the MRP; since the compensation for the risk of investing in risky equity securities, that is the MRP, is the major focus of every local and foreign investor. Hence, a stable exchange rate will have a positive impact on the economy and the overall performance of the JSE.

Furthermore, based on the results, the research recommends that a stable political atmosphere should be maintained because political risk has a positive impact on the MRP. This can be achieved by political leaders putting aside personal interest for the benefit of the country, peaceful coexistence of ethnical groups and race, reduce corruption and strengthening government stability in order to bring down South Africa's political risk ratings and thus, boost JSE reputation as a safe haven for both local and foreign investors.

Lastly, the regulator should ensure that all the market players comply with the policies and regulations in a bid to ensure efficiency and effectiveness of the stock market. The study recommends survey, carried out from time to time on macroeconomic variables affecting market returns and market risk premium. This can be facilitated by availing data for free to students and other researcher with interest in studying the stock market, factors affecting the market returns and risk premium.

5.6 Suggestions for further study

The study only used the following macroeconomic variables, namely, inflation rate, interest rate, foreign exchange rate and political risk as past studies have shown that these macroeconomic variables affect the MRP but excluded other factors such as money supply, oil price/barrel, risk appetite, consumption preference, credit rating, political risk rating and dividend yield. Therefore, future studies on factors affecting the MRP in South Africa can expand the regression model to include money supply, oil price/barrel, risk appetite, consumption preference, dividend yield, political risk rating and earnings-price ratio because these factors might also have a significant impact on MRP.

Lastly, further studies on persistence of news and changes on market risk premium and macroeconomic variables will be useful to investors in understanding how these changes affect their lives and influence them in making rational and better investment decisions and also aid the regulator in effective policy formulation.

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ANNEXURE A: Variable Definitions

The variables used in this study are defined as follows:

Name of Variable	Denoted as	Definition of variable
Return on Market	R_m	Average returns on JSE-ALSI on an annual basis.
Return on Risk-free Security	R_f	Average returns on the government 91-days treasury bill.

Market risk premium	R_m - R_f	The difference between the market returns and the yields on risk-free securities.
Inflation rate	INFR	Average consumer price index measured on an annual basis.
Interest rate	INTR	Average prime lending rate measured on an annual basis.
Foreign exchange rate	FXER	Average ZAR/USD measured on an annual basis.
Political risk factor	EXDB	The ratio of government external debt to GDP measured on an annual basis.
Logarithm	Log	The logarithm of the variables (R_m, R_f, INFR, INTR, FXER and EXDB).

ANNEXURE B: Robustness Test

(Bootstrap replications at 150 for both annual and quarterly data)

<u>Regression Analysis on Annual Data</u>

Source	SS	df	MS
Model	.297199295	4	.074299824
Residual	.13420071	7	.01917153
Total	.431400005	11	.039218182

Number of obs = 12
F(4, 7) = 3.88
Prob > F = 0.0573
R-squared = 0.6889
Adj R-squared = 0.5112
Root MSE = .13846

mrp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
diffinfr3	-.0297193	.0120747	-2.46	0.043	-.0582714	-.0011672
diffintr3	.0921801	.0341261	2.70	0.031	.0114846	.1728756
difffeer3	-.1002749	.0397847	-2.52	0.040	-.1943507	-.006199
diffexdb2	.0103815	.0080311	1.29	0.237	-.0086091	.029372
_cons	.0831309	.0410139	2.03	0.082	-.0138515	.1801134

Bootstrap Regression Analysis on Annual Data

```
(running regress on estimation sample)

Bootstrap replications (150)
----+--- 1 ---+--- 2 ---+--- 3 ---+--- 4 ---+--- 5
..................................................    50
..................................................   100
..................................................   150
```

Linear regression

Number of obs = 12
Replications = 150
Wald chi2(4) = 6.30
Prob > chi2 = 0.1776
R-squared = 0.6889
Adj R-squared = 0.5112
Root MSE = 0.1385

mrp	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
diffinfr3	-.0297193	.0151578	-1.96	0.050	-.0594281	-.0000106
diffintr3	.0921801	.0540497	1.71	0.088	-.0137553	.1981156
difffeer3	-.1002749	.0574767	-1.74	0.081	-.2129271	.0123774
diffexdb2	.0103815	.0087546	1.19	0.236	-.0067773	.0275403
_cons	.0831309	.0483891	1.72	0.086	-.0117099	.1779718

Regression Analysis on Quarterly Data

```
. regress d1mrp d2infr  d2intr d2fxer d2exdb
```

Source	SS	df	MS
Model	1106.41326	4	276.603315
Residual	6266.02552	57	109.930272
Total	7372.43879	61	120.859652

Number of obs	=	62
F(4, 57)	=	2.52
Prob > F	=	0.0513
R-squared	=	0.1501
Adj R-squared	=	0.0904
Root MSE	=	10.485

d1mrp	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
d2infr	1.688133	1.214093	1.39	0.170	-.7430466	4.119313
d2intr	4.801797	2.307246	2.08	0.042	.1816162	9.421979
d2fxer	-2.192219	1.87735	-1.17	0.248	-5.951547	1.567109
d2exdb	-.0778075	.4095164	-0.19	0.850	-.8978499	.742235
_cons	.1930727	1.333341	0.14	0.885	-2.476896	2.863042

Bootstrap Regression Analysis on Quarterly Data

```
. bootstrap, reps(150) seed(1): regress d1mrp d2infr  d2intr d2fxer d2exdb
(running regress on estimation sample)

Bootstrap replications (150)
----+--- 1 ---+--- 2 ---+--- 3 ---+--- 4 ---+--- 5
..................................................    50
..................................................   100
..................................................   150
```

Linear regression

Number of obs	=	62
Replications	=	150
Wald chi2(4)	=	4.32
Prob > chi2	=	0.3646
R-squared	=	0.1501
Adj R-squared	=	0.0904
Root MSE	=	10.4848

d1mrp	Observed Coef.	Bootstrap Std. Err.	z	P>|z|	Normal-based [95% Conf.	Interval]
d2infr	1.688133	1.230206	1.37	0.170	-.7230273	4.099293
d2intr	4.801797	3.478133	1.38	0.167	-2.015217	11.61881
d2fxer	-2.192219	1.706949	-1.28	0.199	-5.537777	1.153338
d2exdb	-.0778075	.3520896	-0.22	0.825	-.7678903	.6122754
_cons	.1930727	1.267439	0.15	0.879	-2.291063	2.677208

ANNEXURE C: Data Collection Form

Variables	MRP*	Inflation rate (INFR)	Interest rate (INTR)	Foreign exchange rate (FXER)	Political risk factor (EXDB)*
Sources	**JSE, SARB**	**World Bank**	**SARB**	**SARB**	**SARB, Stats SA**
Period					
1/31/2002					
2/28/2002					
3/28/2002					
4/30/2002					
5/31/2002					
8/31/2017					
9/29/2017					
10/31/2017					
11/30/2017					
12/29/2017					

ANNEXURE D: Actual and Modified Data

DATE	MRP*	INFR	INTR	FXER	EXDB*
1/31/2002	10.364	5.010	13.000	11.626	31.011
2/28/2002	16.942	5.971	13.000	11.492	29.023
3/28/2002	30.423	6.319	14.000	11.486	30.145
4/30/2002	17.357	7.618	13.500	11.083	30.083
5/31/2002	13.849	7.734	14.500	10.162	29.182
6/28/2002	9.574	8.142	15.000	10.184	29.995
7/31/2002	1.461	9.964	15.500	10.103	30.083
8/30/2002	1.108	10.764	15.000	10.588	29.010
9/30/2002	9.937	11.423	16.000	10.597	29.128
10/31/2002	1.721	13.191	16.500	10.306	30.302
11/29/2002	-7.061	14.007	17.000	9.651	31.832
12/31/2002	-20.577	13.508	17.000	8.948	31.510
1/31/2003	-24.287	12.539	17.000	8.695	22.158
2/28/2003	-32.634	11.075	17.000	8.286	21.066
3/31/2003	-40.474	10.616	17.000	8.051	21.244
4/30/2003	-41.934	9.013	17.000	7.663	22.276
5/30/2003	-33.190	8.483	17.000	7.660	22.946
6/30/2003	-29.777	7.370	13.000	7.859	22.833
7/31/2003	-11.813	5.153	13.500	7.546	22.601
8/29/2003	-11.144	4.819	13.500	7.395	21.962
9/30/2003	-11.641	3.197	12.500	7.306	22.431
10/31/2003	-0.230	0.897	12.000	6.964	22.010
11/28/2003	-2.215	-1.427	11.000	6.721	21.997
12/31/2003	8.774	-1.635	11.000	6.537	22.888
1/30/2004	20.221	-1.999	11.500	6.940	19.013
2/27/2004	26.703	-1.587	11.500	6.754	18.980
3/31/2004	36.026	-1.699	11.500	6.614	18.959
4/30/2004	34.948	-1.816	11.500	6.575	19.250

5/31/2004	17.793	-1.804	11.500	6.800	18.761
6/30/2004	17.034	-1.540	11.500	6.422	18.433
7/30/2004	12.803	-0.841	11.500	6.135	19.214
8/31/2004	17.399	-1.253	11.500	6.467	20.731
9/30/2004	28.737	-0.551	11.000	6.535	20.367
10/29/2004	15.715	0.506	11.000	6.382	20.102
11/30/2004	24.970	2.259	11.000	6.031	19.864
12/31/2004	18.171	2.199	11.000	5.724	19.488
1/31/2005	14.213	2.065	11.000	5.959	19.933
2/28/2005	20.291	1.798	11.000	6.000	18.433
3/31/2005	20.991	1.938	11.000	6.033	19.923
4/29/2005	17.557	2.133	11.000	6.147	18.405
5/31/2005	29.593	1.874	10.500	6.327	19.349
6/30/2005	37.532	1.577	10.500	6.740	18.595
7/29/2005	44.651	2.127	10.500	6.697	19.867
8/31/2005	35.344	2.500	10.500	6.460	18.296
9/30/2005	41.057	2.561	10.500	6.366	19.444
10/31/2005	38.389	2.394	10.500	6.588	18.184
11/30/2005	31.363	1.770	10.500	6.655	19.951
12/30/2005	40.432	2.017	10.500	6.348	18.078
1/31/2006	51.964	2.096	10.500	6.076	22.479
2/28/2006	38.965	2.181	10.500	6.115	22.638
3/31/2006	50.870	1.865	10.500	6.244	21.404
4/28/2006	66.350	1.799	10.500	6.081	21.801
5/31/2006	46.494	2.432	10.500	6.313	22.245
6/30/2006	46.801	3.395	10.500	6.974	21.868
7/31/2006	34.237	3.346	11.000	7.069	21.554
8/31/2006	38.527	3.881	11.000	6.950	21.560
9/29/2006	28.308	4.058	11.500	7.447	21.176
10/31/2006	37.520	4.485	12.000	7.630	21.953

11/30/2006	38.271	4.510	12.000	7.246	22.154
12/29/2006	32.839	4.817	12.500	7.035	22.729
1/31/2007	23.472	5.181	12.500	7.190	25.821
2/28/2007	29.963	4.912	12.500	7.176	25.392
3/30/2007	29.369	5.325	12.500	7.353	25.422
4/30/2007	28.380	5.965	12.500	7.103	26.055
5/31/2007	34.364	6.048	12.500	7.015	26.123
6/29/2007	27.871	6.028	12.500	7.152	26.618
7/31/2007	31.219	6.208	13.000	6.973	26.222
8/31/2007	24.774	6.154	13.000	7.215	25.585
9/28/2007	28.069	6.484	13.500	7.101	25.651
10/31/2007	27.900	6.898	14.000	6.757	25.955
11/30/2007	19.585	7.231	14.500	6.705	25.642
12/31/2007	8.714	7.568	14.500	6.838	25.460
1/31/2008	-0.418	8.274	14.500	6.996	24.158
2/29/2008	11.606	8.986	14.500	7.658	24.341
3/31/2008	0.955	9.667	14.500	7.992	24.397
4/30/2008	1.632	9.457	14.500	7.759	25.535
5/30/2008	3.475	9.805	15.000	7.608	25.861
6/30/2008	-1.273	10.571	15.000	7.937	25.706
7/31/2008	-11.788	11.155	15.500	7.611	24.561
8/29/2008	-12.115	11.144	15.500	7.665	25.242
9/30/2008	-29.148	11.205	15.500	8.075	25.221
10/31/2008	-41.793	10.599	15.500	9.780	24.937
11/28/2008	-38.527	10.255	15.000	10.111	24.676
12/31/2008	-34.005	9.347	15.000	9.923	24.256
1/30/2009	-32.789	8.378	15.000	9.908	28.424
2/27/2009	-46.809	8.862	15.000	9.977	26.339
3/31/2009	-37.160	9.008	14.000	9.954	26.804
4/30/2009	-38.613	8.820	13.000	8.964	27.563

5/29/2009	-33.575	8.366	12.000	8.374	26.979
6/30/2009	-32.113	7.107	11.000	8.033	27.686
7/31/2009	-16.789	6.758	10.500	7.945	27.089
8/31/2009	-13.951	6.343	10.500	7.941	27.630
9/30/2009	0.760	6.057	10.500	7.503	27.298
10/30/2009	22.281	5.665	10.500	7.487	27.304
11/30/2009	23.319	5.665	10.500	7.510	26.095
12/31/2009	25.063	6.042	10.500	7.485	26.280
1/29/2010	26.052	5.890	10.500	7.463	26.373
2/26/2010	41.221	5.468	10.500	7.668	27.092
3/31/2010	37.145	4.790	10.500	7.406	27.058
4/30/2010	35.180	4.410	10.000	7.344	27.512
5/31/2010	15.346	4.276	10.000	7.652	27.918
6/30/2010	15.244	4.028	10.000	7.636	27.928
7/30/2010	13.031	3.517	10.000	7.521	27.626
8/31/2010	5.243	3.392	10.000	7.288	26.126
9/30/2010	15.046	3.147	10.000	7.110	26.528
10/29/2010	12.338	3.380	9.500	6.909	26.564
11/30/2010	9.667	3.497	9.500	6.975	26.871
12/31/2010	13.394	3.372	9.000	6.824	27.277
1/31/2011	15.109	3.592	9.000	6.924	27.311
2/28/2011	18.042	3.571	9.000	7.184	27.953
3/31/2011	9.655	4.000	9.000	6.898	26.847
4/29/2011	12.347	4.224	9.000	6.721	27.248
5/31/2011	17.744	4.556	9.000	6.856	27.413
6/30/2011	19.182	5.125	9.000	6.786	26.220
7/29/2011	7.573	5.323	9.000	6.787	27.933
8/31/2011	11.389	5.317	9.000	7.087	26.509
9/30/2011	-1.891	5.650	9.000	7.577	26.533
10/31/2011	3.911	6.201	9.000	7.954	27.274

11/30/2011	6.163	6.194	9.000	8.149	27.151
12/30/2011	-2.893	6.412	9.000	8.193	26.350
1/31/2012	5.360	6.376	9.000	8.003	36.075
2/29/2012	4.135	6.340	9.000	7.639	37.091
3/30/2012	1.986	6.154	9.000	7.607	37.182
4/30/2012	2.588	6.243	9.000	7.833	35.951
5/31/2012	-0.482	5.773	9.000	8.151	36.379
6/29/2012	3.663	5.525	9.000	8.382	37.037
7/31/2012	9.108	4.946	9.000	8.254	37.036
8/31/2012	12.947	5.156	9.000	8.260	37.478
9/28/2012	19.492	5.562	8.500	8.257	35.016
10/31/2012	13.652	5.520	8.500	8.642	36.510
11/30/2012	14.874	5.726	8.500	8.799	37.351
12/31/2012	22.126	5.708	8.500	8.612	36.672
1/31/2013	18.624	5.468	8.500	8.798	38.452
2/28/2013	14.277	5.858	8.500	8.877	40.268
3/28/2013	17.421	6.004	8.500	9.193	38.045
4/30/2013	11.006	5.876	8.500	9.101	37.378
5/31/2013	25.671	5.458	8.500	9.349	40.356
6/28/2013	15.892	5.544	8.500	10.000	37.566
7/31/2013	17.897	6.352	8.500	9.913	38.276
8/30/2013	17.730	6.435	8.500	10.071	40.817
9/30/2013	21.906	6.079	8.500	9.962	40.127
10/31/2013	21.191	5.533	8.500	9.898	40.567
11/29/2013	16.566	5.316	8.500	10.201	40.623
12/31/2013	15.879	5.300	8.500	10.368	40.855
1/31/2014	9.642	5.710	8.500	10.887	41.186
2/28/2014	17.238	5.880	9.000	10.951	42.521
3/31/2014	17.842	5.981	9.000	10.745	40.765
4/30/2014	24.353	6.158	9.000	10.536	40.270

5/30/2014	16.065	6.835	9.000	10.409	40.692
6/30/2014	26.948	6.784	9.000	10.677	40.264
7/31/2014	22.281	6.597	9.000	10.658	41.890
8/29/2014	18.504	6.428	9.250	10.663	40.016
9/30/2014	9.443	5.919	9.250	10.991	42.757
10/31/2014	6.636	5.956	9.250	11.059	40.186
11/28/2014	8.566	5.855	9.250	11.090	41.302
12/31/2014	4.837	5.316	9.250	11.498	42.059
1/30/2015	11.055	4.476	9.250	11.553	39.194
2/27/2015	10.265	4.079	9.250	11.577	39.233
3/31/2015	6.735	4.028	9.250	12.088	39.256
4/30/2015	8.979	4.582	9.250	11.976	39.762
5/29/2015	2.777	4.338	9.250	11.972	38.549
6/30/2015	-0.973	4.551	9.250	12.291	40.190
7/31/2015	-1.661	4.628	9.250	12.460	39.494
8/31/2015	-5.036	4.504	9.500	12.901	39.189
9/30/2015	-1.450	4.504	9.500	13.639	39.416
10/30/2015	5.484	4.494	9.500	13.493	39.395
11/30/2015	0.427	4.719	9.500	14.145	38.705
12/31/2015	-1.612	5.180	9.750	15.002	40.368
1/29/2016	-7.920	6.201	10.250	16.325	47.634
2/29/2016	-11.295	6.943	10.250	15.762	48.882
3/31/2016	-3.873	6.527	10.250	15.379	47.186
4/29/2016	-6.971	6.462	10.500	14.587	49.387
5/31/2016	-0.910	6.565	10.500	15.326	47.931
6/30/2016	-3.374	6.529	10.500	15.050	48.657
7/29/2016	-2.863	6.472	10.500	14.393	48.250
8/31/2016	1.316	6.250	10.500	13.783	47.862
9/30/2016	-0.702	6.466	10.500	14.026	48.990
10/31/2016	-10.768	6.774	10.500	13.927	49.058

11/30/2016	-7.579	6.867	10.500	13.913	47.225
12/30/2016	-4.981	7.066	10.500	13.838	47.701
1/31/2017	2.885	6.794	10.500	13.545	49.487
2/28/2017	-0.976	6.492	10.500	13.191	49.180
3/31/2017	-4.696	6.127	10.500	12.920	50.520
4/28/2017	-2.912	5.247	10.500	13.451	50.836
5/31/2017	-5.252	5.339	10.500	13.264	50.093
6/30/2017	-5.652	5.005	10.500	12.892	49.264
7/31/2017	0.270	4.357	10.250	13.150	50.245
8/31/2017	2.983	4.564	10.250	13.215	49.076
9/29/2017	3.119	4.858	10.250	13.170	49.504
10/31/2017	12.853	4.632	10.250	13.698	49.519
11/30/2017	15.092	4.418	10.250	14.043	48.975
12/29/2017	13.635	4.500	10.250	13.092	50.317

***Modified data**

Sources:

***MRP:** JSE (2018), SARB (2018)

Inflation rates: World Bank (2018)

Interest rates: SARB (2018)

Foreign exchange rates: SARB (2018)

***Political risk**: SARB (2018), Stats SA (2018), CEIC (2018)

ANNEXURE D: Language Editor Letter

Office No. C7-4
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Thohoyandou
0950
19 February 2018

Dear Sir/Madam

This serves to confirm that I proof-read and edited Masters thesis entitled "The Impact of Macroeconomic Variables on the Equity Market Risk Premium in South Africa" by Obadire Ayodeji Michael, student number 16003735.

I have also suggested a few amendments, provided the changes I recommended are effected to the text, the language is of an acceptable standard.

Please don't hesitate to contact me for any enquiry.

Regards

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