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Vlachos, Hermina Gina

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The South African equity risk premium, country risk and macroeconomic factors

Hermina Gina Vlachos

A research report submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration

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ABSTRACT

The equity risk premium is a central parameter in the investment decision making process. As both companies and investors are becoming increasingly entangled in the global economy, they are confronted with the influence of globalisation on the equity risk premium. This research study estimates the South African equity risk premium using the methodology proposed by Fama and French (2002) and further separates the equity risk premium into a global risk premium and a South African country risk premium. The study estimates monthly equity risk, global risk and country risk premiums over the 1980 to 2013 time horizon.

The study further investigates the relationship between the country risk premium and macroeconomic fundamentals. This investigation is framed within the confines of the Arbitrage Pricing Theory (APT) framework. The relationship between the country risk premium and the macroeconomic environment is of particular interest to investors, as an understanding of this relationship holds potential risk mitigating and profit yielding opportunities.

Multivariate Cointegration techniques and a Vector Error Correction model (VECM) are used to investigate the relationship between the country risk premium and the South African macroeconomic environment. The results of this study provide evidence of a significant long-run relationship between the South African country risk premium and the South African macroeconomic environment. Further, the model estimated by this study can be used to estimate future country risk premiums. Therefore, investors can use the estimated model in the investment decision making process to improve profits in the long-term.

DECLARATION

I, Hermina Gina Vlachos, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Hermina Gina Vlachos

Signed at ……

On the …….. day of …… 2014

DEDICATION

To my husband, parents and two brothers:

For their endless support, motivation and encouragement.

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1 CHAPTER 1: INTRODUCTION

1.1 Purpose of the study

The purpose of this research study is to estimate the country risk premium of the South African equities market, using realised market returns. This report further establishes the relationship between macroeconomic factors and this additional return offered to investors for investing in the South African equities market, relative to the return offered to investors in developed markets.

1.2 Context of the study

1.2.1 *The South African securities market*

The South African securities market, the Johannesburg Securities Exchange (JSE) was established in 1887 to facilitate the explosion of trade sparked by the discovery of gold in South Africa and has grown substantially since. Today the JSE is the largest and best regulated market in Africa, and the 19th largest stock exchange in the world, based on market capitalisation (JSE, 2013).

During the second half of the 19th century, the JSE operated against a backdrop of political uncertainty, oppression and violence in the years leading up to the country's first democratic election. This election, held in 1994, saw the end of the apartheid era and the newly elected African National Congress (ANC) faced the daunting task of transforming the country and restoring the economy which had been harmed by sanctions.

The abolishment of sanctions lead to the reintegration of South Africa into the world economy and had a substantial effect on the JSE (Moolman & du Toit, 2005). The subsequent obliteration of the exchange controls that prevented foreign investors from participating in the South African equities market, lead to further changes in the JSE (Moolman & du Toit, 2005). The JSE became entangled in the global trading environment and thus more susceptible to the

influence of events and trends in the rest of the world (Moolman & du Toit, 2005).

1.2.2 *Equity risk premiums*

The difference between the return offered by the equity securities market and the risk-free rate, the equity risk premium, is a much debated number in finance (Damodaran, 2012). The equity risk premium is a key parameter in investment decisions, and it is commonly used to forecast the growth of an investment in the long term.

The equity risk premium of emerging markets has been a topic of interest in recent years and Salomons and Grootveld (2003) have found the equity risk premium of emerging markets to be significantly higher than that of developed markets. This finding has been confirmed in more recent research by Donadelli and Prosperi (2012) and van Ewijk, de Groot, and Santing (2012). This additional return offered by emerging markets relative to the returns of developed markets, the country risk premium, is received by investors for bearing the additional risks associated with emerging markets. The concept is represented below in *equation 1.1* with reference to South Africa:

$$ERP_{SA} = ERP_{developed\ market} + CRP_{SA} \quad (1.1)$$

where ERP_{SA} is the South African equity risk premium , $ERP_{developed\ market}$ refers to the equity risk premium of a developed market and CRP_{SA} is the country risk premium of South Africa (Damodaran, 2012).

a. ***The South African premium and macroeconomic environment***

Currently, South Africa is ranked as one of the top 15 emerging markets in the world by the Emerging Market Opportunities Index (Grant Thornton, 2012) and has come a long way from the early post-apartheid days. However, the road ahead is long and plagued with hurdles, such as the high unemployment rate of

25.20 per cent (Trading Economics, 2013), volatile exchange rates and a modest GDP growth rate. In addition, foreign investment in South Africa has been volatile over the last decade (Grant Thornton, 2012).

In the literature, Firer and Staunton (2003), Digby, Firer, and Gilbert (2006) and Hassan and Van Biljon (2010) have estimated the South African equity risk premium using various methodologies, over different time horizons. Whereas the work of Van Rensburg (1996) (2000), Moolman and du Toit (2005), Olalere (2006) and Junkin (2012) provide a valuable insight into the relationship between the JSE All-share index and selected macroeconomic and monetary variables. However, these studies do not compare the equity risk premium to that of developed markets, or investigate the relationship between the country risk premium and macroeconomic and monetary variables.

Given the turbulent history of South Africa, the current challenges faced by the country and its emerging market status, the South African country risk premium and the factors that influence the premium is of much interest to the business world.

1.3 Problem statement

1.3.1 *Main problem*

Calculate the country specific risk premium of the South African equities market and determine the relationship between macroeconomic factors and the country risk premium, within the confines of the arbitrage pricing theory framework.

1.3.2 *Sub-problem 1*

The first sub-problem is to calculate and compare the equity risk premiums of South Africa, the United Kingdom and the United States of America and establish what the global and local risk components of the South African equity risk premium are.

1.3.3 *Sub-problem 2*

The second sub-problem is to determine the relationship between macroeconomic factors and the South African country risk premium within the framework of the arbitrage pricing theory.

1.4 Significance of the study

The study fills a gap in the literature in that there is to the researcher's knowledge no study that calculates the country risk premium of South Africa relative to developed markets, using equity market returns. The study fills a further gap in the literature by evaluating the relationship between macroeconomic variables and the South African country risk premium.

The studies done by Firer and Staunton (2003), Digby et al. (2006), and Hassan and Van Biljon (2010) focus on the South African equity risk premium exclusively with no reference to developed markets or possible factors that influence the premium. Moolman and du Toit (2005) have evaluated the influence of macroeconomic variables on the JSE All-share index, however, not with reference to a country specific risk premium for South Africa. Similarly, Olalere (2006) has examined the behaviour of the All-share index and JSE market capitalization in response to changes in domestic and international macroeconomic and monetary factors, however, the study does not estimate the South African equity risk premium or country risk premium.

This study provides guidance to private and government investors as a cross border and local investment decision-making tool. The equity premium is a central input into the decision making process of investors as they determine their asset allocations between equities and bonds and determine the cost of capital of investment opportunities (Firer, Ross, Westerfield, & Jordan, 2012).

This study aims to provide investors with a realistic estimate of the South African equity risk premium as well as to establish the global and country specific risk components of the premium. A realistic estimate of the equity and country risk premium is an important number in investment as a too low

estimate of the premium can cause investors to overinvest, while an overly conservative, too high premium can cause investors to miss important cross border investment opportunities. An understanding of the relationship between macroeconomic factors on the country risk premium will provide additional guidance to investors in the decision making process.

1.5 Delimitations of the study

This study only investigates the South African equities market to determine the country risk premium and notes that other estimation methods do exist in the literature.

This study uses two developed equity markets, the USA S&P 500 index and the UK FTSE 100 index, as two proxies for global equity market risk. The study does not include any other developed markets or any other proxies for global equity market risk.

The study investigates the January 1980 to December 2013 time period to estimate the equity risk premiums, country risk premiums and global risk premiums. This study excludes the years prior to 1980 and posts December 2013 because of data availability limitations in the years prior to the commencement of this study.

This study uses realised market prices and dividends to estimate the equity risk premiums. The study does not use forward-looking analyst estimates to calculate the equity risk premium, due to a lack of reliable data sets of this nature for South Africa during the early years of this study.

This study only examines the relationship between selected macroeconomic variables and the South African country risk premium. The study does so within the confines of the arbitrage pricing theory framework. The study does not include other factors such as political risk which may be an influential factor.

1.6 Definition of terms and abbreviations used

Equity risk premium:

The equity risk premium is the reward that the market offers to investors for bearing risk, relative to the risk free rate. It refers to the 'extra' compensation offered to investors for bearing additional risk, relative to the risk associated with a risk-free investment (Damodaran, 2012).

Risk free rate:

Charteris and Strydom (2011) defines the risk-free rate as the rate of return that an investor would expect from a risk-free investment over a given period of time.

Country risk premium:

The country risk premium refers to the additional return received by investors for bearing the *extra* risks associated with emerging markets, relative to the return offered by developed markets (Damodaran, 2012).

Arbitrage pricing theory (APT):

The APT is an asset pricing model that establishes the relationship between asset returns and multiple sources of risk (Reilly & Brown, 2011).

S&P 500 index:

Standard & Poor's 500 index consists of 500 stocks listed in the United States of America (USA). The constituents of the index are chosen for liquidity, market size and industry diversification (S&P500, 2013). The index is reflective of the risk and return behaviour of liquid, large global companies.

FTSE 100 index:

Financial Times Stock Exchange 100 index is an index of 100 securities listed on the London Stock Exchange in the United Kingdom (UK). The index is reflective of global, liquid large companies (FTSE, 2013b).

1.7 Assumptions

The following assumptions have been made regarding the study:

a. JSE listed companies with a primary listing abroad suffer from South African country risk to a lesser degree than companies that have a primary listing on the JSE, thus these companies have been excluded from the analysis.

b. The S&P 500 index and the FTSE 100 index, being reflective of large liquid global companies, serve as the proxies for global equity market risk in this study.

c. The duration of the period under review by this study is considered sufficient to draw conclusions.

d. Data available from Thompson Datastream is assumed to be accurate and correct. The study does not attempt to compare the data with data from other financial data sources.

2 CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This section explores the academic literature relating to the key topics of relevance to this research study. The first area of discussion in section 2.2 provides background to the equity risk premium and sets the scene for the in debt review of literature relating the premium that will follow. Section 2.3 investigates the various methodologies used to calculate the equity risk premium. The review refers to prior studies that have been done in the South African context, as well as studies conducted elsewhere in the world. This section further examines the equity markets of South Africa, the United Kingdom and the United States of America, and draws on literature of the differences and similarities between these markets and their returns. The section also makes mention of the literature pertaining to the returns of emerging markets. Section 2.4 explains the arbitrage pricing theory (APT) and macroeconomic variables that serve as systematic risk factors in a market. The section includes literature of studies that examine the influence of macroeconomic factors on the returns of various equity markets. Finally, section 2.5 concludes the review of literature and restates the hypothesis as formulated in the review of literature.

2.2 The equity risk premium

The equity risk premium is the return on the equities market in excess of the risk-free rate (Damodaran, 2012). This "extra" return offered to investors is viewed as compensation for bearing the "extra" risks associated with the equities market.

$$ERP_{market} = E(R_{market}) - R_f \quad (2.1)$$

where ERP_{market} is the equity risk premium of the equities market, $E(R_{market})$ is the expected return of the market and R_f is the risk-free rate.

Markowitz first expressed the link between risk and return in 1952. Markowitz (1952) published the portfolio selection theory that stated that every investor should seek to maximise his/her expected returns while minimising the variance of the returns. In this framework, Sharpe (1964), Lintner (1965), and Mossin (1966), each independently developed an asset pricing model that together resulted in the development of the Capital Asset Pricing Model (CAPM) (Tucker, Becker, Isimbabi, & Ogden, 1994). The CAPM depicts the relationship between the risk of an asset and its expected return under conditions of market equilibrium (Tucker et al., 1994). The equity risk premium is a central input of this widely used CAPM.

Mehra and Prescott (1985) noted that the average long-term equity risk premium is in excess of what can be explained by classical equilibrium theory and termed the phenomenon the equity premium puzzle. Ever since, researchers have attempted to explain this "puzzle" using various theoretical and empirical approaches (Claus & Thomas, 2001; Damodaran, 2012; Salomons & Grootveld, 2003). However, this puzzle persists.

2.3 Equity risk premium estimations across markets

The equity risk premium is one of the most disputed numbers in finance, with controversial views about the appropriate methodology that should be used to calculate the equity risk premium at the core of the debate (Damodaran, 2012; Elton, 1999; Schröder, 2007).

2.3.1 *Equity risk premium calculation methodology*

Damodaran (2012) contends that there are three broad approaches used to estimate the equity risk premium. The first, and most commonly used approach, is to estimate the premium using returns earned on equities in the past, relative to the risk-free rate. The second approach is to survey a subset of investors, managers, academics and relevant individuals to get an estimate of their expectations about future equity market returns. The third approach attempts to estimate a forward-looking equity risk premium using current market

prices, referred to as the implied equity risk premium. The latter two approaches are commonly referred to as forward-looking estimation approaches, while the former is referred to as an historical realised approach.

2.3.2 *The Historical realised approach*

The historical estimation approach can be traced back to the early twentieth century to the work done by Edgar Lawrence Smith (Goetzmann & Ibbotson, 2005). Smith collected the returns of stocks and bonds from the New York stock exchange (NYSE) and compared their relative performances (Goetzmann & Ibbotson, 2005). This evaluation of realised returns in an attempt to estimate future market returns has been widely used ever since, such as in the studies done by Fisher and Lorie (1964), Ibbotson and Sinquefield (1976), Mehra and Prescott (1985) Dimson, Marsh, and Staunton (2003); Wilson and Jones (2002) and Donadelli and Lucchetta (2013) to name only a few.

Mehra and Prescott (1985) proposed the following methodology to calculate the equity risk premium using historical data:

$$R_e = \frac{P_{t+1} + D_t - P_t}{P_t} \tag{2.2}$$

where R_e is the annual return, P_t is the price at the start of the year and P_{t+1} is the price at the end of the year and D_t is the dividends paid out during the year (Mehra & Prescott, 1985). A similar approach has been suggested by Fama and French (2002) to estimate the average stock return:

$$A(R_t) = A\frac{D_t}{P_{t-1}} + A(GP_t) \tag{2.3}$$

where $A(R_t)$ is the average realised return for month t, D_t is the average dividend for the month t and P_{t-1} is the price at the end of month $t-1$.

A(GP_t) is the rate of capital gain as described by equation 2.4 below:

$$GP_t = \frac{(P_t - P_{t-1})}{P_{t-1}} \tag{2.4}$$

Using the described methodology, Fama and French (2002) have estimated the USA equity risk premium at 5.57 per cent for the 1872 to 2000 time period, 4.40 per cent for the 1872 to 1950 time period and 7.43 per cent for the 1951 to 2000 time period.

Digby et al. (2006) have applied the Fama and French (2002) methodology as described to the South African market over the time period 1900 to 2004. The authors have reported an estimate of 7.11 per cent over the entire duration of the study and an estimate of 7.63 per cent over the 1960 to 2004 time period.

Gilbertson (1979) has applied a similar methodology to estimate the historical equity risk premium of industrial securities listed on the JSE, using 6 years of historical return data. The study provided an equity risk premium estimate of 5.4 per cent, however, the estimate has been criticised in literature for the short duration of the study (Digby et al., 2006).

Firer (1993) has estimated the historical premium over a longer period of time, from 1960 to 1992. He used the JSE All-share index and treasury bill rate, and estimated the arithmetic average of the equity risk premium to be 9.5 per cent over the time period. Firer and Staunton (2003), over a 102-year period, have estimated the historic arithmetic mean premium to be 8.5 per cent. The period covered stretches from 1900 to 2001.

The most recent study was done by Hassan and Van Biljon (2010). They have extended the dataset used by Firer and Staunton (2003) to a 105 year period and estimated the South African mean equity risk premium to be 8.22 per cent over the time period 1900 to 2004. Further, Kabir Hassan, Maroney, Monir El-Sady, and Telfah (2003) and Erbas and Mirakhor (2007) have studied the historical equity risk premium of groups of emerging markets, including South Africa.

A summary of the equity risk premiums estimated for South Africa using the historical approach is presented in table 2.1.

Table 2-1: Summary of prior equity risk premium studies in South Africa using the historical realised return approach

Author	*Time period*	*Risk-free proxy*	*Estimate*
Digby et al. (2006)	1960 - 2004	T-bill and 10-year bond	7.81% - T-bill 7.63% - Bond
Gilbertson (1979)	1973 - 1979	1-year bonds	5.4%
Firer (1993)	1960 - 1993	T-bill	9.5%
Firer and Staunton (2003)	1900 - 2001	T-bill	8.5%
Hassan and Van Biljon (2010)	1900 - 2004	T-bill	8.22%
Favish and Affleck-Graves (1987)	1960 – 1985	T-bill	12.3%

(Source: Digby et al. (2006) and author's own summary)

The historical approach to estimating the equity risk premium assumes that investors expect future returns of the market to be, on average, equal to past returns. Mehra (2003) argues that there is no plausible reason to believe that the future will be different from the past and therefore the equity risk premium is likely to be similar in the future, to what it has been in the past.

However, there are several problems with the use of historical returns in estimating a future equity risk premium. Elton (1999) has demonstrated that information surprises involving business firms do not cancel each other out over time. Thus past behaviour is a biased estimator of future behaviour. Damodaran (2012) has explained that if very long historical periods of data is

used, abnormal events smooth out. But in such a case we have to assume that investors' risk profiles and market fundamentals remain constant throughout this long period of time (Damodaran, 2012). In addition, there is survivorship bias. Based on these pitfalls, international literature is placing increased emphasis on improving the methodologies used to estimate the equity risk premium.

2.3.3 *The survey approach*

The survey approach of estimating the forward looking premium has been used by numerous authors, such as Fernandez (2009); (2010), Fernandez, Aguirreamalloa, and Corres (2011) and Welch (2000).

In the South African context, Correia and Cramer (2008) have estimated the mean equity risk premium by sending a survey to all companies listed on the JSE. They received 28 usable responses, indicating a mean equity risk premium of 5.35 per cent. They argue that their estimate is fairly close and consistent with the results of the PricewaterhouseCoopers valuation methodology survey, that estimates the mean premium as 5.6 per cent (PwC, 2005). Price Waterhouse Coopers' more recent 2012 survey results reveals the market risk premium range to be between 3 per cent and 12 per cent, with the average low range being 4.7 per cent and the average high range being 6.6 per cent (PwC, 2012).

Although it seems logical to ask investors what returns they require for investing in risky assets, the estimation method based on surveys fail for various reasons. Damodaran (2012) has pointed out that it is extremely difficult to define a subset of the market that adequately represents the aggregate market. He also adds that this method is not only sensitive to whom the question is directed at, but also how the question is asked. Further, Ilmanen (2003) have argued that surveys tend to be optimistic because of behavioural biases that exists amongst respondents. While, Fisher and Statman (2000) have proposed that when investors become more optimistic and expect a larger premium, this optimism is more likely to be a precursor to poor market returns, than high market returns. Thus, if surveys have any predictive power, it leans to the opposite, and incorrect direction (Damodaran, 2012).

2.3.4 *The Implied approach*

Damodaran (2012) suggests three broad categories to calculate the implied equity risk premium based on the model used, namely the discounted cash flow (DCF) based models, option pricing based models and default spread based estimations. This dissertation will focus on the DCF based models.

In 1938, John Williams stated that the investment value of stocks is the present value of all future dividends (Goetzmann & Ibbotson, 2005), the premise of the discounted cash flow model. The discounted cash flow valuation model can be used to estimate the equity risk premium by using proxies for the market's expectation of future earnings and solving for the implied discount rate that equates the present value of the expected future earnings to the current share price (Schröder, 2007). There are various discounted cash flow based approaches that can be used to estimate the implied equity risk premium (Schröder, 2007).

The most common and widely used version is the constant growth model, often referred to as the Gordon growth model. The model assumes a constant dividend growth rate and takes on the following form (Gordon, 1962):

$$P_t = \frac{D_t\,(1+g)}{(R-g)} \tag{2.5}$$

where the current price per share P_t, is the present value of all expected dividends D_t, discounted at the required rate of return, R; and the constant growth rate is g.

Vandell and Kester (1983) have estimated the USA equity risk premium for the period 1944 to 1978 using the constant growth model. Their estimate average for the period is 7.1 per cent. Over a different time period, 1982 to 1998, Harris and Marston (2001) have estimated the USA equity risk premium at 7.14 per cent, using the same model and analysts' forecasts to derive the constant growth rate.

Favish and Affleck-Graves (1987) have estimated the South African equity risk premium for the 1965 to 1985 period using the constant growth model. They estimated the premium for the period as 9.7 per cent. The Favish and Affleck-Graves (1987) study was the first to estimate the South African premium using a forward looking approach.

A dividend growth based variation of the constant growth model has been proposed by Fama and French (2002). Rearranging the constant growth model and using the growth in realised dividends to estimate the growth rate, the formula takes the following form:

$$A(RD_t) = A\frac{D_t}{P_{t-1}} + A(GD_t) \tag{2.6}$$

where $A(RD_t)$ is the average dividend growth return for month t, D_t is the average dividend for the month t and P_{t-1} is the price at the end of month $t-1$. $A(GD_t)$ is the growth rate of realised dividends, as described in equation 2.4 below:

$$GD_t = \frac{(D_t - D_{t-1})}{D_{t-1}} \tag{2.7}$$

Digby et al. (2006) have applied the Fama and French (2002) approach to the South African market over the time period 1900 to 2004. They found the dividend growth approach to produce less robust estimates of the equity risk premium than the historical realised returns approach over the full sample period. Digby et al. (2006) proposed that the unreliability is largely due to the high volatility in dividend growth during the 1910 to 1959 period. After excluding this period from the sample, the dividend model proved to be more robust and estimated the premium to be 6.6 per cent. The equity risk premiums estimated for South Africa using a forward-looking approach have been summarised in table 2.2 on the following page.

Table 2-2: Summary of prior studies estimates of the South African equity risk premium, using a forward looking estimation approach.

Author	*Time period*	*Risk-free proxy*	*Estimate*
Digby et al. (2006)	1960 - 2004	T-bill and 10-year bond	6.60% - T-bill 6.42% - Bond
Favish and Affleck-Graves (1987)	1960 – 1985	T-bill	9.7%

(Source: Authors own summary of literature presented)

In reality, most companies growth rates are uncertain, and certainly not constant (Fuller & Hsia, 1984), as suggested by the constant growth models. Further, these models are only valid when the expected return is greater than the constant growth rate.

Multi-stage dividend discount models address some of the shortcomings of the constant growth model (Fuller & Hsia, 1984). Cornell (1999) have proposed a three-stage dividend discount model, consisting of an initial 5-year phase of high growth, followed by a transition phase in which the growth rate declines linearly to a stable growth rate (Schröder, 2007). This stable growth rate is maintained to infinity by the last stage (Schröder, 2007). Cornell (1999) has applied the model to the USA stock market and estimated the premium to be 5.77 per cent, using short-term treasury bills as the risk-free rate, and 4.34 per cent when using long term-bonds as the risk-free rate.

Mozes and Cooks (2010) have used a similar three-stage model to estimate the USA equity risk premium. Their mean estimate is 4.01 per cent over the 1990 to 1998 time period. Similarly, Smant (2011) has estimated the equity risk premiums of the USA, UK and Netherlands' stock markets over the 1987 to 2010 time period, using a variation of the three-stage model, the H-model, as first proposed by Fuller and Hsia (1984). Their sample average equity risk

premium is 5.1 per cent for the USA, 5.3 per cent for the UK and 5.8 per cent for the Netherlands' stock markets respectively. Panigirtzoglou and Scammell (2002) have also advocated the use of the H-model, as it is more flexible and fits the data better. Damodaran (1999) has suggested the use of a two-stage model. However, the two-stage model incorporates a sudden jump between the abnormal growth rate and the long run growth rate which is a questionable assumption (Schröder, 2007).

Another way to manipulate the dividend discount model is to substitute the clean surplus[1] into the model; the result is referred to as the residual income model (RI). The pioneering study using the residual income model by Claus and Thomas (2001) have calculated the mean equity risk premium for the USA over the time period 1985 to 1998 to be 3.4 per cent. Mishra and O'Brien (2005) have used the Claus and Thomas (2001) approach to estimate the equity risk premium of 16 emerging markets, however, South Africa was not included in the study. A drawback of the model as pointed out by Easton, Taylor, Shroff, and Sougiannis (2002), is its sensitivity to assumptions about the rate of growth in residual income beyond the forecast horizon. Schröder (2007) and Aggarwal and Goodell (2008) add that if the composite market-to-book ratio is less than one for a particular country/year, the equity premium estimation becomes illogical.

Aggarwal and Goodell (2008) have proposed the use of an abnormal earnings growth (AEG) model. The abnormal earnings growth model does not require the use of clean surplus or assumptions regarding current and future dividend pay-out ratios (Aggarwal & Goodell, 2008). Over the 1996 to 2003 time period, using the abnormal earnings growth model and analysts' data, they have estimated the equity risk premium of sixteen emerging markets, including South Africa. Their estimate of the South African premium is 1.16 per cent. However, they use a risk-free rate of 12.76 per cent, a possible reason for the low equity risk premium estimate.

[1] Clean surplus accounting refers to the present book value of a firm, plus the present value of reported earnings, minus a charge for the cost of equity capital.

The residual income model and the abnormal earnings growth model are mathematically equivalent to the dividend discount model, but use different inputs and therefore can yield different results (Schröder, 2007). Criticism of the dividend discount model and its variants is that the present value approach assumes that the current share price accurately reflects the market's expectations about discounted future cash flows. Further, the reliability of the forecasts of the future dividends and growth rates is questionable. Elton, Gruber, and Gultekin (1981) have argued that analyst forecasts are a good proxy for investor expectations. However, Easton et al. (2002) and Guay, Kothari, and Shu (2011) have argued that analyst forecasts tend to be optimistic. As the discounted cash flow model assumes an infinite flow of cash, the accuracy of these estimates is of great importance. Currently no consensus is evident in the literature as to the most appropriate model, or inputs that should be used.

2.3.5 *The Risk-free rate*

A critical component in the estimation of the equity risk premium is the risk-free rate. However, there is no definitive agreement in the literature as to which risk-free measure should be used (Damodaran, 2012; Digby et al., 2006; Donadelli & Prosperi, 2012).

In the South African context, Favish and Affleck-Graves (1987), Firer (1993) and Digby et al. (2006) have used the treasury bill rate as a proxy for the risk-free rate. Digby et al. (2006) have indicated that this decision was based on the argument of Firer and Bradfield (2002) that long-term bonds contain an element of inflation risk, and thus should not be used as a proxy for the risk-free rate. Damodaran (2012) has contested this view and explained that such reasoning is only valid if the investor is only interested in a single period equity risk premium (e.g. six months). If the time horizon is longer, the short-term treasury bill will induce reinvestment-risk, making the use of a long-term bond more appropriate.

Donadelli and Prosperi (2012) have stated that the proxy used for the risk-free rate should have zero risk of default, be traded in liquid markets and have

duration similar to the lifetime of the risky investment. Damodaran (2012) has agreed with the views of Donadelli and Prosperi (2012) and further explained that for an investment to be risk-free the actual returns of the investment should be equal to the expected return of the investment.

Charteris and Strydom (2011) have investigated the volatility of South African risk-free rate proxies and found that the South African treasury bill includes a risk premium for the risk that is evident in the yield of this instrument. The South African long-term treasury bond does not include a premium and therefore Charteris and Strydom (2011) have advocated the use of the long-term treasury bond as a proxy for the South African risk-free rate.

2.3.6 *Geometric or Arithmetic means*

The arithmetic average return measures the simple mean of the time series of returns, whereas the geometric average measures the compounded rate of return (Damodaran, 2012). Thus the arithmetic average provides a measure of what the market return was in a typical year, and the geometric average explains the market return on average per period, compounded (Firer et al., 2012). The two measures provide different answers, with the arithmetic average yielding higher returns than the geometric averages (Firer et al., 2012; Hassan & Van Biljon, 2010).

In the literature the arithmetic average has been used extensively by numerous authors in estimating the equity risk premium over an extended period in time (Claus & Thomas, 2001; Digby et al., 2006; Gameiro, 2008). Damodaran (2012) explains that the arithmetic averages provides a good measure if returns are uncorrelated over time, however, literature indicates that over an extended period in time, market returns are negatively correlated (Fama & French, 1988). For this reason, Damodaran (2012) argues that the geometric means provide a better measure if the mean market returns are calculated over an extended period in time.

2.3.7 *Equity markets*

The FTSE group have classified equity markets as developed, advanced emerging, secondary emerging and frontier based on a set of developmental criteria. The criteria evaluates the quality, stability, predictability and consistency of the market, access to the market and the size of the country to determine its classification (FTSE, 2013a). The March 2013 classification of markets is displayed in table 2.3 on the following page.

Mature equity markets of developed countries such as the United Kingdom and the United States of America are assumed to be more liquid and efficient compared to the equity markets of emerging countries (Kohers, Kohers, & Kohers, 2006), such as South Africa. Research also suggest that the equity markets of emerging countries are more volatile and include a higher degree of country specific risk, and thus requires a higher rate of return than developed markets (Barry, Peavy, & Rodriguez, 1998; Bekaert & Harvey, 1995; Kohers et al., 2006; Salomons & Grootveld, 2003). This "excess" return received in emerging markets in reference to developed markets, can be seen as reward for holding country specific idiosyncratic risk. Carrieri, Errunza, and Majerbi (2006) have used a partial integration asset pricing model to evaluate local risk factors in emerging markets and the authors found the equity risk premium of emerging markets to be more related to local, rather than global risk factors.

Developed markets are fully integrated in the world capital market, while emerging markets are typically partially segmented from the rest of the world (Bekaert & Harvey, 1995). Kabir Hassan et al. (2003) have evaluated the returns of emerging markets and have found the emerging markets in their study to be largely uncorrelated with other emerging markets and global equity markets. Their reasoning was that many emerging markets have had severe restrictions on the participation of outsiders in their equity markets, resulting in these markets being separated from other emerging markets and the global market (Kabir Hassan et al., 2003). As emerging markets become more integrated into the global equity market, their equity risk premium is expected to decrease while their correlation with mature markets increases (Boussiga & Abaoub, 2013; Salomons & Grootveld, 2003).

Table 2-3: FTSE Classification of Markets

Developed	*Advanced Emerging*	*Secondary Emerging*	*Frontier*
Australia	Brazil	Chile	Argentina
Austria	Czech Republic	China	Bahrain
Belgium	Hungary	Colombia	Bangladesh
Canada	Malaysia	India	Botswana
Denmark	Mexico	Indonesia	Bulgaria
Finland	Poland	Morocco	Cote d'Ivoire
France	South Africa	Pakistan	Croatia
Germany	Taiwan	Peru	Cyprus
Greece	Turkey	Philippines	Estonia
Hong Kong		Russia	Ghana
Ireland		UAE	Jordan
Israel			Kenya
Japan			Lithuania
Netherlands			Macedonia
New Zealand			Malta
Norway			Mauritius
Portugal			Nigeria
Singapore			Oman
South Korea			Qatar
Spain			Romania
Sweden			Serbia
Switzerland			Slovakia
UK			Slovenia
USA			Sri Lanka
			Tunisia
			Vietnam

(Source: FTSE (2013a))

a. *The JSE main board*

The JSE is the 19th largest stock exchange in the world in terms of market capitalisation (JSE, 2013). The number and type of companies listed on the JSE have changed dramatically over the years as the South African economy evolved and expanded. The mining companies that originally gave rise to the formation of the JSE have since been joined by a diverse range of companies and today the majority of companies listed on the JSE are not mining companies (Moolman & du Toit, 2005). The number of companies listed on the JSE and the market capitalisation at the time is presented in table 2.2 below:

Table 2-4: Characteristics of the JSE

Characteristic	*1985*	*1995*	*2002*	*2013*
JSE main board listings	462	640	852	410
Market Capitalization (R million)	141 785	1022 656	1584 100	9.1 trillion

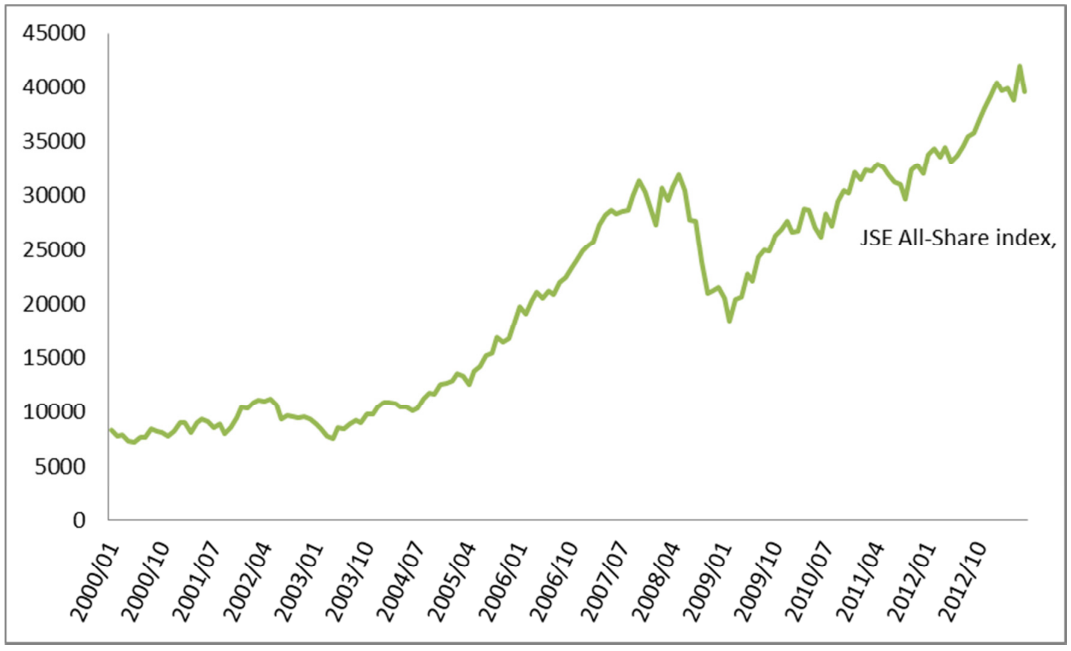
(Source: Moolman and du Toit (2005) and JSE (2013))

b. *The FTSE/JSE All-share and Top 40 indexes*

The FTSE/JSE All-share index represents 99 per cent of the full market capital of all the ordinary securities listed on the main board of the JSE (FTSE, 2013c). The market capitalisation, as of the 15th of September 2013 was 8,332 billion South African Rand (Bloomberg, 2013). The index contains the leading 164 companies listed on the JSE main board, measured by market capitalisation. Prior to June 2002, the index was referred to as the JSE All-share index (FTSE, 2013c).

The FTSE/JSE Top 40 index is designed to represent the performance of South African companies. The FTSE/JSE Top 40 index consists of the 40 largest companies ranked by market capitalisation that are included in the FTSE/JSE All-share index. The index was developed in June 2002 (JSE, 2013).

Figure 2-1: FTSE/JSE All-share index: 13-year historical performance review



(Source: Thompson Datastream data)

c. *AltX*

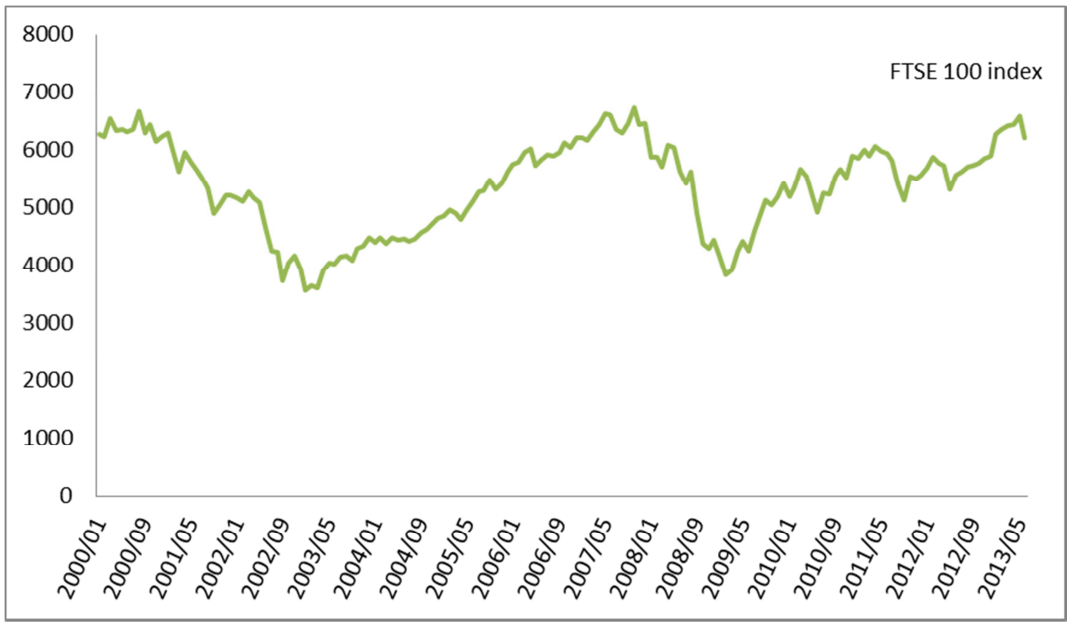
The Alternative Exchange, AltX, focuses on good quality small and medium sized growth companies (JSE, 2013). The index provides smaller companies that show great potential with the opportunity to access capital through the stock market. A total of 61 companies were included in the index at the end of 2013 (JSE, 2013).

d. *The Standard & Poor's 500 index*

The S&P 500 index is one of the most commonly used benchmarks for the overall U.S stock market and the index came into existence in 1957 (S&P500, 2013). The S&P 500 represents nearly 80 per cent of the total domestic U.S equity market capitalisation and covers the leading companies from the leading

industries (S&P500, 2013). The companies included are large, liquid companies that typically operate in the global market. On the 15th of September 2013, the market capitalisation of the index is 15,48 trillion US dollar (Bloomberg, 2013)

Figure 2-2: S&P 500 index: 13-year historical performance review

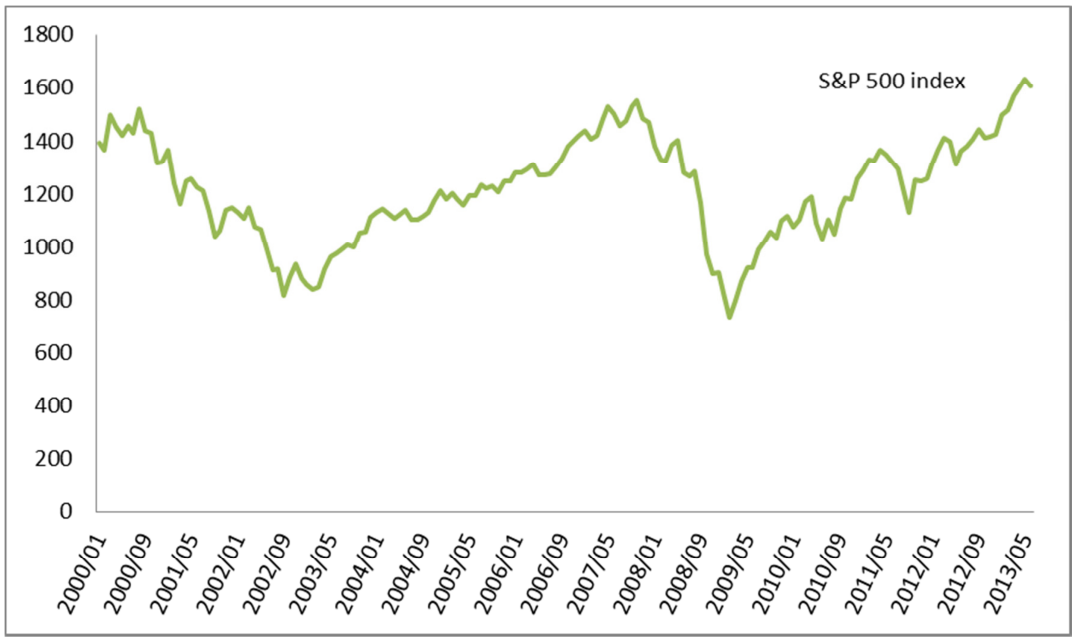


(Source: Thompson Datastream data)

e. *FTSE 100 index*

The FTSE 100 index includes the 100 companies listed on the London Stock Exchange with the largest market capitalization (Factsheet, 2013). The constituents of the index are determined quarterly and the index adjusted accordingly. The stocks are weighted, to ensure the index is investable as well as being screened for liquidity to ensure the tradability of the index (Factsheet, 2013). The index was formed in 1984 and is managed by the FTSE group, a subsidiary of the London Stock Exchange. The market capitalisation of the index as on the 15th of September 2013 is 1,656,833 million British Pounds (Bloomberg, 2013)

Figure 2-3: FTSE 100 index: 13-year historical performance



(Source: Thompson Datastream data)

2.3.8 *Hypothesis 1*

The South African equity risk premium consists of a global risk and country risk premium

2.4 Arbitrage Pricing Theory

The arbitrage pricing theory (APT) was originally developed by Ross (1976) and is a multi-factor model that allows for more than one source of risk to be considered in explaining asset returns. This is in contrast to its predecessor; the capital asset pricing model (CAPM), which relies on a single factor, the CAPM beta, to explain asset returns. Various theoretical investigations have linked variability in asset returns to a wide variety of firm-specific idiosyncratic risk factors and pervasive systematic risk factors (Burmeister, Roll, & Ross, 2003; Chen, Roll, & Ross, 1986; Reilly & Brown, 2011; Sabetfar, Fah, Mohamad, & Noordin, 2011), resulting in the APT being seen as a more realistic and less restrictive asset return model. The APT can be described by two equations, with the first equation describing the return generating process and the second equation decomposing the compensation for bearing risk into a number of risk premiums. .

2.4.1 *The return generating process*

Ross (1976) assumes that the return on an asset is a function of *k* systematic risk factors that are common to all assets:

$$R_i - E\lfloor R_i \rfloor = \beta_{ij} f_j\,(t) + \cdots + \beta_{iK} f_K \quad + \quad \epsilon_i \tag{2.3}$$

where R_i is the realised return on asset *I*, $E(R_i)$ is the expected return on asset *i*, β_{ij} is the risk exposure of asset *i* to risk factor *Fj* for (*j* = 1, …, k); and $\boldsymbol{\varepsilon}_i$ is the value of the idiosyncratic asset specific risk. The idiosyncratic asset specific risk can be diversified away, and thus the return of a diversified portfolio is driven by systematic risk factors only (Burmeister et al., 2003). The idiosyncratic risk factor as well as each of the systematic risk factors are assumed to be unpredictable at the beginning of every period with an expected value of zero (Burmeister et al., 2003). It is further assumed that the asset specific idiosyncratic risk is uncorrelated with the factor realisations and that all of the factor realisations and the asset specific idiosyncratic risks are

uncorrelated across time (Burmeister et al., 2003). Other assumptions pertaining to the model include the following:

- Capital markets are assumed to be frictionless and perfectly competitive.
- All investors have homogenous beliefs regarding the form of the return generating process.
- The return generating process can be expressed as a linear function (Reilly & Brown, 2011).
- Investors are risk averse, and prefer more wealth to less wealth with certainty (Reilly & Brown, 2011).

2.4.2 *The equilibrium between returns and risk premia*

A second equation *(equation 2.4)* as proposed by Ross (1976), determines if the factors in the return generating process are "priced" and thereby establishes the equilibrium relationship between returns and priced risk premia (Burmeister et al., 2003).

$$E(R_i) = \lambda_0 + \beta_i \lambda_j + \ldots + \beta_{ik} \lambda_k \quad (2.4)$$

where λ_0 is the expected return on an asset with zero systematic risk, alternatively it may be denoted as the risk-free rate and λ_k is the risk premium required by investors per unit of the risk due to f_k as measured by β_{ik} (Reilly & Brown, 2011). For a factor to be "priced" and thus able to explain the expected returns, the factor must be statistically different from zero (Burmeister et al., 2003).

Central to the equation is the assumption that it is impossible for an investor to earn a positive return on any combination of assets without undertaking some risk and making a net investment of funds; pure arbitrage profits are impossible (Burmeister et al., 2003).

2.4.3 *The unexpected risk factors*

Empirical tests of the APT rely on the assumption that asset prices react to unanticipated news about a wide variety of macroeconomic and financial variables, however, the APT does not state how the unexpected components should be generated (Priestley, 1996). In the literature, three methodologies are widely used and will be described:

The first methodology, the rate of change, has been used by Cheng (1995) Chen et al. (1986), Azeez and Yonezawa (2006). The methodology simply uses the first difference of the variables, assuming the first difference represents the unanticipated innovation in these variables and that they are random walks (Cheng, 1995).

The second methodology relies upon time series autoregressive techniques, where the residuals are taken to be the unexpected component of the variable. This approach has been used by Van Rensburg (2000) in the South African market to estimate the unexpected component of selected variables.

The third methodology, as suggested by Priestley (1996), advocates the use of a Kalman filter to generate the unexpected component of the variable. In this approach, expectations are updated continuously in each period as more information becomes available. This methodology has been used by Clare and Priestley (1998) in their investigation of the Malaysian stock market.

2.4.4 *Selecting the risk factors*

The arbitrage pricing theory does not specify what the systematic risk factors are, how many there are, or how they should be selected (Chen et al., 1986). Roll and Ross (1980), Cheng (1995), Altay (2003) and Isenmila and Erah (2012) have used the statistical technique, factor analysis, to extract factors from the model. This technique entails the derivation of factors based on the degree of correlation present with the asset returns. However, Dhrymes, Friend, Gultekin, and Gultekin (1985) have stated the ineffectiveness of this technique in estimating the arbitrage pricing theory factors as the factors

identified cannot be directly associated with macroeconomic variables. In view of the ineffectiveness of the technique, researchers have attempted to identify observable factors *a priori* that are potential sources of systematic risk, such as macroeconomic factors (Clare & Priestley, 1998). In identifying these factors *a priori* the dividend discount model[2] is used to establish linkages between possible macroeconomic factors and market returns. In the model, future dividends are a function of the current profitability of a firm and the dividend policy of the firm, where the profitability of the firm is influenced by the macroeconomic environment the firm operates in (Moolman & du Toit, 2005).

Using the *a priori* approach, Chen et al. (1986) have identified the following potential macroeconomic factors:

- Gross Domestic Product (GDP) / Industrial Production
- Inflation
- Interest rates
- The default spread
- Market index
- Per capita consumption
- Oil price changes

Chen et al. (1986) identified these variables by examining the return behaviour of a developed market, and added that he does not claim the list to be complete. Subsequent to Chen et al. (1986) seminal study, various other researchers have investigated these and other macroeconomic variables in markets around the world. A review of macroeconomic factors will follow with reference to other studies, their findings and possible theoretical explanations for the relationships observed where applicable

[2] The dividend discount model is discussed in more detail in section 2.3.4

a. *Gross domestic product (GDP)/ Industrial Production*

Vast amounts of literature suggest a significant relationship between aggregate production measures and market returns (Chen et al., 1986; Moolman & du Toit, 2005; Mukherjee & Naka, 1995). Maysami, Howe, and Hamzah (2004) have conducted a cointegration analysis of the Singapore stock market and macroeconomic variables. They found a positive and significant relationship between the Singapore All-share index and industrial production.

Further, Hsing, Phillips, and Phillips (2011) have evaluated the returns of the Brazilian Bovespa stock index over the 1997 to 2010 time period and found the index to be sensitive to changes in industrial production and GDP growth. van Ewijk et al. (2012) have conducted a meta-analysis of factors that cause variation in the equity premium as reported by numerous authors in the literature, and found that volatility in GDP rates result in a higher equity risk premium.

b. *Inflation*

Inflation and its relationship with market returns have been subject to extensive empirical investigation. Inflation has been found to be a significant influential factor in the studies done by Mukherjee and Naka (1995), Coetzee (2002), Alagidede (2009), Hosseini, Ahmad, and Lai (2011) and Junkin (2012) to name only a few. In these studies, the consumer price index (CPI) was used as a proxy for inflation. The index provides a measure of the overall price level of a selected basket of goods and services, consumed by an average household (Janse van Rensburg, McConnell, & Brue, 2011).

Two different views on the effects of inflation on equity market returns can be distinguished in the literature. The first view builds on the work of Irvin Fisher, who originally posited in 1930 that a positive relationship exists between anticipated inflation and changes in the risk-free rate of interest, referred to as the Fisher effect (Miller, Jeffrey, & Mandelker, 1976). Transposing the Fisher effect to risky assets, such as stocks, it can be argued that an increase in inflation raises investors required rate of return, thus a positive relationship between inflation and stock market prices exists. Boussiga and Abaoub (2013)

have found a positive relationship between inflation and the equity risk premium in a study consisting of a panel of 60 emerging markets, over the year 2000 to 2010 time period. In Africa, a positive relationship has been found between inflation and market returns in Kenya, Nigeria and Tunisia by Alagidede (2009) over the 1980 to 2006 time period. Alagidede (2009) has explained that the positive relationship observed is in support of the generalised Fischer effect, implying that over an extended period in time common stocks provide a hedge against inflation in Kenya, Nigeria and Tunisia.

In contradiction to the first view, the second view poses that a negative relationship exists between inflation and stock market returns. Different explanations of this negative relationship have been documented in literature. Fama (1981) has argued that the negative relationship between stock market returns and inflation is a result of what he terms the "proxy effect". The proxy effect builds on the evidence that real stock market returns are positively related to measures of real activity and according to the quantity theory of money; higher anticipated growth rates of real activity are associated with lower current inflation rates. Thus, the proxy effect entails that the lower inflation rate also influences the market returns, leading to higher market returns. A different explanation has been offered by Modigliani and Cohn (1979) who attribute the negative relationship to equity market investor irrationality. They argue that equity market investors misinterpret the effect of inflation on nominal dividend growth rates within the context of the dividend growth model that assumes a share price is the present value of all future cash flows. This implies that share prices are undervalued when inflation is high, and may possibly become overvalued when inflation decreases (Modigliani & Cohn, 1979).

A negative relationship has been observed in the literature by Wongbangpo and Sharma (2002) in their investigation of the relationship between stock market returns and inflation in the Philippines, Singapore and Thailand. Similar results have been found by Jecheche (2012) in his investigation of the stock market returns of Zimbabwe between 1980 and 2005.

Studies pertaining to South Africa offer mixed results. Olalere (2006) has observed a negative long-run relationship between stock prices and inflation in

a study stretching over the 1990 to 2004 time period, while Junkin (2012) has reported a positive relationship between inflation and the general retail and industrial indices on the JSE and a negative relationship between inflation and the construction, financial and pharmaceutical indices.

Fama (1981) further adds that the stock market is concerned with the information that inflation contains about future real activity. Boussiga and Abaoub (2013) and Clare and Priestley (1998) have explained that the equity risk premium increases when inflation is higher than anticipated. It is however, not the level of inflation, but the uncertainty about it that influences the equity risk premium (Damodaran, 2012).

c. *Money supply*

Monetary policy affects the general economy through the transmission mechanism and has been investigated extensively. There are varying measures of money supply that can broadly be defined as narrow and broad money. The different types of money are typically classified as 'M's, where M0 is the most narrow, and M3 the broadest (Janse van Rensburg et al., 2011). The most commonly used measure in studies of this nature is the M2, which includes coins and banknotes in circulation; demand deposits including cheques and transmission deposits and all short and medium term deposits (Janse van Rensburg et al., 2011).

A positive relationship between money supply and stock market prices have been reported by Bilson, Brailsford, and Hooper (2001) and Wongbangpo and Sharma (2002). Bilson et al. (2001) investigated the returns of a group of 20 emerging markets over the 1985 to 1997 time period, and have found a change in money supply to be an influential factor in explaining the market returns. Similarly, Wongbangpo and Sharma (2002) have found money supply to be a fundamental determinant of the market returns of Indonesia, Singapore, Malaysia, Thailand and the Philippines over the 1985 to 1996 time period.

In Australia, Chaudhuri and Smiles (2004) have investigated the effects of money supply (M3) and other macroeconomic variables on the stock prices of the Australian stock market using quarterly data from 1960 to 1998. Over the

duration of the study, Chaudhuri and Smiles (2004) have found money supply to play a significant role in explaining the movement of stock prices on the Australian stock market.

Similar findings have been reported by Tsoukalas (2003) in his investigation of the Cypriot equity market. The study stretches over the 1975 to 1998 time horizon and finds a strong relationship between stock prices and money supply. He attributes money supplies' influence to the strong monetary and fiscal policies implemented by the Cypriot government (Tsoukalas, 2003).

d. *Interest rates*

Interest rates are also influenced by monetary policy and Isenmila and Erah (2012) have argued that interest rates are one of the most important factors affecting the behaviour of investors in the equity market. Interest rates represent an opportunity cost for investing in equities as well as affecting the investors' cost of borrowing.

In the South African market, Junkin (2012) has investigated the influence of macroeconomic variables on the JSE Top 40 index and seven sector indices. The study was conducted using the Johansen cointegration technique and stretched over the 1995 to 2010 time period. The study found a positive and significant relationship between interest rates and the mining and pharmaceutical indices; a negative and significant relationship with the construction and materials index and no significant relationship with the financial, food producers, general retailers and industrial indices.

In other studies done, Groenewold Fraser (1997) have found interest rates to be a priced factor in the returns of the Australian equity market over the time period 1980 to 1994. Wongbangpo and Sharma (2002) have found a negative long run relationship between stock returns and interest rates in the Philippines, Singapore and Thailand, however, they have found a positive relationship between the stock returns of Indonesia and Malaysia and the interest rate. The meta-analysis conducted by van Ewijk et al. (2012) suggests that lower interest rates result in higher equity risk premiums.

Clare and Priestley (1998) have investigated the macroeconomic variables as suggested by Chen et al. (1986) and have found changes in the term structure of interest rates as well as changes to the risk-free rate to influence the returns of the Malaysian equities market.

e. ***Gold prices***

In the South African context, the influence of the gold price on market returns has been subject to investigation as gold was once the cornerstone of the South African economy (Moolman & du Toit, 2005). Over time, this position has changed as the economy has become diversified.

Van Rensburg (1995), as described by Moolman and du Toit (2005) has investigated the relationship between the returns of the JSE and unexpected changes in the gold price, unexpected changes in interest rate term structure, unexpected returns on the New York stock exchange and changes in inflation expectations. The results of the study indicated that all four factors significantly influence JSE stock prices. Similarly, Moolman and du Toit (2005) have found a significant positive relationship between the JSE All-Share Index and the gold price.

f. ***Oil prices***

The review of literature provides mixed results on the relationship between oil prices and market returns. In Norway, Europe's largest oil producer, Gjerde and Saettem (1999) have found a positive and highly significant relationship between oil prices and share prices on the Oslo stock exchange. The authors attribute the results to Norway's dependency on commodity prices and explain that an increase in the price of oil is beneficial to Norwegian companies, resulting in an increase in share prices (Gjerde & Saettem, 1999).

Further, a significant amount of literature exists that report a negative and significant relationship between oil prices and equity market returns (Hosseini et al., 2011; Isenmila & Erah, 2012; Jones & Kaul, 1996; Kuwornu, 2012). However, Kilian and Park (2009) have shown that market specific demand shocks with future concerns about supply shortfalls lead to higher oil prices and

lower stock prices, while global demand for industrial commodities cause higher oil prices and higher stock prices (Kilian & Park, 2009).

On the emerging market front, Maghyereh (2004) has investigated the effect of oil prices on the stock market returns of 22 emerging countries. In the study, Maghyereh (2004) found only weak evidence of a relationship between crude oil prices and stock market behaviour. However, Isenmila and Erah (2012) have found a significant relationship between oil prices and the Nigerian stock market. The study was conducted within the confines of the arbitrage pricing theory and stretches over the 2000 to 2010 time period. The study used the Johansen cointegration technique and found the oil price to be significant both in the short and long run. In the Ghanaian stock market, Kuwornu (2012) observed similar results to Isenmila and Erah (2012). Kuwornu (2012) investigated the effect of selected macroeconomic variables on the Ghanaian stock market over the 1992 to 2008 time period and used cointegration analysis to determine the relationships. The author found a significant and negative relationship between oil prices and stock market prices.

g. *Exchange rates*

Exchange rates and stock market returns have been investigated extensively, yielding mixed results. In the Nigerian market, exchange rates were observed to be a significant factor and negatively related to stock market returns (Isenmila & Erah, 2012), while exchange rates were found to not play a significant role in the Australian market (Groenewold Fraser, 1997). Further, a positive relationship between exchange rates and stock market returns have been reported by Maysami et al. (2004) in a study concerning the Singapore stock market.

In South Africa, the ZAR/USD exchange rate has been found to explain short term fluctuations on the JSE over the time period 1978 to 2000 by Moolman and du Toit (2005) while Olalere (2006) found no significant relationship between exchange rates and the JSE All-share price index over the 1990 to 2004 time period.

h. ***Political risk***

Harvey (2004) has evaluated the performance of emerging equity markets using the financial, economic and political risk ratings of the Political Risk Service Group (PRS group), and has found a high correlation between the political risk rating and the equity risk premium of the emerging markets in his study. Harvey (2004) has further added that not all country risk factors are rewarded equally in the equity risk premium.

2.4.5 *Hypothesis 2*

There is a relationship between local macroeconomic factors and the South African country risk premium.

2.5 Conclusion of Literature Review

The historical approach of estimating the future equity risk premium using realised returns is the most commonly used methodology, and was regarded as the standard approach for decades (Damodaran, 2012). However, as investing is a forward looking concept, the equity risk premium should represent investors' expectations about future returns, not historical realised returns (Penman, 2004, pp. 105-108; Wetherilt & Weeken, 2002). This contention has led to numerous efforts to estimate a forward-looking, implied equity risk premium. These efforts rely heavily on proxies for expected growth in the future (Schröder, 2007). In an attempt to overcome the difficulty of estimating a future growth rate, some studies employ analysts' forecasted earnings, such as the studies of Easton et al. (2002) and Guay et al. (2011) However, analysts' consensus forecasts are only available for South Africa from the late nineties', and the validity of analyst' estimates is also a topic of contention (Easton & Sommers, 2007). No consensus exists in the literature as to the most appropriate estimates or methodology to use.

Emerging markets have received increased interest in recent years due to the higher growth rates associated with these markets (Clare & Priestley, 1998). Studies that have been done on emerging equity markets, such as the work of

Donadelli and Lucchetta (2013); Kohers et al. (2006); Salomons and Grootveld (2003) have revealed that the equity markets of emerging countries provide investors with a higher return, relative to developed countries. This "excess" return is offered to the investor for bearing the additional country risks that are associated with the particular emerging market. Studies have also indicated that the returns of different emerging markets are largely uncorrelated (Kabir Hassan et al., 2003).

Various authors have concluded that local factors play an influential role in the equity premium of emerging markets (Clare & Priestley, 1998; Isenmila & Erah, 2012; Moolman & du Toit, 2005). The arbitrage pricing theory allows for the risk associated with investing in a market to be decomposed into a number of factors (Reilly & Brown, 2011) This further allows for the compensation for bearing risk to be reflected in several risk premiums, as opposed to a single risk premium, as assumed under the single-factor CAPM. Macroeconomic factors such as inflation (Boussiga & Abaoub, 2013), interest rates (van Ewijk et al., 2012), GDP growth rates (Hsing, Phillips, & Phillips, 2011), exchange rates (Moolman & du Toit, 2005), money supply (Bilson et al., 2001) and the oil price (Isenmila & Erah, 2012) have been shown to influence market returns in various countries around the globe. Other risk factors, such as political risk have also been indicated as an influential factor on the equity markets of emerging countries (Harvey, 2004). However, political risk cannot be measured quantitatively and political risk ratings are arguably prone to be subjective.

The hypothesis as formulated in the text, are restated below:

Hypothesis 1:

The South African equity risk premium consists of a global risk and country risk premium.

Hypothesis 2:

There is a relationship between local macroeconomic factors and the South African country risk premium.

3 CHAPTER 3: RESEARCH METHODOLOGY

This chapter outlines the methodology used in this study. This section reviews the research strategy, followed by the research design, the population and the sample selected. Thereafter the research instrument used and procedure for data collection is discussed, followed by an in-depth discussion of the data analysis procedures employed by this study. Limitations of the study, validity and reliability of the study conclude the chapter.

3.1 Research strategy

This research uses a quantitative research strategy that involves the analysis of secondary quantitative data. A quantitative research approach emphasizes the quantification of data, using a deductive approach (Bryman, 2012). Creswell (2003) points out that the quantitative researcher typically employs research practices such as identifying variables to study, using numerical information measures and statistical procedures, as is the case in this study. The secondary data used provides the opportunity for a longitudinal analysis. Albright, Winston, and Zappe (2008) have advised that the analysis of large amounts of data requires a precise and structured approach, as is outlined by this quantitative research methodology chapter.

3.2 Research Design

A longitudinal study design is used to investigate the time varying nature of the South African equity risk premium, relative to other equity markets and selected macroeconomic factors that portray the South African macroeconomic climate. Bryman (2012) defines a longitudinal study as a detailed study over a period in time. This study stretches over the January 1980 to December 2013 period in time, during which monthly data analysis is performed. The advantage of using a longitudinal design is that it allows for causal inferences to be made (Bryman, 2012). In this study, the advantage will allow for the evaluation of the South African equity risk premium and the evaluation of the relationship between the

South African country risk premium and macroeconomic factors, over a period in time. A further advantage of the design in this study is that unusual events can be smoothed out over the time period in the calculation of the equity and country risk premiums.

3.3 Population and sample

3.3.1 *Population*

All companies listed on the JSE serve as the total population for the estimation of the South African equity risk premium. The total population for the calculation of the US equity risk premium is all the companies listed on the S&P 500 index. The total population for the UK equity risk premium is all the companies listed on the FTSE 100 index. The S&P 500 index and the FTSE 100 index are both reflective of mature, developed markets, with liquid, large global companies listed on these indexes.

3.3.2 *Sample and sampling method*

The total sample consists of all companies listed on the JSE over the time period of this study with the exclusion of companies that have a primary listing abroad. These companies are excluded from the sample as it can be argued that these companies suffer from local South Africa risk factors to a lesser degree than companies that derive their cash flows largely from local sources and have a primary local listing. This sample selection aims to capture the drastic changes underwent by the JSE during the study period, in an attempt to accurately reflect the South African equity and country risk premiums.

All companies listed on the S&P 500 index and FTSE 100 index have been included in the sample for the calculation of the USA and UK equity risk premiums. The FTSE 100 index was launched in 1984, and thus data from the commencement of this study is not available for the FTSE 100 index. The FTSE 100 index is not included in the early years of the study. The US and UK premiums are used as proxies for the global equities market.

This study calculates the South African and USA equity risk premiums from January 1980 to December 2013, and the UK equity risk premium from January 1988 to December 2013. To do so, this study uses 204 967 price and dividend data points of the JSE listed companies, 408 index price data points of the S&P 500 index and 312 index price data points of the FTSE 100 index. The same number of data points of the respective risk-free rates is obtained.

3.4 The research instrument

This study uses historical market returns and the 10-year bond yield rate to estimate the equity risk premiums of South Africa, the UK and the US on a monthly interval basis, using the realised and dividend growth calculation method described by Fama and French (2002)[3]. The methodology allows for the estimation of a realised equity risk premium and a forward looking dividend growth equity risk premium, and was selected in an attempt to address some of the shortcomings associated with the various methodologies, as discussed in section 2.3 of the literature review. The use of the 10-year bond yield rate as a proxy for the risk-free rate is based on the findings of Charteris and Strydom (2011) and Damodaran (2012) as discussed in section 2.3.5 of the literature review. The study reports continuously compounded geometric returns for the equities and bond markets as the study is conducted over an extended period in time and uses long-term 10-year bond rates. This decision is based on the recommendations made by Damodaran (2012), as discussed in section 2.3.6 of the literature review.

The arbitrage pricing theory provides the framework required in determining the influence of macroeconomic variables on the South African country risk premium. The framework does not specify a universal set of variables that should be used (Chen et al., 1986). However, various studies have been done in this framework and appropriate variables can be selected *a priori* by drawing

[3] The Fama and French (2002) calculation method is discussed in section 2.3.2 and 2.3.4 of the literature review in chapter 2

from the literature[4]. In this study, the selection process was done *a priori* while being mindful of data availability. This study uses inflation, manufacturing production, exchange rates, gold price, oil price, money supply, risk and interest rates as macroeconomic variables in this analysis. These variables are calculated on a monthly interval basis for the January 2003 to December 2013 time period. All the data used in this study is of secondary nature, sourced from the relevant databases as per table 3.1.

Table 3-1*: Sources of data*

Data	*Source*
JSE All-Share index prices and dividends	Thompson DataStream
S&P 500 index prices and dividends	Thompson DataStream
FTSE 100 index prices and dividends	Thompson DataStream
10-year Government bond yield data	Federal Reserve Bank of St. Louise
91-day short term treasury bill	Federal Reserve Bank of St. Louise
Inflation (consumer price index)	South African Reserve Bank
Manufacturing production data	South African Reserve Bank
Gold price	South African Reserve Bank
Exchange rates (ZAR/USD , ZAR/GBP)	South African Reserve Bank
Money Supply (M2)	South African Reserve Bank
Oil Price (Brent spot)	Federal Reserve Bank of St. Louise

This study uses Microsoft Excel, SPSS and the *R* software program to perform the data analysis. The procedure for data collection is described next.

[4] Section 2.4.4 of the literature review provides a description of macroeconomic variables used in similar studies.

3.5 Procedure for data collection

The first step in the data collection process involved the collection of the price and dividend data and the risk-free rates for South Africa, the UK and the USA, to compute the monthly equity risk premiums. The data was collected from Thompson Datastream services for the period January 1980 to December 2013, with the exception of the FTSE 100 index, where data was only collected from January 1988 to December 2013. The FTSE 100 index only came into existence in 1984 and the researcher could only find limited dividend data for the early years of the index, thus the index was only included from 1988.

In the second step, the data pertaining to the macroeconomic and monetary variables was collected. Consumer price index data was collected from the South African Reserve Bank and serves as a proxy for inflation rates in the study. Manufacturing production data, the gold price, exchange rates and money supply data was also gathered from the South African Reserve Bank. The interest rates (short-term government bond rates and 10-year government bond rates) and the oil price data was collected from the Federal Reserve Bank of St. Louise economic database. The macroeconomic and monetary variable data was collected for the January 2003 to December 2013 time period.

The final step involved screening the data for missing data points and dealing with these in an appropriate manner. The South African equity market data was also screened to remove all dual listed companies with a primary listing abroad, as explained in section 3.3.2.

3.6 Data analysis and interpretation

The data analysis methodology pertaining to hypothesis 1 is discussed first in section 3.6.1, followed by the analysis methodology pertaining to hypothesis 2 in section 3.6.2.

3.6.1 *Estimation of the equity risk premium and its components*

This study calculates monthly returns using the realised and dividend growth approach for all the markets in the sample, as described in section 3.3.2, using the methodology suggested by Fama and French (2002) and subsequently used by Digby et al. (2006) in the South African context. The Fama and French (2002) methodology allows for the calculation of a realised equity risk premium and a forward looking dividend growth equity risk premium The calculation formulas will be discussed in turn.

The realised returns were calculated using equation 3.1 below:

$$A(R_t) = A\frac{D_t}{P_{t-1}} + A(GP_t) \quad (3.1)$$

where $A(R_t)$ is the average realised return for month t, D_t is the average dividend for the month t and P_{t-1} is the price at the end of month $t-1$. $A(GP_t)$ is the rate of capital gain as described by equation 3.2 below:

$$GP_t = \frac{(P_t - P_{t-1})}{P_{t-1}} \quad (3.2)$$

The returns using the dividend growth approach was calculated using the dividend growth model suggested by Fama and French (2002) and described in equation 3.3 below:

$$A(RD_t) = A\frac{D_t}{P_{t-1}} + A(GD_t) \quad (3.3)$$

where $A(RD_t)$ is the average dividend growth return for month t, D_t is the average dividend for the month t and P_{t-1} is the price at the end of month $t-1$.

$A(GD_t)$ is the growth rate of dividends, as described in equation 3.4 below:

$$GD_t = \frac{(D_t - D_{t-1})}{D_{t-1}} \quad (3.4)$$

Subsequently, the equity risk premiums were calculated by applying equation 3.5 to the estimated market returns and respective risk-free rates.

$$ERP_{it} = R_{it} - R_f \quad (3.5)$$

where ERP_{it} is the equity risk premium for market *i* in month *t* and R_f is the risk free rate.

This study further investigates the South African equity risk premium by separating the premium into a "global" and "country" risk component. This was done by applying the following equation, as proposed by Damodaran (2012), to the equity risk premiums:

$$CRP_{SA} = ERP_{RSA} - ERP_{mature\ market} \quad (3.6)$$

where CRP_{SA} is the South African country risk premium, $ERP_{mature\ market}$ is the equity risk premium of a mature market and ERP_{SA} is the equity risk premium of South Africa. A "global" and "local" factor model has been applied by Bekaert and Harvey (1995), Harvey (2004) and Bilson et al. (2001) in prior studies that have evaluated equity market returns.

Descriptive statistics of the monthly compounded mean equity risk premiums and country risk premiums and Pearson correlations were used to analyse the premiums. In estimating the Pearson correlations, logarithmic returns were used as they are more likely to be normally distributed (Strong, 1992), and normality of data is a data assumption of the Pearson correlation (Bryman, 2012).

For two series of measurement *X* and *Y* consisting of measurements x_i and y_i where *i = 1, 2, 3, …, n* the Pearson correlation, or Pearson *r* can be written as:

$$\boldsymbol{r} = \frac{\sum (\boldsymbol{x_i} - \bar{\boldsymbol{x}})(\boldsymbol{y_i} - \bar{\boldsymbol{y}})}{(\boldsymbol{n}-\boldsymbol{1})\boldsymbol{s_x}\boldsymbol{s_y}} \tag{3.7}$$

where r is the Pearson correlation, $\bar{\mathbf{x}}$ and $\bar{\mathbf{y}}$ are the means of the series *X* and *Y*, and s_x and s_y are sample standard deviations for the series *X* and *Y*.

3.6.2 *Arbitrage Pricing Theory*

This research study uses the Arbitrage Pricing Theory framework as described in section 2.4 of the literature review, to evaluate the relationship between the selected macroeconomic variables and the country risk premium. On the African continent, the arbitrage pricing theory framework has most recently been used by Isenmila and Erah (2012), to model the Nigerian stock market returns and Jecheche (2012) to investigated the stock market return behaviour of the Zimbabwean stock market.

3.6.3 *Model specification and variable description*

The return generating equation of the arbitrage pricing theory is used to model the time varying nature of the South African country risk premiums. The equation originally described in section 2.4.1 will be employed as follows:

$$CRP_{SA} = \beta_{ij} f_j(t) + \cdots + \beta_{iK} f_K + \epsilon_i \tag{3.8}$$

where CRP_{SA} is the South African country risk premium, βj is the risk exposure to risk factor *F; j* for (*j* = 1, …, k); and $\boldsymbol{\varepsilon}_i$ is the error term. The country risk premium and factors are discussed in the next section.

a. *The Country risk premiums*

The South African country risk premium (CRP_{SA} *) relative to the USA and the UK* is estimated using equation 3.9 and 3.10. The estimated county risk premiums are used in the return generating model

$$CRP_{SA\ vs\ USA} = ERP_{SA} - ERP_{USA} \quad (3.9)$$

$$CRP_{SA\ vs\ USA} = ERP_{SA} - ERP_{USA} \quad (3.10)$$

To this effect, two models are estimated using each of the country risk premiums as the presumed endogenous dependent variable with the same macroeconomic variables being used in each model.

b. *Macroeconomic and monetary variables*

The study selected macroeconomic and monetary factors that are relevant to the South African context *a priori* by drawing on the literature presented in chapter 2. The factors selected are inflation (CPI), manufacturing production, exchange rate (*ZAR/USD and (ZAR/GBP),* gold price, oil price, money supply, risk and interest rate. The macroeconomic and monetary variables and their denotations that are used in the analysis are summarised in table 3.2 on the following page.

Table 3-2: Summary of macroeconomic and monetary variables

Variable	*Description of Variable*
Inflation	Consumer Price index as a proxy for Inflation
Man_prod	Manufacturing Production
Rdollar	Rand Dollar Exchange Rate
Rpound	Rand Pound Exchange Rate
Gold	Gold Price
Oil	Oil Price (Brent spot)
Money	Money Supply (M2)
Interest	Unexpected component of long-term interest rates
Risk	Risk

The risk variable is constructed using the approach of Moolman and du Toit (2005). The risk variable is constructed as the excess return on the South African 10-year long-term Government bond relative to the USA 10-year long term Government bond, as described by equation 3.12 below:

$$Risk \quad = LGB_{SA} \quad - \quad LGB_{USA} \tag{3.11}$$

where LGB_{SA} is the 10-year long term Government bond rate for South Africa and LGB_{USA} is the 10-year long term Government bond rate for the USA.

The interest rate variable was originally constructed by Chen et al. (1986) to capture the influence of the unexpected component of the long-term interest rate on market behaviour. This study constructs the variable in the same way, using the following equation:

$$Interest_t \quad = LGB_t \quad - \quad TB_{t-1} \tag{3.12}$$

where $Interest_t$ is the unexpected component of long-term interest rates in time period t, LGB_t is the 10-year long term government bond rate in time period t and TB_{t-1} is the short term government Treasury bill rate in time period $t-1$, where t ($t = 1, \ldots, n$).

The APT requires that the unexpected component of the macroeconomic factors be used when modelling the return generating process and therefore this study employs the "rate of change" methodology, as used by Chan et al (1985), to calculate the unexpected component of the factors, where appropriate. The unexpected components of the individual variables are constructed using equation 3.13 below:

$$U(V_j)_t = V_{j;t} - V_{j;t-1} \quad (3.13)$$

where $U(V_j)$ is the unexpected component of variable $V_{j;t}$ in time t, and $V_{j;\,t-1}$ is variable $V_{j;t}$ in time $t - 1$. As the formula gives rise to the first difference of the variable, a method commonly used to achieve stationarity, the variables were first checked for stationarity, as will be discussed in the following section.

3.6.4 *Time-series analysis*

This study employs a time-series analysis to examine the relationship between the country risk premium and macroeconomic variables within the confines of the APT. As the APT does not distinctly specify the nature or number of macroeconomic variables to include in the analysis, thus this study selects variables a priori and conducts a principal component analysis (PCA) on these variables to reduce the dimensionality of the data.

The long run relationship between the selected variables and the country risk premium is analysed using the Johansen (1988) approach that was further developed in Johansen and Juselius (1990). A vector error correction model (VECM) is estimated to capture the long-run relationships in the model. The analyses mentioned are discussed in greater detail in the following sections.

a. *Principal Component Analysis*

Principal component analysis allows for a large number of theoretically important variables that may be influential to be included in the analysis (Fifield, Power, & Sinclair, 2002). In most arbitrage pricing theory studies no more than 5 variables are used, thus the possibility of important factors being excluded exists. Principal component analysis addresses this possibility by including all the possible influential factors in the original data set.

The analysis transforms the large data set to a "new" set of variables, the principal components, and thereby greatly reduces the dimensionality of the data (Jolliffe, 2002). Further, in the literature, such as in the studies conducted by Junkin (2012) and Basu and Chawla (2012), high levels of correlation have been documented between the selected variables leading to the problem of multicollinearity. PCA deals effectively with interrelated variables while retaining a substantial portion of the variation present in the data (Jolliffe, 2002). The estimated principal components are uncorrelated, and ordered so that the first few retain most of the variation present in the original set of variables (Jolliffe, 2002). This method has been successfully used by Sabetfar et al. (2011), Altay (2003) and Isenmila and Erah (2012) in similar studies within the arbitrage pricing theory framework.

b. *Stationarity*

A time series is said to be weakly stationary if its mean and variance are constant and independent of time and the covariance's depends only on the lag (time difference) between the observations (Baltagi, 2008). A stationary time series is referred to as an integrated series of order *0* and it is denoted by *I(0)*, while a non-stationary time series is considered to be integrated of order *k* and is thus denoted *I(k)*. Such an integrated series is said to have *k* unit roots (Patterson, 2000).

In this analysis the Augmented Dickey-Fuller (ADF) and Kwiatkowski-Philips-Schmidt-Shin (KPSS) tests are used to test for unit roots. The ADF tests a null hypothesis that the series being tested contains a unit root and is thus not

stationary whereas the KPSS tests against a null hypothesis that the series is stationary (Patterson, 2000; Stock & Watson, 2011).

Most regression techniques require that each series included in the model be stationary i.e. integrated of the order zero *I (0)*. If this is not the case, the possibility of spurious regression arises (Moolman & du Toit, 2005). A spurious regression refers to a regression that finds a significant relationship between two time-series when in fact none exists (Bryman, 2012). A non-stationary series of order 1 *[I (1)]* can be converted to a stationary series if differenced once as described in equation 3.14 where $Y_i = X_i$:

$$X_i = Y_i - Y_{i-1} = \Delta Y_i \qquad i = 2, \dots, n \tag{3.14}$$

The first difference of a series results in the rate of change, as described in section 3.6.3 (b). The rate of change methodology is also used to determine the "unexpected component" of the variable as this is a requirement of the APT. The decision on whether to use the unexpected component of the variable or not is based on its stationarity and implications on the tests used in the analysis.

c. *The cointegration concept*

It is possible for a combination of individually non-stationary series, to become stationary in a linear combination (Baltagi, 2008). This relationship is referred to as a cointegration relationship (Stock & Watson, 2011). In such a case, the series are said to possess a long-run relationship (Stock & Watson, 2011). For cointegration to exist in a series, it is necessary that the series must the integrated of an order greater than zero for such a long-run relationship to exist in the model.

In more general terms two series X_i and Y_i and are said to be cointegrated if they are both [*I(1)*] series, but stationary in a linear relationship as represented in equation 3.15 (Stock & Watson, 2011):

$$W_i = aX_i + bY_i, \quad i = 1, 2, \ldots n \tag{3.15}$$

where W_i is a stationary [*I(0)*] series (Stock & Watson, 2011).

3.6.5 *The Cointegration framework*

In this study, cointegration is tested for using the Johansen and Juselius (1990) framework. This method has the advantage over the Engle-Granger and Phillips-Ouliaris methods in that it can estimate more than one cointegration relationship (Baltagi, 2008). As more than two variables are included in the analysis, the possibility of multiple cointegrated vectors cannot be ruled out. Given the Johansen and Juselius (1990) framework's relative superiority, the approach has gained popularity and has been used in the South African context by Moolman and du Toit (2005), Olalere (2006) and most recently by Junkin (2012). Within the arbitrage pricing theory model, the Johansen and Juselius (1990) framework has most recently been used by Isenmila and Erah (2012) in a study of the Nigerian stock market.

The technique requires that the appropriate lag length of the variance auto regression (VAR) be specified. A VAR is a set of *k* time series regressions, in which the regressors are lagged values of all *k* series (Stock & Watson, 2011). A commonly used technique for this is to use the information criterion method (Olalere, 2006). The method includes the Akaike Information Criterion (AIC), the Final Prediction Error (FPE), the Schwarz Information Criterion (SC) and the Hannan-Quin Information Criterion (HQ).

To determine whether cointegrating relationships exist in the model, the Johansen procedure applies maximum likelihood to the vector auto regression (VAR), assuming that the errors are white noise (Maddala & Kim, 1999).

Applying standard economic literature, the VAR of order *p* is given by equation 3.18 (Hosseini et al., 2011):

$$\Delta y_t = \prod y_{t-1} + \sum_{i=1}^{k-1} \Gamma_i \Delta y_{t-i} + \epsilon_t \quad (3.16)$$

Where Δ is a first difference notation, Y_t is an *pxl* vector of *I(0)* variables, ΔX_t are all *I(0), Γ_i* and $\prod$ are pxp coefficient matrices; $\boldsymbol{\varepsilon}_{kt}$ are normally and independently distributed error terms (Hosseini et al., 2011; Junkin, 2012). $\prod$ is a long-run coefficient matrix, of which the rank gives the number of cointegrating vectors (Junkin, 2012; Naka, Mukherjee, & Tufte, 1998). In the case where the coefficient matrix $\prod_i$ has a reduced rank of $r \leq p$, then there exists *pxr* matrices α and β´ each with rank *r* such that (Hosseini et al., 2011; Naka et al., 1998):

$$\prod_i = \alpha\beta' \quad (3.17)$$

where β´ is the matrix of coefficients of the cointegrated vectors and α is the adjustment parameters of the error correction model (Hjalmarsson & Osterholm, 2007; Naka et al., 1998).

The order of cointegration (r) is determined by using the trace statistic (λ_{trace}) and maximum eigenvalue test (λ_{max}) as suggested by Johansen and Juselius (1990) These test statistics are given by equation 3.18 and 3.19:

$$\lambda_{\text{trace}} = -\text{T} \sum_{\text{i=r+1}}^{\text{n}} \log(1 - \hat{\lambda}_{\text{i}}) \quad (3.18)$$

$$\lambda_{max} = -Tlog(1 - \hat{\lambda}_{i-1}) \quad (3.19)$$

where *T* is the sample size and $\hat{\lambda}_i$ is the i^{th} largest eigenvalue of the $\prod_i$ matrix (Hjalmarsson & Osterholm, 2007). The null hypothesis of the trace statistic is

that the number of cointegrated relationships is less than or equal to *r*, against the alternative hypothesis of more than *r* cointegrated relationships (Olalere, 2006). The maximum eigenvalue tests the null hypothesis that there are *r* cointegrated relationships against the alternative hypothesis of *r + 1* cointegrating relationships (Hjalmarsson & Osterholm, 2007; Olalere, 2006). In the event of cointegrating relationships in the model, the VECM can be estimated.

The VECM is determined by specifying the number of cointegrating relationships, the trend assumptions used and by normalizing on the truly endogenous variables. To determine the truly endogenous variables in the model, weak-exogeneity test are performed. In the event that more than one cointegrating relationships exists in the model, this study only normalizes on the presumed endogenous country risk premiums, as the study is interested in the relationships between the country risk premiums and the macroeconomic factors included in the model.

3.7 Limitations of the study

The study does not consider other macroeconomic factors such as GDP that may also affect the country risk premium. This specific example of GDP is excluded as GDP data is only available on a quarterly basis. Other risk factors, such as political risk are also excluded, as it cannot be objectively quantified. The effects of other variables that have not been included in the study are not controlled for in the study.

3.8 Validity and reliability

3.8.1 *External validity*

External validity is concerned with the generalizability of the results produced by the study (Bryman, 2012). The generalizability of this study is limited, as it only takes into account South African factors. However, the aim of this study is to estimate the South African premium and evaluate the effect of local

macroeconomic factors on the premium. The nature of the study limits the external validity thereof.

The companies in the first sample in month 1 of the study will not necessarily be in all the samples over the entire duration of the study, leading to the problem of attrition. This is a common occurrence in studies of this nature. However, by restricting the sample to selected companies it will lead to an incorrect measure of the South African market. Thus, to only use the initial sample over time is not an option. It should also be noted that this study is interested in the market as a whole, not necessarily in the individual companies that make up the market.

3.8.2 *Convergent validity*

The convergent validity of the study is tested by comparing the estimates of this study, to the estimates of other studies that have used different methodologies to estimate the equity risk premium of South Africa, the USA and the UK. Examples of other studies include the work of Digby et al. (2006), Dimson, Marsh, and Staunton (2011), Favish and Affleck-Graves (1987) and Firer and Staunton (2003). Convergent validity refers to comparing the measured outcome of the study, to the measured outcome of other studies that have measured the same concept, but using a different method (Bryman, 2012).

3.8.3 *Internal validity*

Internal validity is concerned with the conclusion of a relationship being reflective of the actual relationship, or lack of an actual relationship between two or more variables (Bryman, 2012). Several attempts are made to avoid the possibility of producing ambiguous results.

Firstly, the macroeconomic variables are carefully selected based on prior studies in South Africa and other emerging markets while being mindful of the availability of reliable data sources. Thus, the constructs are based on prior results, aiding the validity of the constructs used.

Secondly, by excluding JSE listed companies that have a primary listing abroad, the internal validity of this study is improved, as possible external risk factors from other countries are excluded.

Lastly, face validity refers to the measure delivered by the study being reflective of reality (Bryman, 2012). This study achieves face validity by comparing the premiums estimated by the study, with prior studies over the same time period. The macroeconomic variables and their effect on the country risk premium are validated in the same manner.

3.8.4 *Reliability*

Reliability relates to the consistency and dependability of results (Bryman, 2012). This is achieved through the correct application of the mathematical models and theoretical frameworks that are used by the study. These have been applied in other similar studies and are well established within the field. Further, the literature review provides a good basis of previous findings to compare the findings of this study with, in order to evaluate the consistency and dependability of the results.

Lastly, the secondary data points are sourced from reliable and well-established databases. This further enhances the consistency and repeatability of this study.

4 CHAPTER 4: PRESENTATION OF RESULTS

4.1 Introduction

This chapter presents the results of this research study. The profile of the sample studied is described first, followed by a preliminary description of the variables used in the analysis. This is followed by the results pertaining to hypothesis 1 and 2 respectively. The results are presented using charts and tables where appropriate.

4.2 Sample Profile

The final sample consisted of 34 years of monthly price and dividend data of a total of 1273 listings on the JSE over the course of the study. The 1273 listings include new listings and delisted companies. Over the duration of the study a total of 817 companies delisted, thus of the 1273 listings, 456 were included in the final year of the study[5]. The delisted companies include companies that were acquired and therefore delisted from the JSE. After the acquisition, these companies' returns were included in the returns of the company they were acquired by. Where a company in the sample unbundled a subsidiary, the study included the returns of the newly listed subsidiary and the holding company as two separate companies, from the first month where the new listing appeared. The 1287 listings do not include companies that have a primary listing abroad, as it is argued that these companies are not exposed to South African risk factors to the same extent as companies that hold a primary listing in South Africa. Share buybacks were not accounted for in this study, on the grounds that share buybacks are a form of capital reduction which only affects those shareholders who exit the company.

Dividends constitute a significant portion of the rewards an investor receives for holding a share, and therefore were included in this study. The total dividends

[5] Appendix A provides a list of the final 456 companies, while a list of the 817 companies that delisted over the course of the study can be found in Appendix B.

paid per year by a company were divided by 12, to get the average dividends paid per month. This assumption has been found to be reasonable by Firer and McLeod (1999) in their investigation of the pattern of dividend payments by large listed JSE companies.

In the USA market, monthly return and dividend data was obtained from the S&P index for the full duration of the study. In the UK, complete data could only be obtained from January 1988 to December 2013 for the FTSE 100 index. The FTSE 100 index began in January 1984; however, the researcher could only obtain limited dividend data for the period 1984 to 1987 and thus concluded to only include the FTSE 100 index from January 1988.

4.3 Preliminary description of variables

The equity risk premiums of South Africa, the USA and UK were estimated using the dividend growth and realised approach as discussed in section 3.6.1 in chapter 3. The South African country risk premium was subsequently calculated relative to the USA and UK. This approach gave rise to two country risk premiums relative to the USA and two country risk premiums relative to the UK. The total of six equity risk premiums and four country risk premiums were denoted with an (R) to indicate the realised approach and an (G) to indicate the dividend growth approach, as described in table 4.1 below.

Table 4-1: Denotation of the equity and country risk premiums

Equity Risk Premiums	*Country Risk Premiums*
SA ERP (R)	CRP relative to USA (R)
SA ERP G)	CRP relative to USA (G)
USA ERP (R)	CRP relative to UK (R)
USA ERP (G)	CRP relative to UK (G)
UK ERP (R)	
UK ERP (G)	

The cointegration analysis was performed using only the country risk premiums estimated using the growth approach as the realised return estimation approach yielded country risk premiums that were too volatile to use in the cointegration analysis. Further, the cointegration analysis was performed over the January 2003 to December 2013 period, as the data prior to 2003 did not seem to move together or show any signs of cointegration in this analysis.

To obtain macroeconomic variables of similar magnitudes, log transformations were performed on gold, money, manufacturing production, inflation and oil. For each of the transformed variables a *log* was prefixed to the name The macroeconomic and monetary variables with the transformed denotation are described in table 4.2 below.

Table 4-2: Macroeconomic and Monetary variable denotations

Variable	*Description of Variable*
Log gold	Log transformation of gold
Rdollar	Rand Dollar Exchange rate
Rpound	Rand British Pound Exchange rate
	Log transformation of M2 money supply
Interest	Unexpected component of interest rates
Log man_prod	Log transformed manufacturing production
Log inflation	Log transformed inflation (consumer price index)
Log oil	Log transformed oil price (Brent spot)
risk	Risk

4.4 Results pertaining to Hypothesis 1

The two sets of results pertaining to hypothesis 1 are presented in turn, followed by a conclusion on whether the hypothesis is supported by the research findings. Firstly, the equity risk premiums calculated using the realised and dividend growth estimation methods are presented graphically and summarised by presenting the mean equity risk premiums over four time periods in a table. Secondly, the South African equity risk premium is separated into a global risk and country risk component, using the equity risk premiums of the USA and UK as proxies for global risk. Both the realised and dividend growth estimates are used and the results are presented graphically in figures followed by tables that provide a summary of the mean country risk and global risk components over four periods in time.

For ease of reference, hypothesis 1 is restated below:

The South African equity risk premium consists of a global risk and country risk premium.

4.4.1 *The Equity Risk Premiums*

The equity risk premium of South Africa, the USA and the UK was calculated on a monthly interval basis using the realised and dividend growth method and are graphically represented in figure 4.1 and figure 4.2. In the figures, it is visually observed that the South African equity risk premium exceeds the equity risk premiums of the USA and UK at all periods in time and the equity risk premiums of the USA and UK move very closely together.

Figure 4-1: Equity Risk premiums calculated using the realised approach

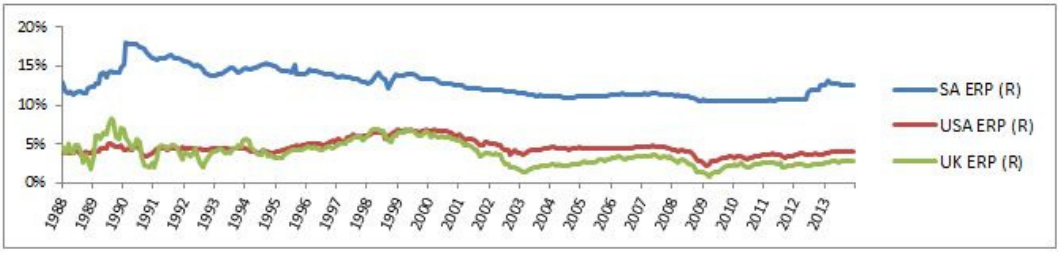


Figure 4-2: Equity Risk Premiums calculated using the growth approach

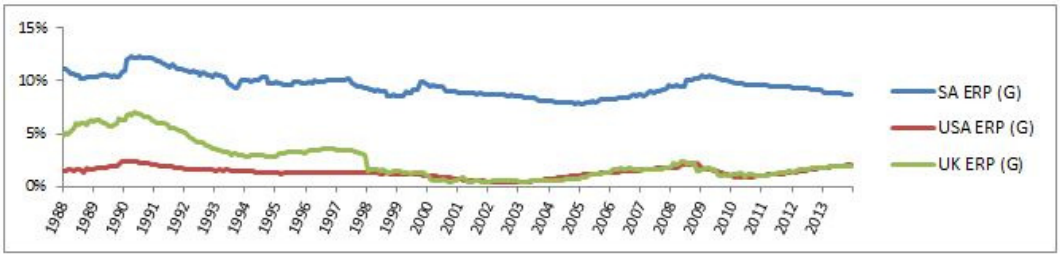


Table 4.3 below provides the compounded geometric averages and standard deviations of the equity risk premiums calculated on a monthly interval basis, summarised over three 8-year periods, namely January 1980 to December 1987; January 1988 to December 1995; January 1996 to December 2003 and one 10-year period stretching from January 2004 to December 2013. The averages are also reported over the entire duration of the study, thus averages from January 1980 to December 2013 are reported for SA and the USA and averages from January 1988 to December 2013 for the UK.

Table 4-3: Equity risk premium

	Realised equity risk premium			*Growth equity risk premium*		
	SA	*USA*	*UK*	*SA*	*USA*	*UK*
1980 - 1987	13.77%	3.40%		12.94%	2.86%	
	(1.80%)	(1.45%)	-	(2.03%)	(1.41%)	-
1988 - 1995	14.54%	4.29%	4.31%	10.65%	1.70%	4.72%
	(1.43%)	(0.33)	(1.25%)	(0.79%)	(0.32%)	(1.43%)
1996 - 2003	12.84%	5.58%	4.73%	9.12%	.96	1.51%
	(0.96%)	(0.95%)	(1.61%)	(0.56%)	(0.35%)	(1.18%)
2004 - 2013	11.19%	3.94%	2.58%	9.08%	1.45%	1.47%
	(0.64%)	(0.57%)	(0.57%)	(0.75%)	(0.38%)	(0.45%)
1980 – 2013	12.97%	4.28%	-	10.36%	1.72%	-
	(1.80%)	(1.20%)	-	(1.94%)	(1.01%)	-
1988 - 2013			3.77%			2.48%
			(1.52%)			(1.83%)

Standard deviations are indicated in parentheses

Drawing from table 4.3, the mean equity risk premium for South Africa over the entire duration of the study is 12.97 per cent using the realised approach and 10.36 per cent using the dividend growth approach. The standard deviations are 1.80 per cent and 1.94 per cent respectively. The USA equity risk premium is presented at 4.28 per cent with a standard deviation of 1.20 per cent using the realised approach and 1.72 per cent with a standard deviation of 1.01 per cent using the growth approach. As for the UK, the realised approach gives an equity risk premium of 3.77 per cent with a standard deviation of 1.52 per cent and the growth approach estimates the premium at 2.48 per cent with a standard deviation of 1.83 per cent.

Correlations between the equity risk premiums of SA, the USA and the UK were calculated and are presented below. The correlations relating to the realised equity risk premiums are presented in table 4.4 and the correlations relating to the dividend growth equity risk premiums in table 4.5.

Table 4-4: Correlations of the Realised equity risk premiums

	SA (R)	*USA (R)*	*UK (R)*
SA (R)	1		
USA (R)	0.374**	1	
UK (R)	0.598**	0.806**	1

*** Correlation is significant at the 0.01 level. *.Correlation is significant at the 0.05 level*

Table 4-5: Correlations of the Growth equity risk premiums

	SA (G)	*USA (G)*	*UK (G)*
SA (G)	1		
USA (G)	0.579**	1	
UK (G)	0.787**	0.806**	1

*** Correlation is significant at the 0.01 level. *Correlation is significant at the 0.05 level*

All the correlations reported between the equity risk premiums of SA, the USA and the UK are significant at the 0.01 level. The realised and growth approach equity risk premiums of the USA and UK are highly correlated (0.806). The South African equity risk premium shows a higher correlation with the USA and UK equity risk premiums when calculated using the growth approach, than when calculated using the realised approach. Log transformed equity risk premiums were used to calculate the correlations as the Pearson correlation requires normally distributed data. The histograms are presented in *appendix C*. Time series data seldom meets the normality data assumption. In this analysis, most of the log transformed equity risk premiums are fairly normal, with exception of the log equity risk premium of South Africa using the realised estimation method and the log transformed equity risk premium of the UK using the dividend growth method. The latter two premiums show more than one peak.

4.4.2 *The Components of the South African equity risk premium*

The following section describes the components of the South African equity risk premium. The equity risk premiums of the USA and UK served as proxies for the global risk component of the South African equity risk premium, and the South African country risk component was calculated by subtracting these proxies for the global component, from the South African equity risk premium. The results obtained are first described through use of time series graphs, followed by tables presenting the means of the components over selected time periods.

The South African equity risk premium and country risk premium are graphically represented in figure 4.3 and figure 4.4 using the realised estimation method and in figure 4.5 and figure 4.6 using the dividend growth method. The graphs present the premium in its components over time. In interpreting the area graphs of the equity risk and country risk premium, the green area represents the South African country risk premium component of the South African equity risk premium and the blue area represent the global risk component of the South African equity risk premium.

Figure 4-3: The South African equity risk and country risk premium relative to the USA, using the realised return approach.

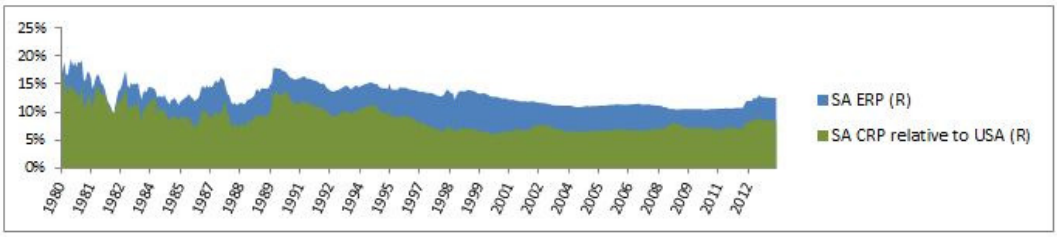


Figure 4-4: The South African equity risk and country risk premium relative to the UK, using the realised return approach.

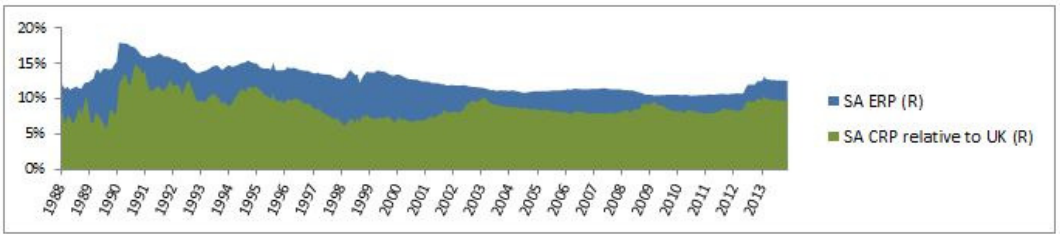


Figure 4-5: The South African equity risk and country risk premium relative to the USA, using the growth approach.

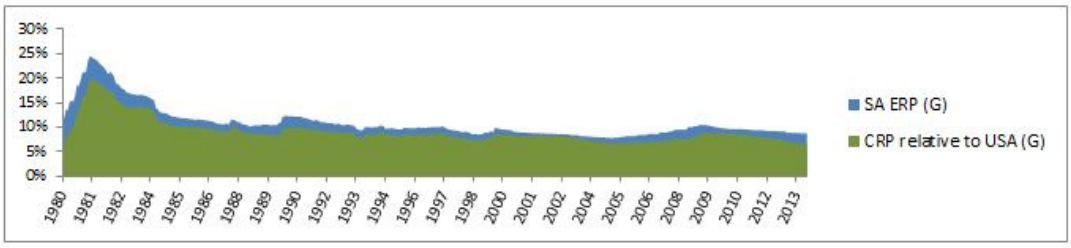
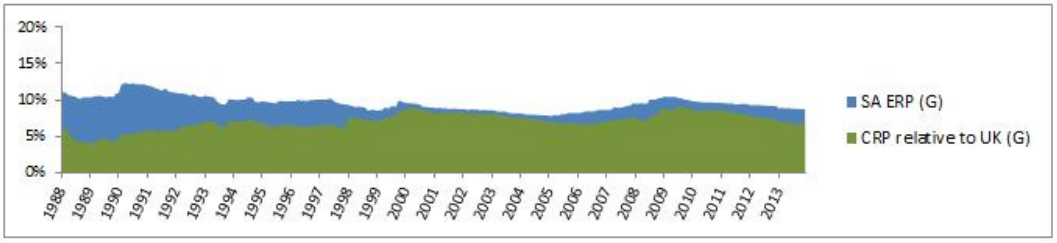


Figure 4-6: The South African equity risk and country risk premium relative to the UK, using the growth approach.



It is visually observed from the graphs that the country risk component exceeds the global risk component of the equity risk premium. It is further noted that that the global risk and country risk components move together over time, with exception to the 1988 to 1993 time period on graph 4.6 where the global and country risk premiums seem to not move as closely together.

The components of the South African equity risk premium are summarised by the use of tables. Table 4.6 presents the results obtained using the realised estimation method, while table 4.7 presents the results obtained using the dividend growth method. In both tables the geometric averages and standard deviations are summarised over three 8-year periods, namely January 1980 to December 1987; January 1988 to December 1995; January 1996 to December 2003 and one 10-year period stretching from January 2004 to December 2013, for ease of interpretation.

Table 4-6: The country risk and global risk components of the South African equity risk premium using the realised estimation method.

	South African Realised Equity Risk Premium			
	Country Risk	Global Risk (USA as proxy)	Country Risk	Global Risk (UK as proxy)
1980 -1987	10.38%	3.40%	-	-
	(1.76%)	(1.45%)	-	-
1988 – 1995	10.25%	4.29%	10.23%	4.31%
	(1.42%)	(0.33)	(1.96%)	(1.25%)
1996 – 2003	7.25%	5.58%	8.11%	4.73%
	(0.84%)	(0.95%)	(1.10%)	(1.61%)
2004 – 2013	7.24%	3.94%	8.61%	2.58%
	(0.66%)	(0.57%)	(0.63%)	(0.57%)
1980 – 2013	8.69%	4.28%	-	-
	(1.95%)	(1.20%)	-	-
1988 - 2013	-	-	8.95%	3.77%
	-	-	(1.57%)	(1.52%)

Standard deviations are indicated in parentheses

Table 4-7: The country risk and global risk components of the South African equity risk premium using the growth estimation method

	South African Growth Equity Risk Premium			
	Country Risk	Global Risk (USA as proxy)	Country Risk	Global Risk (UK as proxy)
1980 -1987	10.08%	2.86%	-	-
	(1.73%)	(1.41%)	-	-
1988 – 1995	8.95%	1.70%	5.92%	4.72%
	(0.55%)	(0.32%)	(0.96%)	(1.43%)
1996 – 2003	8.16%	.96	7.60%	1.51%
	(0.40%)	(0.35%)	(0.80%)	(1.18%)
2004 – 2013	7.62%	1.45%	7.61%	1.47%
	(0.73%)	(0.38%)	(0.72%)	(0.45%)
1980 – 2013	8.64%	1.72%	-	-
	(1.36%)	(1.01%)	-	-
1988 - 2013	-	-	7.09%	2.48%
	-	-	(1.13%)	(1.83%)

Standard deviations are indicated in parentheses

Drawing from table 4.6 and 4.7 it is observed that the country risk component of the South African equity risk premium has decreased over time, with the exception of the country risk component of the growth estimated equity risk premium where the UK equity risk premium serves as proxy for the global risk component. It is further observed that this exception is due to the relative sharp decrease in the UK equity risk premium, the global risk component, over the summarised time periods. Further, in table 4.6 it is evident that the average country risk components using the realised calculation method are fairly similar (8.69% and 8.95%) over the duration of the study. The dividend growth method yielded average country risk premiums of 8.64 per cent and 7.09 per cent relative to the USA and UK global risk proxies respectively. The components calculated using the realised method (table 4.6) are in general higher than the components calculated using the dividend growth approach (table 4.7).

In conclusion, the results presented support the hypothesis that the South African equity risk premium consists of a global risk premium and a country specific risk premium. The South African equity risk premium exceeds the equity risk premiums of the two global market proxies, the USA and UK equity risk premiums, at all periods in time, thereby allowing for the premium to be separated into a country risk premium and global risk premium.

4.5 Results pertaining to Hypothesis 2

The results pertaining to hypothesis 2 are presented below. A graphical representation of the variables is presented first by means of a time-varying plot. The correlation results obtained are described next, followed by the Principal Component Analysis (PCA). Subsequent to determining the principal components, the stationarity of these principal components are deliberated upon. The results of the Johansen cointegration technique and the parameters of the long-run vector error correction model (VECM) are presented next using tables. And finally, the description of the results pertaining to hypothesis 2 is concluded.

For ease of reference, hypothesis 2 is restated below:

> There is a relationship between local macroeconomic factors and the South African country risk premium.

4.5.1 *Graphical Analysis*

Visual inspection of figure 4.7 at levels against time for the period 2003 to 2013 reveals an upward sloping trend for most of the variables with periods of downward slumps or drifts. The interest rate variable reveals a downward trend and in the early years and a major slump in 2008, while risk reveals a negatively sloping trend or drift between 2003 and 2005.

Figure 4-7: Graphical plot of the country risk premiums and macroeconomic variables

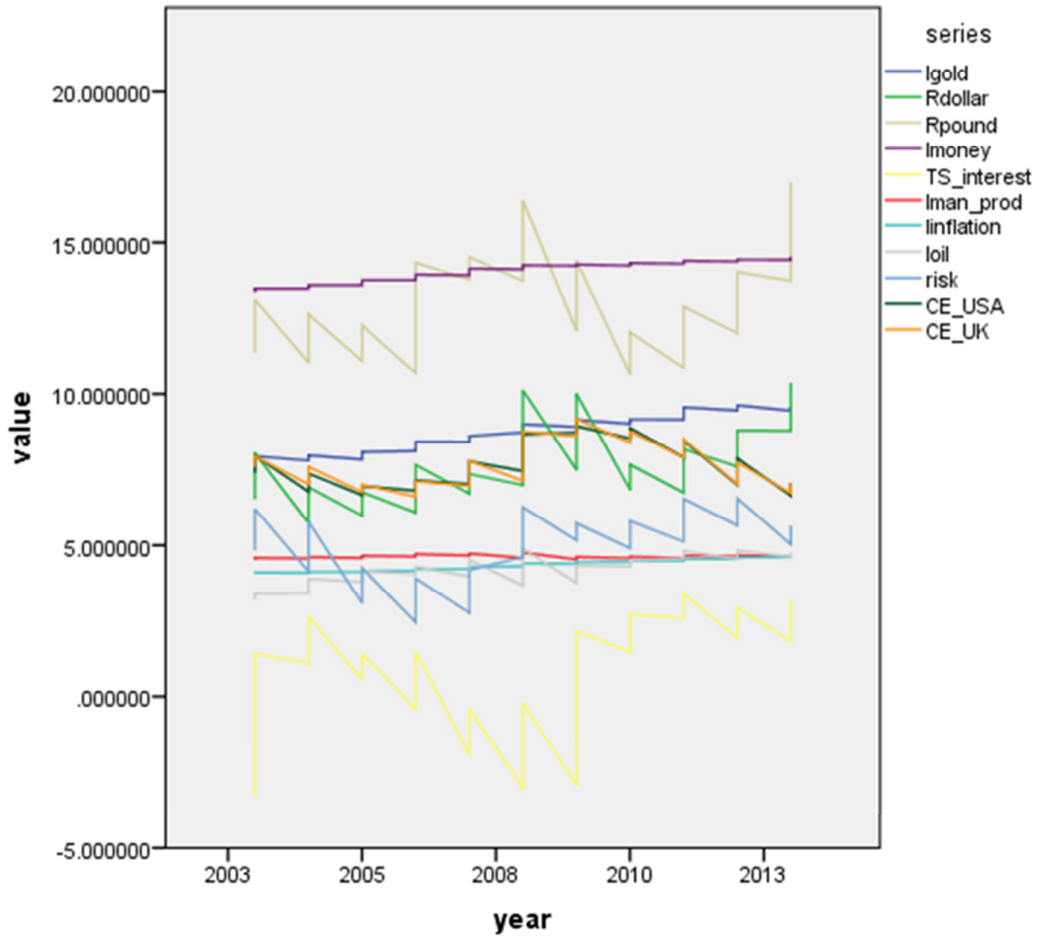


Figure 4.7 suggest that the respective country risk premiums could move together with some of the macroeconomic variables over the 2003 to 2013 time period. Therefore a model based on cointegration of the country risk premium with these variables was used to analyse their movement over time. The plot further reveals that the variables may possibly not be stationary over time as visually the mean and the variance of the individual series do not seem to be time invariant.

4.5.2 *Correlation matrix*

Given the linkages between the macroeconomic variables as described in the literature review, the possibility of multicollinearity cannot be excluded. Thus, a

correlation matrix was estimated for the variables. The matrix is presented in table 4.8.

Table 4-8: Correlation matrix of macroeconomic variables

	Log gold	*R-dollar*	*R-pound*	*Log money*	*Interest*	*Log manprod*	*Log inflation*	*Log oil*	*Risk*
Log gold	1								
Rdollar	.802**	1							
Rpound	.818**	.966**	1						
Log money	.945**	.854**	.898**	1					
Interest	.050	-.060	-.134*	-.050	1				
Log man-prod	.842**	.819**	.902**	.908**	-.104	1			
Log inflation	.920**	.866**	.889**	.988**	-.016	.872**	1		
Log oil	.910**	.627**	.708**	.872**	.043	.813**	.816**	1	
Risk	-.624**	-.522**	-.627**	-.680**	.060	-.715**	-.605**	-.735**	1

*Significance: 0 '***' 0.001 '**' 0.01 '*' 0.05 ' ' 0.1 ' '*

The results presented in table 4.8 suggest a high level of correlation between all the macroeconomic variables, especially between the Rand/Dollar and Rand/Pound exchange rates. Both log gold and log oil are positively correlated with all the other variables, except for with Risk, where a negative correlation is observed. All the correlations with log gold and log oil are significant at the 0.1 per cent level, except for the correlation with interest rates that is not statistically significant. Risk is negatively correlated with all the variables, except for interest rates, where a positive correlation is observed. Interest rates are negatively correlated with all the variables, except for log gold, log oil and risk where a positive relationship is observed. Of the correlations observed with interest rates only the correlation with Rand/Pound exchange is significant at the 0.1 per cent level. Money supply is positively correlated with all the variables, except for manufacturing production and log inflation, where a negative correlation is evident. All the correlations with money supply are

statistically significant at the 0.1 per cent level. Manufacturing production and inflation are both positively correlated with all the variables, except for with the risk and interest rate variables where a negative correlation is observed. All the correlations observed for manufacturing production and inflation are highly significant at the 0.1 per cent level, with exception to the correlation with interest rates that is not statistically significant.

The significant and highly correlated relationships observed suggest that the possibility of multicollinearity between the variables cannot be ruled out. It further suggests that the series are related amongst themselves and that the series can be grouped to form new series. Principal component analysis was used to do so. The use of Principal Component analysis is appealing in this scenario as it addresses the possible problem of multicollinearity between the variables (Fifield et al., 2002).

4.5.3 *Principal Component Analysis*[6]

Principal Component analysis was performed for two reasons. The first reason pertains to addressing the possible problem of multicollinearity between the variables. While the second aims to reduce the number of variables, as in most studies within the arbitrage pricing theory, a maximum of 5 explanatory variables were used (Fifield et al., 2002; Hosseini et al., 2011; Sabetfar et al., 2011). Table 4.9 and 4.10 summarizes the results from applying the principal component analysis.

In table 4.9 the eigen values are described before extraction and after extraction. Before extraction nine components were identified by the analysis. The eigen values associated with each of the nine components provide information on the amount of variance explained by the particular component (Jolliffe, 2002). Jolliffe (2002) has suggested that principal components with an eigen value of greater than 0.7 be retained, while the Kaiser (1960) criterion only includes components with an eigen value of greater or equal to one. A

[6] The data pertaining to the principal components estimated by this study is presented in appendix D

rigid adoption of the criteria might result in important information being discarded, thus this analysis relaxed the criterion slightly and included three components to account for more than 90 per cent of the variation in the data. The eigen values associated with the extracted components are displayed under the label “sum of square loadings”. The values remain the same; however, the discarded components are excluded. It can be seen from the table that the first three components account for 92.83 per cent of the variation in the macroeconomic series.

Table 4-9: Eigen values and proportions of variance explained by the principal components presented.

Component	*Initial Eigenvalues*			*Extraction Sums of Squared Loadings*		
	Total	*% of Variance*	*Cumulative %*	*Total*	*% of Variance*	*Cumulative %*
1	6.674	74.159	74.159	6.674	74.159	74.159
2	1.042	11.580	85.740	1.042	11.580	85.740
3	.638	7.091	92.831	.638	7.091	92.831
4	.359	3.989	96.820			
5	.127	1.411	98.231			
6	.103	1.145	99.376			
7	.042	.463	99.839			
8	.012	.132	99.971			
9	.003	.029	100.000			

Extraction Method: Principal Component Analysis.

The loadings of the retained components are described in table 4.10. By weighting the loadings on each of the variables, interpretation can be given to the general macroeconomic forces at play in each of the three identified components (Bilson et al., 2001). For parsimony, only components with a

weight of above 0.50, as presented in table 4.10, are considered. All the variables, except for interest rates meet the criteria in the first component, suggesting that the first component may be a broad proxy for the South African macroeconomic environment. These variables positively dominate the series, except for risk, where a negative weight is observed. As for the second component, only the interest rate weight is higher than 0.50, and thus it is argued that the second component is concerned with interest rates. In the third component, only the risk variable dominates positively with a weight higher than 0.50, therefor this component is argue to be concerned with South African risk.

Table 4-10: Principal component loadings of the retained components

	Component		
	1	*2*	*3*
Log gold	.943	.135	.014
Rdollar	.890	-.067	.368
Rpound	.937	-.131	.222
Log money	.983	.013	.039
Interest	-.053	.986	.083
Log man_prod	.943	-.071	-.029
Log inflation	.958	.037	.145
Log oil	.886	.151	-.298
Risk	-.743	.011	.578

4.5.4 *ADF and KPSS*

To establish the order of integration in the series two unit root tests, namely the ADF and KPSS tests, were performed. The three principal components and the

two country risk premiums were included in the tests and the results are presented in table 4.11.

From table 4.11 it is evident that at level terms all the series is non-stationary using both the tests, but become stationary when differenced once. Thus the series are integrated of order one *I(1).* As described in chapter 3, two or more series are said to be cointegrated if a linear combination of the individual *I(1)* series is *I(0)* (Stock & Watson, 2011). Therefore, a long-run relationship between the variables included in the tests may exist. The cointegration technique is described in the next section.

Table 4-11: ADF and KPSS unit root test results

series	*ADF (series)*	*ADF (1^{st} difference)*	*KPSS (series)*	*KPSS (1^{st} difference)*
p1	-2.0224(0.567)	-5.6667 (<0.01)	6.0016 (<0.01)	0.0712 (>0.1)
p2	-3.5207(0.041)	-5.8603 (<0.01)	0.4718 (0.048)	0.1461 (>0.1)
p3	-2.4589(0.3829)	-7.4082 (<0.01)	1.7662 (<0.01)	0.0398 (>0.1)
CRP (USA)	-2.5686(0.3367)	-5.7011 (<0.01)	2.8586 (<0.01)	0.065 (>0.1)
CRP (UK)	-1.5946(0.7473)	-7.1927 (<0.01)	3.2967 (<0.01)	0.1233(>0.1)

p-values are indicated in parentheses

4.5.5 *Johansen's cointegration procedure*

Multivariate cointegration analysis was performed to determine whether any long-run relationships exist between the identified principal components and the country risk premiums. The Johansen approach allows for more than one cointegration relationship in a VAR model and therefore was used in this analysis. First the appropriate number of lags to be used in the subsequent steps was decided upon using the information criterion. The second step involved testing to determine whether cointegrated relationships exist among

the variables, and if so, how many exists. And lastly, if cointegrated relationships were found, the VECM was estimated.

a. *Identification of the lag order*

The Johansen procedure is very sensitive to the lag length selected and thus requires that an appropriate lag length and deterministic assumption be specified (Junkin, 2012). Different information criteria may present conflicting results (Olalere, 2006), thus this analysis used four information criterions popular in the literature. The results are presented in table 4.12 below:

Table 4-12: Information criterion results

Lag criteria	*AIC*	*HQ*	*SC*	*FPE*
Lag	3	2	1	3

Notes

AIC: Akaike information criterion | SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion | FPE: Final prediction error

The VARselect of the vars package in R was used.

Figure 4.12 suggests lags of 3, 2 and 1 using the different criterion. This analysis used lag order 3 in further calculations.

b. *Cointegration tests*

The Johansen framework of cointgration tests provides two likelihood ratio (LR) test statistics, namely the trace statistic and the maximum eigenvalue test (Isenmila & Erah, 2012). This analysis performed both using a deterministic assumption and report the results obtained from the maximum eigen value test in table 4.13 and the trace test results in table 4.14.

Table 4-13: Maximum Eigenvalue test

	Test statistic	*Critical Values*		
		90 per cent	*95 per cent*	*99 per cent*
$r \leq 4$	1.75	7.52	9.24	12.97
$r \leq 3$	14.90	13.75	15.67	24.60
$r \leq 2$	21.38	19.77	22.00	41.07
$r \leq 1$	28.06	25.56	28.14	60.16
$r = 0$	43.16	31.66	34.40	84.45

Table 4.13 presents the results of the maximum eigen value test for the model. The value of *r* indicates the number of significant relationships. The hypothesis of all series being stationary (r=0) is rejected. The hypothesis of $r \leq 4$ is accepted as the test statistic is less than the critical value at the 10% level of significance. This means that there are 4 cointegrated relationships in the data. The results pertaining to the trace test are presented next.

Table 4-14: Trace test

	Test statistic	*Critical Values*		
		90 per cent	*95 per cent*	*99 per cent*
$r \leq 4$	1.75	7.52	9.24	12.97
$r \leq 3$	16.64	17.85	19.96	24.60
$r \leq 2$	38.02	32.00	34.91	41.07
$r \leq 1$	66.08	49.65	53.12	60.16
$r = 0$	109.24	71.86	76.07	84.45

The trace test results as presented in table 4.14 suggests that the hypothesis $r \leq 3$ should be accepted as the test statistic is less than the critical value at the 10 per cent level of significance. Thus, the trace test indicates that there are

3 coingrating relationships. This result is slightly different from that of the maximum eigenvalue test. It is observed in the literature that the eigen and trace tests often produce different results, as has been the case in the research of Olalere (2006) and Naka et al. (1998).

Linear trend test were subsequently preformed using the results from the maximum eigen value and trace test output as input. The results obtained are presented in table 4.15. The maximum eigen value test suggests no linear trend, while the trace test suggests a linear trend.

Table 4-15: Linear trend maximum eigen value and trace tests

	Maximum Eigen Value	*Trace test*
Test statistic	1.74	7.45
p-value	0.19	0.02
	Test statistic is distributed as chi-square with 1DF	*Test statistic is distributed as chi-square with 2 DF*

This research used the results of the trace test as Naka et al. (1998) have indicated that the trace test provides more robust results in studies of this nature. The analysis includes a linear trend plus the 3 cointegrating relationships in the model.

c. ***VECM***

The model estimation was performed by using the ordinary least squares vector error correction method (VECM) of the"urca" package from the R software program. The results of the model estimations are presented in tables 4.16 and 4.17. The model where the country risk premium relative to the USA; CRP(USA), was normalized on is presented first in table 4.16 , followed by the model where the country risk premium relative to the UK; CRP(UK), was normalized on in table 4.17. The results are subsequently described. In the tables and the description thereof, the Δ denotation refers to the variable in its first differenced form.

Table 4-16: Coefficients and p-values of the estimated long-run model for the country risk premium relative to the USA

	Lag	Estimate	Std. Error	t value	Pr(>|t|)	
constant	-	-0.8699496	0.5766522	-1.509	0.134263	
∆p1	1	-0.0175197	0.0250097	-0.701	0.485083	
∆p2	1	-0.0248577	0.0309584	-0.803	0.423741	
∆p3	1	-0.0362284	0.0462325	-0.784	0.434951	
∆CRP (USA)	1	-0.3353833	0.1222783	-2.743	0.007114	**
∆CRP (UK)	1	0.2071313	0.0874225	2.369	0.019564	*
∆p1	2	0.0056971	0.0262535	0.217	0.828607	
∆p2	2	-0.0397835	0.0294900	-1.349	0.180091	
∆p3	2	0.0063542	0.0486300	0.131	0.896280	
∆CRP (USA)	2	-0.3431743	0.1291985	-2.656	0.009078	**
∆CRP (UK)	2	0.1422992	0.0886580	1.605	0.111353	
p1	3	0.0219323	0.0103922	2.110	0.037085	*
p2	3	-0.0104130	0.0126962	-0.820	0.413893	
p3	3	-0.0503976	0.0140326	-3.591	0.000493	***
CRP (USA)	3	-0.1123481	0.0659438	-1.704	0.091262	.
CRP (UK)	3	0.1442676	0.0640388	2.253	0.026255	*
trend	3	-0.0004658	0.0009809	-0.475	0.635818	

*Significance: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' Residual std. error: 0.09736 on 110 DF Multiple R^2 :0.2805 F-statistic: 2.522 on 17 and 110 DF p-value: 0.002049*

Table 4-17: Coefficients and p-values of the estimated long-run model for the country risk premium relative to the UK

	Lag	*Estimate*	*Std. Error*	*t value*	*Pr(>|t|)*	
constant		-1.4982261	0.8033539	-1.865	0.06485	.
∆p1	1	0.0268289	0.0348418	0.770	0.44294	
∆p2	1	0.0113590	0.0431292	0.263	0.79276	
∆p3	1	-0.0933414	0.0644081	-1.449	0.15012	
∆CRP (USA)	1	0.2464144	0.1703501	1.447	0.15088	
∆CRP (UK)	1	-0.2095246	0.1217913	-1.720	0.08818	.
∆p1	2	-0.0003282	0.0365747	-0.009	0.99286	
∆p2	2	-0.0084586	0.0410835	-0.206	0.83726	
∆p3	2	-0.0546522	0.0677482	-0.807	0.42158	
∆CRP (USA)	2	-0.1886824	0.1799909	-1.048	0.29680	
∆CRP (UK)	2	-0.0997330	0.1235125	-0.807	0.42114	
p1	3	0.0304502	0.0144777	2.103	0.03772	*
p2	3	0.0072061	0.0176875	0.407	0.68450	
p3	3	-0.0068482	0.0195493	-0.350	0.72678	
CRP (USA)	3	0.2457681	0.0918686	2.675	0.00861	**
CRP (UK)	3	-0.2216517	0.0892146	-2.484	0.01448	*
trend	3	-0.0022998	0.0013665	-1.683	0.09520	

*Significance: 0 '***' 0.001 '**' 0.01 '*' 0.05 ' . ' 0.1 ' ' 1 Residual std. error: 0.1356 on 110 DF Multiple R^2 :0.2557 F-statistic: 2.223 on 17 and 110 DF p-value: 0.006986*

In 4.16 pertaining to the country risk premium relative to the USA (CRP (USA)), the most significant relationship is observed with p3 lagged by 3 periods. This relationship is negative. A positive relationship is observed between CRP (USA) and p1 and it is significant at the 1 per cent level at 3 lag periods. The second principal component, p2, has a negative relationship with CRP (USA); however, the relationship is not significant. The relationship between CRP (USA) and ΔCRP (USA) is significant at the 0.1 per cent level at both 1 lag and 2 lags, and the CRP (USA) is significant at the 5 per cent level at 3 lags. As for the CRP (UK) variable, significant relationships at the 5 per cent level are observed at 3 lags, and at 1 lag for the Δ CRP (UK) variable. The multiple R-squared for the model is 0.28, suggesting that 28 per cent of the variation in the country risk premium relative to the USA model can be explained by the variables included in the model in the long run.

From table 4.17 pertaining to the country risk premium estimated using the UK as global risk proxy, CRP (UK), a significant relationship at the 1 per cent level is observed with p1 at 3 lag periods. The relationship is positive. No significant relationships are observed with p2 or p3 in this model. The relationship between CRP (UK) and ΔCRP (UK) is significant at the 5 per cent level at 1 lag period, while a significant relationship at the 1 per cent level is reported with CRP (UK). A highly significant relationship is observed with CRP (USA) at 3 lag periods. This model provides a slightly weaker fit than the model for the country risk premium relative to the USA as it has a multiple R-squared of 0.2557.

In conclusion, the results presented pertaining to hypothesis 2 provides evidence of a significant relationship between the estimated country risk premiums and the macroeconomic environment in South Africa, in support of hypothesis 2. The results further indicate a significant relationship between the country risk premium relative to the USA model and the risk principal component. In addition, significant relationships were observed with both the country risk premiums serving as explanatory variables in both the estimated models.

4.6 Summary of the results

This research study estimated the average South African equity risk premium over the entire duration of the study at 12.97 per cent using the realised methodology and 10.36 per cent using the dividend growth methodology. The study further reports the global risk and country risk components of the South African equity risk premium, and thus provides evidence in support of hypothesis 1 that the South African equity risk premium consists of a global risk and country risk premium component. The mean country risk premium estimated when using the USA equity risk premium as a proxy for global risk is 8.69 per cent using the realised method and 8.64 per cent using the dividend growth method. When the UK equity risk premium is used as the global risk proxy, the mean country risk premium is 8.95 per cent and 7.09 per cent, using the realised and dividend growth methods respectively. As for the global risk proxies, when the USA is used this study estimates the mean global risk component at 4.28 per cent using the realised method and at 1.72 per cent using the dividend growth method. When the UK is used, the mean estimates of the global risk component are 3.77 per cent and 2.48 per cent using the realised and dividend growth methods respectively.

This research study further reports results in support of the second hypothesis, as significant relationships between the country risk premiums and the macroeconomic factors are observed. The analysis reduced the original variables to three principal components that capture 92.83 per cent of the variation in the original macroeconomic series, using principal component analysis. The principal components and the two country risk premiums were subsequently checked for stationarity and the appropriate lag order of the variables was determined. The analysis used a lag order of 3 periods in the cointegration tests and identified 3 cointegrating relationships plus linear trend. The analysis consequently normalized on the country risk premium where the USA served as global risk proxy and on the country risk premium where the UK served as global risk proxy, giving rise to two long-term relationship models. Both models indicated significant relationships with the first principal component pertaining to the macroeconomic environment, while no significant relationship

was observed with the second principal component that is concerned with interest rates. The third principal component that relates to risk was found to be significant in the model where the country risk premium relative to the USA was normalized on, however not in the country risk premium relative to the UK model. Further, significant relationships were found with both the country risk premiums serving as explanatory variables in the two models where the respective country risk premiums had been normalized upon.

5 CHAPTER 5: DISCUSSION OF THE RESULTS

5.1 Introduction

Extensive research has been done on the equity risk premiums of the USA and UK and the factors that influence these premiums are well documented in academic literature. Far less research has been done on the South African equity risk premium and factors of influence. This is partially due to South Africa's exclusion from global financial markets prior to the abolishment of sanctions in 1994 and the subsequent late inclusion of the country in the widely used emerging market databases such as the International Finance Corporation's Emerging Markets Database.

This chapter discusses the South African equity risk premium, its components and the factors of influence within the research hypothesis framework of this study. The chapter deliberates on the results presented in chapter 4 by drawing on prior research studies on the South African market and other markets where relevant. Section 5.2 discusses the final sample used in this research study, followed by a discussion pertaining to the results of hypothesis 1 in section 5.3. Section 5.4 considers the results obtained in the investigation of hypothesis 2, and finally section 5.5 concludes the discussion of the results.

5.2 Sample profile

The final sample consisted of a total of a total of 1273 listings on the JSE over the duration of the study. The 1273 listings include new listings and delisted companies. Over the course of the study a total of 817 companies delisted, thus of the 1273 listings, only 456 were included in the final year of the study[7]. The 1273 listings do not include companies that have a primary listing abroad, as it is argued that these companies are exposed to South African risk factors to

[7] Appendix A provides a list of the final 456 companies, while a list of the 817 companies that delisted over the course of the study can be found in Appendix B.

a lesser extent than companies that hold a primary listing in South Africa. To estimate the South African market return, a total of 204 967 share price and dividend data points were gathered. A total of 408 index price and dividend data points were gathered to estimate the USA market return and 312 index price and dividend data points for the UK market return. The extensive amount of companies that were included in this study makes the study sufficiently reflective of the actual South African, USA and UK markets.

In addition, the equity risk premiums are estimated over a lengthy period in time, a total of 34-years. Various authors, such as Hassan and Van Biljon (2010), Damodaran (2012) and Firer and Staunton (2003) have warned that a long sample period should be used when estimating the equity risk premium as the premium varies widely over time. The relationship between macroeconomic factors and the country risk premium was investigated over a shorter period in time, from 2003 to 2013; however, in comparison to studies of a similar nature, the time period covered is extensive.

5.3 Discussion pertaining to Hypothesis 1

When investigating the returns of emerging markets, earlier studies done by Clare and Priestley (1998), Bilson et al. (2001), Harvey (2004) and Gameiro (2008) have indicated that global risk factors as well as local country specific risk factors influence the return of these emerging markets. In addition, research has indicated that the equity markets of emerging countries include a higher degree of country specific risk, and therefor demand a higher rate of return than their developed market counterparts (Barry et al., 1998; Bekaert & Harvey, 1995; Damodaran, 2012; Kohers et al., 2006; Salomons & Grootveld, 2003).

The results of this research study is in alignment with previous studies on emerging markets as the South African equity risk premium exceeds the equity risk premiums of the USA and UK, which served as proxies for global risk in the analysis. Prior research studies have reported varying estimates of the equity risk premiums of South Africa, the USA and the UK. These estimations of the

respective equity risk premiums directly impact the study of the global and country risk components of the South African equity risk premium, and are therefore discussed in turn.

5.3.1 *The South African equity risk premium*

The estimates of this research study are fairly close to the estimates of Favish and Affleck-Graves (1987). Using historical returns Favish and Affleck-Graves (1987) estimated the premium at 12.3 per cent, while this research study provided an estimate of 12.97 per cent. As for the growth approach, their estimate was 9.1 per cent and this study estimated the premium at 10.36 per cent. Both the Favish and Affleck-Graves (1987) estimates are lower than the estimates of this research. As the Favish and Affleck-Graves (1987) study used treasury bills as the risk-free rate, that are in general lower than bonds, it would be expected that this research would yield estimates lower than the Favish and Affleck-Graves (1987) study. This study used long-term government bonds as proxy for the risk-free rate as short term treasury bills induce reinvestment risk (Damodaran, 2012), making their use less suitable in estimating the equity risk premium over an extended time period. The observed difference could possibly be attributed to the different time periods included in the two studies (the Favish and Affleck-Graves (1987) study covers the 1960-1985 time period), the differences in calculation methodology and the difference in the frequency of the calculation (the Favish and Affleck-Graves (1987) study calculated the premium on a quarterly basis).

Digby et al. (2006) calculated the South African equity risk premium using the Fama and French (2002) model, as was done in this study. They estimated the premium at 6.42 per cent using the dividend growth method and 7.63 per cent using the realised returns method, over the 1960 to 2004 period. Using the same data set, but over a shorter time period (1960 to 1992) and using a different calculation methodology, Firer (1993) estimated the realised equity risk premium as 9.5 per cent. These estimates highlight the influence that the calculation methodology and time period covered has on the outcome of the calculation. In the Digby et al. (2006) and Firer (1993) study it should also be

noted that the return estimates are adjusted for inflation and reported in real terms, while this research reports the estimates in nominal terms.

Additional differences between the studies mentioned and this study pertains to the sample used. In this research study companies with a primary listing abroad have been excluded while this is not the case in the other studies reporting the equity risk premium of South Africa. Further, this study included companies listed on the Alternative Exchange (AltX) and small cap companies, while the other studies focus on the JSE All-share index or the Main Board exclusively. Higher risk and higher returns are associated with small cap companies and companies listed on the AltX, resulting in a higer equity risk premium estimate. The AltX has shown significant growth in recent years, with growth figures of 43 per cent and 78 per cent reported for 2006 and 2007 respectively (Theron, 2011), which translate into a higher equity risk premium. Small cap and AltX listed companies are predominatly small and medium size companies and thus demand a higher premium, the small firm premium (Damodaran, 2012). This was first observed by Banz (1981) who documented that shares of small firms had offered, on average, higher risk-adjusted returns than their larger counterparts. The Banz (1981) study was conducted on the New York stock exchange between 1936 and 1975. The study concluded that small cap companies generated about 6 per cent higher returns, than larger companies. The author further noted that the returns of the smaller firms are more volatile than that of the larger firms (Banz, 1981), as is the case with small cap and AltX listed firms in this study. A similar study found the small firm premium to be around 7 per cent for the UK over the 1955 to 1984 time period (Damodaran, 2012).

5.3.2 *The global risk component*

Since South Africa is an open economy, its markets are not only influenced by domestic factors, but also by international markets (Moolman & du Toit, 2005). Markets become more sensitive to world events and world measures of risk as it undergoes financial liberation and integration in the world market (Bekaert & Harvey, 1995; Harvey, 2004).

Correlations provide a measure of how two markets move together and this study found a correlation of 0.579 between the South African and USA equity risk premiums and 0.787 between the equity risk premiums of South Africa and the UK, calculated using the dividend growth approach. The realised equity risk premium yielded slightly lower correlations, a correlation of 0.374 with the USA and 0.598 with the UK was observed. These correlations are significant at the 0.01 per cent level. Jefferis and Okeahalam (1999) have reported a market return correlation of 0.462 between South Africa and the UK in 1991. This was before the liberalisation and reintegration of the South African equity market into the world market, and could explain why this research reports a much higher correlation than the Jefferis and Okeahalam (1999) study. The linkages between markets are expected to increase with the removal of government intervention in markets, an increase in international capital flows, technological advances and an increase in multinational companies with dual-listings (Jefferis & Okeahalam, 1999). The correlations reported provide some insight into the influence of global risk on the South African market and are in support of the research findings of Harvey (2004) and Clare and Priestley (1998) that state that global risk factors influence the returns of emerging markets, as is the case with South Africa.

In the event where assets of identical risk in two markets command the same return, Bekaert and Harvey (1995) consider these markets to be fully integrated, however factors such as home asset preference reduce the likelihood of full market integration occurring. The equity risk premiums offered by the USA and the UK differ over the duration of this study, as have also been the case in other studies where both market premiums are reported (Dimson et al., 2011). Further, the estimates of the equity risk premiums of the USA and UK reported in chapter 4 are higher in some instances, and lower in other when compared to estimates reported in the literature.

The Fama and French (2002) estimates of the USA equity risk premium for the 1951 to 2000 period are higher than the estimates of this study. Using the dividend growth model, they estimate the premium at 2.55 per cent, while this study estimates it at 1.72 per cent. The realised returns method estimate of the

Fama and French (2002) study is 7.43 per cent and this study estimates it at 4.28 per cent. It should be added that the Fama and French (2002) study uses arithmetic means that result in higher estimates than when using geometric means, as have been used in this study and that the studies cover different periods in time. In a study covering a more recent time period of 1998 - 2008, Gameiro (2008) reported premiums of 4.8 per cent for the UK and 3.1 per cent for the USA using a three-stage dividend growth model. Thus, their premium estimates are consistently higher than the estimates of this research.

Other studies report estimates for the USA that are lower than the estimates of this study, such as the research done by Jagannathan, McGrattan, and Scherbina (2000) that report an equity risk premium of 0.94 per cent for the 1980 to 1989 period and 2.51 per cent for the 1990 to 1999 period for the USA.

Claus and Thomas (2001) report an equity risk premium for the UK using an abnormal earnings approach for the 1989 to 1998 time period of 2.81 per cent. This estimate falls in between the realised return estimate of 3.77 per cent and the growth estimate of 2.48 per cent of this study for the UK. They also report an estimate for the USA using the abnormal earnings approach of 3.40 per cent which is lower than the realised return estimate of 4.28 per cent and higher than the growth estimate of 1.72 per cent reported by this study.

The estimates reported by Dimson et al. (2011) that were calculated over an extensive 109-year period are fairly similar to the findings of this report. Using bonds as the risk free rate, they report an equity risk premium of 4.3 per cent for the UK and 5.3 per cent for the USA, fairly close to the 3.77 per cent and 4.28 per cent reported for these markets respectively by this study.

The equity risk premiums estimates for the USA and UK by this study fall within the wide range of estimates reported in the literature. In the literature, contending views exists on the most appropriate methodology, risk-free rate proxy, duration of the study and method to estimate the mean equity risk premium, leading to the varied range of premiums reported (Damodaran, 2012; Elton, 1999; Schröder, 2007).

The co-movement of the USA and UK equity markets and their integration into the world market is well documented in academic literature (Damodaran, 2012; Fraser & Oyefeso, 2005). In this study, the equity market movement of the USA and UK is highly correlated at a 0.01 per cent significance level. This correlation of 0.806 is higher than the correlation of 0.500 reported by Gameiro (2008), possibly due to the study covering a different time period. The correlation across markets is expected to increase over time, as both companies and investors globalize (Damodaran, 2012). This is supported by the findings of Li, Tapon, and Sun (2006) that found a correlation of 0.63 between the UK and US over the 1988 to 1992 time period and a correlation of 0.82 during the 1998 to 2002 time period. The high correlation observed substantiates the use of these equity risk premiums as global risk proxies, as they move together.

5.3.3 *The South African country risk premium*

Over the entire duration of this study, South Africa consistently offers a higher equity risk premium than its developed world counterparts, as have also been observed by Salomons and Grootveld (2003) and Donadelli and Prosperi (2011) in their respective investigations of other emerging markets relative to developed markets. This additional return offered and observed in this study is termed the South African country risk premium. The country risk premium observed varies over time and the estimates using the two global risk proxies result in slightly different estimations, as can be expected.

The country risk premium estimates decrease over the four summary time periods described in chapter 4, with exception of the country risk premium using the growth estimation method and UK as global risk proxy. The decrease in the country risk premium can be interpreted that South Africa is perceived to be a less risky investment destination in the latter years of the study, compared to the early years of the study. This could partially be explained by South Africa's inclusion in global markets and the abolishment of sanctions in 1994. As for the country risk premium using the growth estimation method and UK as global risk proxy, the UK equity risk premium reported in the first period is substantially

higher than the equity risk premiums reported for the UK in the subsequent periods, leading to a higher country risk premium in the second and third time period, compared to the first. For this reason, the researcher does not focus on the increase in country risk premiums observed in the three time periods, as in this case, it is due to the calculation methodology and the initially high UK equity risk premium estimate.

However, the average country risk premium using the two methodologies and two global risk proxies are fairly similar over the duration of the study. Using the realised estimates, the average country risk premium relative to the USA is estimated at 8.69 per cent and 8.95 per cent when the UK is used as global risk proxy. These estimates are markedly similar. As for the growth estimates, the country risk premium relative to the UK is 1.55 per cent lower than the premium using the USA as a global risk proxy. This lower mean estimate is due to a significantly higher UK equity risk premium reported in the first summary time period, as already discussed.

To the international investor, this would mean that investing in the South African equities market would yield on average 8.34 per cent higher returns than investing in the mature equity markets of the USA and UK, relative to the respective bond markets.

5.4 Discussion pertaining to Hypothesis 2

The studies done by Van Rensburg (1996), Moolman and du Toit (2005), Junkin (2012); Olalere (2006), Jefferis and Okeahalam (2000) and various others provide valuable insight into the relationship between selected macroeconomic variables and South African equity market behaviour. This research hypothesis investigated the relationship between macroeconomic factors and the South Africa country risk premiums by means of estimating principal components that capture the variance in the macroeconomic variables. The study then normalised the estimated model containing the principal components onto both the country risk premium using the USA as global risk proxy and the country risk premium using the UK as global risk proxy. The results reported in chapter

4 are in support of hypothesis 2 as significant relationships are observed between the country risk premiums and the estimated macroeconomic principal components in the long-run. The relationships are discussed in detail by first reviewing the principal components, their interrelatedness and interpretation, followed by a discussion of each of the principal components and country risk premiums that exhibited a relationship.

5.4.1 *The Principal Components*

The principal component analysis indicated that 92.83 per cent of the variability in the original macroeconomic factors can be explained by 3 principal components. The first principal component estimated was positively dominated by manufacturing production, inflation, money supply, Rand/Dollar exchange rate, Rand/Pound exchange rate, gold price and oil price. Considering the macroeconomic variables that dominate the first principal component in this study, it is argued to represent the broad South African macroeconomic environment.

The South African macroeconomic environment is a complex and highly interlinked environment with factors such as manufacturing production, inflation, money supply, exchange rates, oil prices and gold prices all closely related and intertwined through various mechanisms. Through monetary policy, money supply affects both inflation and interest rates as an increase in money supply leads to excess cash in the market which results in an increase in prices, termed inflation. In addition, such an increase in money supply would possibly lead to a decrease in interest rates as the South African Reserve Bank actively manages inflation through the use of the repo rate, that in turn affects all other interest rates in South Africa (Janse van Rensburg et al., 2011). Inflation can further be linked to interest rates through the Fisher effect (Miller et al., 1976) and to measures of domestic activity through the quantity theory of money. Other factors such as exchange rates and oil prices exert an influence on aggregate production measures through input costs to production. While exchange rates also influence revenues from gold and overall profitability of firms in the economy.

The second component estimated by this study was heavily dominated by the interest rate variable and it is therefore assumed that the second principal component is concerned with interest rates. The first two principal components estimated by this study are reasonably similar to the findings of Fifield et al. (2002). In their analysis, inflation, exchange rates, gross domestic product, short-term interest rates, money supply and the trade balance served as the original local macroeconomic factors. Of these variables, inflation, money supply and gross domestic product dominated the first principal component in all thirteen the emerging markets included in the study. As for the second principal component, it was found to be dominated by interest rates in 12 of the 13 emerging markets and thus argued to represent interest rates (Fifield et al., 2002). The Fifield et al. (2002) analysis only estimated two principal components.

In this research study a third principal component was estimated. The component was heavily dominated by the risk variable. Thus it is assumed that the third principal component relates to South African risk.

The principal components and their relationship with the South African country risk premium are discussed in more detail in the following section. The discussion focusses on the significance of the relationship observed, rather than the nature of the relationship as the original variables have been transposed into principal components, distorting the interpretation of the sign of the coefficient. Further, some of the variables have been log transformed and first differenced, further complicating its direct interpretation. In the literature, Moolman and du Toit (2005) have warned against the direct interpretation of coefficients in this form, as in some instances, the economic theory has been differenced away, leading to inappropriate interpretation.

5.4.2 *Macroeconomic environment principal component*

Normalizing on the country risk premium where the USA served as global risk proxy and normalizing on the country risk premium where the UK served as global risk proxy revealed the macroeconomic environment principal component to be a significant factor at 3 lagged periods. The relationship was observed to

be positive in both the models and significant at the 1 per cent level. Given the vast amounts of literature suggesting that local macroeconomic factors influence the equity market returns of emerging markets, the finding of this research study did not come as a surprise.

Fifield et al. (2002) have reported a significant relationship between a principal component capturing the production and financial sector of an economy and equity market returns in Greece and India. The authors argue that this is to be expected as emerging markets are associated with higher economic growth rates than their developed world counterparts.

Similarly, Bilson et al. (2001) have found that local macroeconomic factors play a significant role in explaining the equity market returns of a set of 20 emerging markets. The study also performed principal component analysis to reduce the variables. In the study, the first component served as a proxy for economic activity, as their real activity and trade sector variables that were originally included in the data set, dominated the component (Bilson et al., 2001). Their second component had high positive loadings from both the original variables money supply and trade sector, and thus they argued that the component is concerned with consumption. The third component was concerned with country risk, while the fourth component represented global effects. Using a regression model, the study found the first component representing economic activity to be significant in Brazil, Chile, India, Indonesia, Philippines, Thailand, Taiwan, Greece and Nigeria. While, the consumption component proved to be significant in Argentina, Colombia, Korea, Philippines, Taiwan, Thailand, Greece, Pakistan, Turkey and Zimbabwe. The study also found that the macroeconomic variables should be lagged, as the information contained in the variables do not have an immediate impact on market returns (Bilson et al., 2001), as have been the case in this research study.

In the Indian market, Naka et al. (1998) also found a significant relationship between selected macroeconomic factors and the returns of the Indian stock market. The study used Johansen cointegration techniques and found that in the long-term inflation is the most severe deterrent to Indian stock market

performance; while domestic output growth is the strongest driving force in the long-term.

In the South African context, Jefferis and Okeahalam (2000) have found a significant relationship between returns on the JSE and selected macroeconomic variables over the 1985 to 1995 time period. The variables included real GDP measures, real exchange rate and long-term interest rates. The authors have further found the variables to be significant at three lags, with a lag representing a quarter, suggesting that the variables may influence the return of the stock market indirectly, as opposed to a exerting a direct influence (Jefferis & Okeahalam, 2000).

Similar results are reported by Moolman and du Toit (2005) in their investigation of the South African equity market and its behaviour relative to selected macroeconomic factors relevant to the South African market. One of the macroeconomic factors included in this study that makes it unique from the Jefferis and Okeahalam (2000) study was the gold price. A significant relationship was observed in the short run between the gold price and JSE share prices. Other significant relationships reported by the study was between the JSE share prices and short term interest rates, exchange rates, investors' expectations and the risk premium. The short term interest rate, exchange rate and the risk premium significance was observed at 1 lagged period, where 1 period represents a quarter.

The research of Moolman and du Toit (2005) and Jefferis and Okeahalam (2000) as discussed above as well as the research of others such as Olalere (2006) and Junkin (2012) indicate that changes in the macroeconomic variables precede changes in equity market returns as the macroeconomic factors are found to be significant in the lagged form. Chen et al. (1986) have explained that movements in macroeconomic variables affect future dividends and discount rates within the dividend growth model framework, indicating that changes in macroeconomic variables precede changes in stock prices. The lag observed has also been explained by Bilson et al. (2001) who argues that the lag represents a delay in the release of information pertaining to macroeconomic factors. The authors also add that information contained in

some of the macroeconomic factors do not have an immediate impact on equity market returns. Contrary to this view, a conflicting view can be found in the literature that argues that stock market changes precede changes in macroeconomic variables (Tripathi & Seth). However, the findings of this research study is in support of the research of Moolman and du Toit (2005), Jefferis and Okeahalam (2000), Olalere (2006) and Junkin (2012) that indicate that macroeconomic variable changes precede changes in equity market returns in the South African context.

a. ***Nature of the relationship***

Although this research study does not determine the relationship between the individual macroeconomic factors and the country risk premium, the researcher notes the interrelatedness of the macroeconomic variables and sight possible explanations for the mechanisms at play behind the relationship observed by this study. This is done by referring to the individual macroeconomic variables in brief, as the relationship observed by this study is the cumulative relationship of the individual macroeconomic factors.

The relationship between money supply and equity markets has been subject to numerous investigations. Coetzee (2002) argues that money supply affects equity market prices through its effect on interest rates by means of two mechanisms. The first pertains to the effect of interest rates on a firm's cost of borrowing and thus its profitability (Coetzee, 2002). While the second mechanism is concerned with investor substitution between interest bearing bonds and equities as the interest rate changes in accordance with movement in the money supply (Coetzee, 2002). Maysami et al. (2004) further adds that money supply also affects excess liquidity and thus investors ability to buy shares. An increase in money supply would results in an increase in excess liquidity available to investors, leading to an increase in demand for shares that drive share prices up.

A significant relationship between inflation and equity markets have been reported in the literature by Mukherjee and Naka (1995), Coetzee (2002) and Alagidede (2009) amongst others. Explanations of the relationship observed

range from transposing the Fischer effect to risky assets, such as equities[8], to the " proxy effect", as described by Fama (1981). The proxy effect relates that equity markets are affected by inflation through the effect that inflation has on domestic production and domestic production's effect on equity markets.

Fama (1981) has indicated that industrial production growth has a strong relationship with stock market returns. This is to be expected as the productive capacity of an economy rises during economic growth that results in an increase in profits generated by firms (Chaudhuri & Smiles, 2004). This is confirmed by Fama and French (1989) in their research study which indicates that when an economy is at its peak in the business cycle, firms are making profits and thus share prices tend to rise.

Mangani (2009) explains the relationship between the South African stock market and the gold price with reference to the present value theory. He views an increase in the price of gold as an increase in earnings from investment in the gold sector and thus argues that according to the present value formula of share prices, the share price positively varies with numerator factors such as earnings.

The nature of the relationship between exchange rates and market returns is subject to the stock market industry being investigated. Export driven industries will be adversely affected by an appreciation in the domestic currency, while importing industries will benefit from an appreciation in the domestic currency (Janse van Rensburg et al., 2011). A depreciation of the South African Rand may also entice foreign investors to invest in the South African equities market, as they would then hold the opportunity to buy "cheaper" shares using their domestic currency.

The effect of oil prices on market returns are likely to differ from country to country as it is dependents upon the respective countries' relevant consumption or production of oil (Jones & Kaul, 1996). Oil demand and supply shocks combined have accounted for 22 per cent of the long-run variation in USA real

[8] A detailed description of the Fischer effect can be found in the literature review in section 2.4.4

stock market returns (Kilian & Park, 2009). Further, oil is a central input to domestic production and transportation. Therefore, an increase in the price of oil in the international market would lead to a decrease in share prices in markets that do not produce oil (Kuwornu, 2012). South Africa holds only a small amount of crude oil reserves and produce a marginal amount of crude oil (EIA, 2014), leading to the expectation of a negative relationship between oil prices and equity market returns in the South African context.

5.4.3 *Interest rate principal component*

A negative relationship with the second principal component; interest rates; was observed in both models. However, the relationship observed is insignificant. This is surprising as vast amounts of literature suggest a significant relationship between equity market returns and interest rates.

Chen et al. (1986) first investigated the effect of the unexpected component of interest rates on market returns within the arbitrage pricing theory model and reported a significant negative relationship. In the Finnish market a significant negative relationship between unanticipated changes in long-term interest rates and stock market returns have been reported by Junttila, Larkomaa, and Perttunen (1997). Likewise, in a meta-analysis, van Ewijk et al. (2012) reported similar results and concluded that in times where the interest rate decreases, the equity risk premium increases. Other studies, such as the work of Groenewold Fraser (1997), Clare and Priestley (1998), Wongbangpo and Sharma (2002) provide further evidence of a significant relationship between interest rates and equity market returns.

Further, Fifield et al. (2002) have reported a significant relationship between market returns in India, Mexico, Portugal, Thailand and Turkey and a principal component concerned with interest rates. However, no significant relationship was observed between the interest rate principal component and market returns in Chile, Greece, Hong Kong, Korea, Malaysia, Philippine's, South Africa and Singapore (Fifield et al., 2002). In another study concerned with the South African market, Olalere (2006) also found the relationship between the JSE price index and interest rates to be insignificant. However, in the South African

market Moolman and du Toit (2005) and Jefferis and Okeahalam (2000) have found the relationship to be significant.

This research study found the relationship between the interest rate principal component and country risk premium to be insignificant, similar to the findings of Olalere (2006) and Fifield et al. (2002). Possible reasons for the insignificance of the relationship observed by this study relate to the nature of the interest rate principal component. The component contains influences from other variables and cannot be solely considered as interests rates. Further, the nature of the country risk premium variable could provide another reason as it also contains information pertaining to interest rates. Long-term government bonds have been subtracted from the market return to estimate the equity risk premium and subsequently the country risk premium.

a. ***Nature of the relationship***

Prior research suggests a negative relationship between equity markets and interest rates, as have been observed in this study. Maysami et al. (2004) have argued that the negative relationship between market returns and interest rates occur because interest rates influence the level of business profits. Interest rates impose a cost of borrowing on corporate firms and investors, thus the profitability of investments and corporate firms are likely to be negatively affected by an increase in interest rates, leading to a decrease in stock prices.

Maysami et al. (2004) have also pointed out that a substantial amount of investors borrow money to purchase shares. Thus, an increase in interest rates would lead to investors requiring a higher rate of return to compensate for the more costly transaction. This would result in a reduction in demand, leading to a decrease in share prices. This is further enhanced during times of higher interest rates, as the bond market becomes more attractive and investors could possibly reallocate their funds to the bond market (Damodaran, 2012).

5.4.4 *South African Risk principal component*

The third component is dominated by the risk variable that captures the excess return offered to investors in long-term South African bonds, relative to long-term USA bonds. The risk principal component is a highly significant factor in the country risk premium relative to the USA model, while no significant relationship is observed with the country risk premium relative to the UK model.

The risk principal component is concerned with the riskiness of investing in the South African bond market, relative to the USA bond market. Thus, it is to be expected that the component is highly significant in the country risk premium relative to the USA model as opposed to the country risk premium relative to the UK model. In the country risk premium relative to the USA model, both the risk principal component and country risk premium itself measure South African risk relative to the USA.

Moolman and du Toit (2005) and Kia (2003) have evaluated the relationship between this risk variable and the JSE All-share index and have found the relationship to be significant. This research study calculated the risk variable using the method described by Moolman and du Toit (2005). Bilson et al. (2001) have also included country specific risk factors in their study and these dominated the third principal component estimated by the study. This third principal component was found to be a significant factor in explaining equity market returns in Chile, Colombia, India, Korea, Malaysia, Pakistan, Philippines, Taiwan, Thailand and Zimbabwe.

5.4.5 *Country Risk premium relative to USA*

A significant relationship was observed with the lagged country risk premium relative to the USA and the lagged country risk premium relative to the UK variables in both the models, indicating that past country risk premiums explain future country risk premiums. In the country risk premium relative to the USA model, the country risk premium relative to the USA variable was significant at 1, 2 and 3 lagged periods and the country risk premium relative to the UK variable was significant at 1 and 3 lagged periods. In the country risk premium

relative to the UK model the country risk premium relative to the USA variable was significant at 3 lagged periods and the country risk premium relative to the UK variable was significant at 1 and 3 lagged periods. The observation that the country risk premium relative to the USA and UK variables are significant in both the models could possibly be explained by the calculation methodology of the country risk premium as the two global risk proxies both capture the same global risk factors. The fact to the country risk premiums are significant in a lagged form indicates that the model could be used to predict future country risk premiums

Attempts to predict equity market returns have a long history in finance and various different techniques and variables have been used to do so (Welch & Goyal, 2008). Welch and Goyal (2008) have shown that historical average returns can be used to forecast future returns and that this method provides better estimates than regressions using other variables such as dividend yield and earnings. Whereas Campbell and Thompson (2008) have argued that other predictor variables add power to forecasting future returns after adding simple restrictions on the regression model. Thus, there is support in the literature that lagged equity market returns can be used to forecast future returns and thereby lagged country risk premiums to forecast future country risk premiums, within a model containing macroeconomic variables.

5.5 Conclusion

This research study estimated the South African equity risk premium using the dividend growth and realised methodologies as described by Fama and French (2002). The study further separated the estimated South African equity risk premium into a global risk and country risk component. To the knowledge of this researcher there are no similar studies that estimate the global and country specific risk components of the South African equity risk premium, thus the findings of this research study could only be compared to academic literature by investigating the components individually. In the literature review and in the discussion presented in this chapter on estimates of the equity risk premium, it is evident that there is little agreement among authors on what an accurate

measure of the premium is. This controversy is further emphasised when considering the Price Waterhouse Coopers' 2012 survey, that positions the South African equity risk premium in a wide range of between 3 per cent to 12 per cent (PwC, 2012).

The estimates reported by this report are within the range of the findings reported by other studies, assuring convergent validity of the results reported in chapter 4. Various factors, such as the choice of risk-free rate, the calculation method, time period under review, companies included in sample and whether geometric or arithmetic means are used all influence the outcome of the equity risk premium estimation. The results show clear evidence of a global risk and local country risk component within the South African equity risk premium.

The study further observed a significant long-run relationship between the country risk premiums and the macroeconomic environment principal component in both the models. The risk principal component was found to only be significant in the country risk premium relative to the USA model. Further, significant long-run relationships were observed with the country risk premiums serving as variables in the respective models. These results provide evidence of a relationship between macroeconomic factors and the country risk premium as well as indicating that the model could be used to predict future country risk premiums. Other studies, such as the work of Bilson et al. (2001) have found similar significant relationships between market returns and principal components concerned with macroeconomic variables and country specific returns.

In addition, the models estimated explain a reasonable amount of the variance in the country risk premiums. In the model where the country risk premium relative to the USA was normalized on, the R-squared is 0.28, indicating that 28 per cent of the variation in the country risk premium can be explained by the model. Whereas, in the country risk premium relative to the UK model, 26 per cent of the variation in the country risk premium can be explained by the model as the R-squared is 0.26. Junkin (2012) reported similar R-squared statistics to those reported by this study, in his investigation of the relationship between macroeconomic variables and selected sectors on the JSE.

6 CHAPTER 6: CONCLUSIONS & RECOMMENDATIONS

6.1 Introduction

This chapter brings together the concepts investigated and results obtained by this research study. The chapter first summarises the results presented and the discussion thereof, followed by recommendations to equity market participants. Finally, the chapter concludes with suggestions for further research studies.

6.2 Conclusions of the study

This research study has estimated the South African equity risk premium and has further shown that the premium can be separated into a global risk premium and a country risk premium. This is in line with the research findings of Clare and Priestley (1998), Bilson et al. (2001) and Gameiro (2008) which indicate that global risk factors and country specific risk factors influence equity market returns. The equity risk premium was estimated by this study using the dividend growth and realised methods as described Fama and French (2002).

This study reported geometric average equity risk premium estimates for South Africa of 10.36 per cent using the dividend growth approach and 12.97 per cent using the realised approach. The dividend growth estimation approach yielded slightly lower equity risk premium estimates than the realised approach. This finding is in alignment with the findings of Fama and French (2002) as the authors have also reported lower estimates when applying the dividend growth method as opposed to the realised method. Further, both the estimates reported by this study for South Africa are marginally higher than the wide range of estimates reported in the literature by the studies of Favish and Affleck-Graves (1987), Firer (1993), Digby et al. (2006), Dimson et al. (2011) and PwC (2012). This research study attributes the higher premium observed by this study relative to other studies to the sample of listed companies included in the study. Alternative Exchange listed companies as well as small cap companies were included in this study, leading to a higher equity risk premium estimate. The anomaly of smaller firms offering significantly larger risk adjusted returns

was first documented by Banz (1981), and was termed the small firm premium. The study also acknowledges the influence of the different methodologies, risk-free rate proxies, study periods covered and inflationary adjustments on the outcome of the estimate.

The study also estimated equity risk premiums for the USA and the UK, as these served as proxies for global equity market risk in the analysis. The estimates reported for the USA and UK by this study fall within the range of premiums reported in the literature. The study further found that movements on the USA and UK equity markets are highly correlated, as have been the findings of others in the literature (Damodaran, 2012; Gameiro, 2008).

Separating the estimated South African equity risk premium into a global risk and country risk component yielded country risk premiums that are reasonably similar in magnitude. Using the USA equity risk premium as the global risk proxy, the country risk premium was estimated at 8.69 and 8.64 per cent by the realised and dividend growth approaches respectively. When using the UK equity risk premium as global risk proxy, the country risk premium was estimated at 8.95 using the realised method and 7.09 per cent using the dividend growth method.

The study further investigated the relationship between the estimated country risk premiums and selected macroeconomic fundamentals. To do so a principal component analysis was performed on the original macroeconomic variables and it was found that 92.83 per cent of the variability in the macroeconomic variables could be explained by 3 principal components. The 3 principal components identified were argued to represent the South African macroeconomic environment, interest rates and South African risk. Using the principal components and country risk premiums, two models were estimated. The first model normalized on the country risk premium relative to the USA while the second model normalized on the country risk premium relative to the UK.

This study found a significant relationship between both the country risk premium models and the macroeconomic environment principal component.

Other studies, such as the work of Bilson et al. (2001), Moolman and du Toit (2005) Olalere (2006) , Junkin (2012) also document a significant relationship between macroeconomic variables and stock market returns. The risk principal component estimated by this study was only observed to be significant in the country risk premium relative to the USA model. This observation is to be expected as the risk principal component captures South African risk relative to the USA. Further, Moolman and du Toit (2005) have also found a significant relationship between the risk variable and JSE All-share index, providing some support for the findings of this study.

In addition, both the country risk premiums relative to the USA and the UK proved to be significant factors in the model where the country risk premium relative to the USA was normalized on. Similarly, both the country risk premiums were significant factors in the model where the country risk premium relative to the UK was normalized on. The significant relationships were observed when the country risk premiums were included as variables in a lagged form. This finding indicates that the country risk premiums estimated could be used to predict future country risk premiums within the model estimated by this study.

This research study provided evidence of a country risk premium and global risk premium within the South African equity risk premium in support of the first research hypothesis. The study further established that a long-run relationship exists between the estimated country risk premiums and the South African macroeconomic environment in support of the second research hypothesis of this study.

6.3 Recommendations

The equity risk premium is a central input in finance and investment decisions and provides investors with a measure of the return offered by the equities market, relative to the return offered by the bond market. The estimated country risk premium provides additional information, especially to foreign investors considering investing in the South African equities market.

Further, a better understanding of the relationship between the macroeconomic environment and the country risk premium of South Africa can benefit firms, government institutions as well as private investors. The results obtained by this study provide some insight to investment decision makers with regards to identify risk mitigating and profit yielding opportunities. The results provide investors with the information that there is a relationship between the macroeconomic environment and the South African country risk premium and thus investors should monitor the macroeconomic environment when making long-term investment decisions.

6.4 Suggestions for further research

Broadening the understanding of the relationship between the behaviour of the equity market and factors of influence holds great value for investors and firms alike. Thus it would be beneficial to investigate the relationship further. This study excludes GDP as a potential variable as only quarterly data could be obtained. However, future studies could possibly look at means of extrapolating the quarterly data to monthly data in order to include the GDP variable in the analysis. Bilson et al. (2001) has also suggested that factors constructed from the market such as aggregate dividend yields, stock market turnover and aggregate earnings could add explanatory power. These could be added to the current variables included in this study. Further, adding variables that fall outside the scope of market or macro-economy, such as variables pertaining to the legal and political environment, could potentially also improve the model.

Another possible area in which this research study could be extended is to investigate the South African equity risk premium relative to the Morgan Stanley Capital International (MSCI) emerging market index, to ascertain if the South African equity risk premium is unique or similar to other emerging markets. The influence of macroeconomic and monetary variables could further be investigated to determine if the relationship between these variables and the South African premium is unique, or similar to the relationship observed in other emerging markets.

Further, this research study estimated the equity risk premium using the realised and dividend growth methods as proposed by Fama and French (2002). In their paper, Fama and French (2002) have also suggested a third method, the earnings growth method, which could be used to estimate the equity risk premium. Taking into consideration the wealth of literature that indicate that the equity risk premium is a forward-looking estimate, the latter two methods as well as the three-stage dividend discount model and H-model as described in chapter 2, could possibly be used in a study to estimate the equity risk premium. The study could compare the estimates obtained using the different forward-looking methodologies and provide valuable insight into the different estimation methodologies.

And lastly, very little research has been done on the Alternative Exchange. This researcher is of opinion that it would be very interesting to investigate the behaviour of this exchange. The analysis could take the form of estimating two models, one with the dependant variable being the equity risk premium estimated of only companies listed on the Alternative Exchange and the other where the All-share index is used to estimate an equity risk premium that serves as the dependant variable in the model. Both the models could include macroeconomic variables similar to those included by this research study. Such an analysis would provide the means to compare market behaviour with reference to macroeconomic variables as well as investigating the small firm premium further. It could possibly provide valuable information to companies listed on the exchange, as well as to prospective investors.

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APPENDIX A

List of companies included in the sample in 2013.

1TIME HOLDINGS	ARROWHEAD PROP.A SHARE	BCX
ABE CON.CHEMICALS	ARROWHEAD PROP.B SHARE	CADIZ
ABSA BANK LIMITED	ARTHUR KAPLAN JEWEL	CALGRO M3 HOLDINGS
ABSA CAPITAL	ASCENDIS HEALTH LTD	CAPE EMPWM.TRUST
ABSA BANK PREF.	ASCENSION PROPERTIES 'A'	CAPEVIN HOLDINGS
ACCENTUATE	ASCENSION PROPERTIES 'B'	CAPITAL PROPERTY FD.
ACCPROP	ASPEN PHMCR.HDG.	CAPITEC BANK
ACUCAP PROPERTIES	ASSORE	CAPITEC BANK PREF.
ADAPTIT HOLDINGS	ASTRAL FOODS	CARGO CARRIERS
ADCOCK INGRAM HDG	ASTRAPAK	CASHBUILD
ADCORP HOLDINGS	ASTRAPAK PREF.	CAXTON & CTP PB&PRT.
ADRENNA PROP GROUP	ATLATSA RESOURCES	CENTRAL RAND GOLD
ADVTECH	AUSTRO GROUP	CHEMICAL SPECIALITIES
AECI LIMITED	AVENG	CHOICE HDG.
AFGRI	AVI	CHROMETCO
AFN.RAINBOW MRLS.	AWETHU BREWERIES	CIC HOLDINGS
AFRICA CELULAR.TOWERS	B&W INSTM.& ELEC	CITY LODGE HOTELS
AFRICAN & OS.ENTS.	BAKERS S A	CLICKS GROUP
AFRICAN BANK INVS.PREF.	BARCLAYS AFRICA GROUP	CLIENTELE
AFRICAN DAWN CAPITAL	BARLOWORLD	CLOVER INDUSTRIES
AFRICAN MEDIA ENTAIN LTD	BARLOWORLD 6% CPF.	COMAIR
AFRICAN OXYGEN	BASIL READ	COMBINED MOTOR
AFRIMAT	BAUBA PLATINUM	COMMAND
AFROCENTRIC INV.	BEE-SASOL	COMPU CLEAR.OUTSC.
AH-VEST	BEIGE	CONDUIT CAPITAL
ALERT STEEL HDG.	BEIGE HODLINGS	CONS.FRAME & TEXT.
ALEXANDER FORBES PREF.	BELL EQUIPMENT	CONSOLIDATED INFR.GP.
ALLIANCE MINING	BIDVEST GROUP	CONTROL INSTR
ALLIED ELECTRONICS	BIOSCIENCE BRANDS	CONVERGENET HDG
ALLIED ELTN.PTG.PREF.	BK ONE PREF.	CORONATION FD.MGRS.
ALLIED TECHNOLOGIES	BLACKSTAR GROUP	CORPORATE BK.GP.
AMALGAMATED ELT.	BLUE CIRCLE CEMENT	CORVUS CAP.(SA)
ANDULELA INVESTM HDG.	BLUE FINANCIAL SERVICES	CORWIL INVESTMENTS
ANGLO AMERICAN PLAT	BLUE LABEL TELECOMS	COUNTRY BIRD HDG
ANGLO TVAAL.COLR.	BNP PARIBAS	CREDIT U HOLDINGS
ANGLOGOLD ASHANTI	BONATLA PR.	CROOKES BROTHERS
ANGLORAND HDG. 5.5% CPF	BOWLER METCALF	CSG
ANNUITY PROPERTIES	BRIAN PORTER HDG	CULLINAN
ANSYS	BRIKOR	CULLINAN 5.5% CPF.
ARB HOLDINGS	BRIMSTONE INV.	CURRIE FINANCE
ARCELORMITTAL SA.	BRIT.AMER.TOBACCO	CURRO HOLDINGS
ARDOR	BSI STEEL	DATACENTRIX

ARGENT INDUSTRIAL	BUILDMAX	DATATEC
DB DIDATA	FORTRESS INCOME FUND 'B'	ISA
DB GOLD FIELDS 5000	FOUNTAINHEAD PR.TST.	ITALTILE
DE BEERS INDL.	FRALEX	ITRIX FTSE100 FUND
DELTA EMD	GLOBAL ASSET MAN.	JASCO ELTN.
DELTA PROPERTY FUND	GOLD FIELDS	JCI
DIGICORE	GOLDFIELDS OF NAMBIA	JD GROUP
DIMENSION DATA HDG.(JSE)	GOLIATH GOLD MINING	JOHN DANIEL HDG.
DIPULA INCOME FUND 'A'	GOOD HOPE DIAS.(KIMB.)	JSE
DIPULA INCOME FUND 'B'	GOODERSON LEISURE	JUBILEE PLATINUM (JSE)
DISCOVERY	GRAND PARADE INVESTM	KAP INDUSTRIAL
DISCOVERY PREF.	GRINDROD	KAYDAV GROUP
DISTELL GROUP	GRINDROD CUM PREF.	KEATON ENERGY HOLDINGS
DON GROUP	GROUP FIVE	KELLY GROUP
DORBYL 5% CPF.	GROWTHPOINT PROPS.	KIBO MINING
DORBYL 5.5% CPF.ZAR2	HARMONY GOLD MNG.	KIMBERLEY CONS.MINING
DORBYL SUSP - SUSPENDED	HEALTH STRATEGIC INV.	KIWARA (JSE)
DRD GOLD	HOLDSPORT	KUMBA IRON ORE
DRD GOLD NEW 08/07/05	HOSKEN CONS.INVS.	LABAT AFRICA
DS.& WHSG.NETWORK	HOSPITALITY PR.FD.A	LEWIS GROUP
DYNAMIC TECH.HDG.	HOSPITALITY PR.FD.B	LIBANON GDMNG.
EDGARS CONS.STORES 6% CPF.	HOWDEN AFRICA	LIBERTY 11% CPF.ZAR 0.10
EFFICIENT GROUP	HUDACO	LIBERTY HOLDINGS
ELB GROUP	HUGE GROUP	LIFE HEALTHCARE GP.HDG.
ELEMENTONE	HULAMIN	LITHA HEALTHCARE GROUP
ELLIES HOLDINGS	HYPROP INVESTMENTS	MACMED HEALTH 6.9% PREF.
ELT.MEDIA NETW SUPERSPORT	ILIAD AFRICA	MACQUARIE SECS.
EMIRA PROPERTY FUND	ILLOVO SUGAR	MALHOLD
EOH	IMBALIE BEAUTY	MARSHALL MONTEAGLE
EQSTRA HOLDINGS	IMPALA PLATINUM	MAS REAL ESTATE (JSE)
ERBACON INVESTMENT HDG.	IMPERIAL	MASONITE AFRICA
ESOR	IMPERIAL HOLDINGS PREF.	MASSMART
ETN.TRANSVAAL	INDEQUITY GROUP	MASTER DRILLING GROUP
EVRAZ HIGHVELD STL.VNM.	INFRASORS HOLDINGS	MAZOR GROUP
EXXARO RESOURCES	INGENUITY PROPERTY INVS.	MEDICLINIC INTERNATIONAL
FAIRVEST PR.HDG.	INSIMBI RF&ALY.SUPS.	MERAFE RESOURCES
FAMOUS BRANDS	INTERWASTE	METAIR INVESTMENTS
FENIX INDUSTRIES	INVESTEC	METJE & ZIEGLER 5.5% CPF.
FINBOND GROUP	INVESTEC BANK PREF.	METMAR
FIRSTRAND	INVESTEC PF.	METROFILE
FIRSTRAND B PREF.	INVESTEC PROPERTY FUND	MICROMEGA HDG.
FONEWORX HOLDINGS	INVICTA	MILLENIUM ENTM.GP. AFRICA
FOORD COMPASS	INVICTA HLDGS PREF PRF	MINE RESTORATION INVS.
FORTRESS INCOME FUND 'A'	IQUAD GROUP	MIRANDA MRL.HDG.

MIX TELEMATICS	PIONEER FOOD GROUP	SABVEST 'N'
MMI HOLDINGS	PLATFIELDS	SACOIL HOLDINGS
MONDI	POYNTING HOLDINGS	SAFMARINE & RENNIES 7.2%
MONEY WEB	PREMIUM PROPERTIES	SAFMARINE & RENNIES 7.5%
MORVEST BUS. GROUP	PRES.BRAND GOLD	SANLAM
MPACT	PRESCIENT	SANTAM
MR PRICE GROUP	PRIMESERV GROUP	SANTOVA
MTN GROUP	PRIMOSE GOLD PREF.	SANYATI
MURRAY & ROBERTS	PROTECH KHUTHELE HDG.	SAPPI
MUSTEK	PSG FINL.SVS.PREF.	SASFIN
MVELAPHANDA RES.	PSG GROUP	SASFIN CV.PREF.ZAR 0.01
NAMPAK	PSV	SASOL
NAMPAK 6% CPF.	PURPLE CAPITAL	SATRIX 40 TRUST
NAMPAK 6.5% PREF.	PUTPROP	SATRIX DIV PLUS PRTF.
NASPERS	QUANTUM PROP GROUP	SATRIX FINI
NEDBANK	QUEENSGATE HTL.& LEIS.	SATRIX INDI
NEDBANK GROUP	RAND MERCHANT IN.HDG.	SATRIX RESI PORTFOLIO
NETCARE	RANDGOLD & EXP.	SBRJNOV13 ETN
NETCARE PREF.	RARE HOLDINGS	SCOTTISH CABLES S A
NEW EUROPE PR.INVS	RAUBEX GROUP	SEA KAY HOLDINGS
NEW GOLD ISSUER	RBA HOLDINGS	SEARDEL INV.
NICTUS BEPERK	RCL FOODS	SEARDEL INV.
NIVEUS INVESTMENTS	REBOSIS PROPERTY FUND	SECUREDATA HOLDINGS
NORTHAM PLATINUM	RECM & CALIBRE PREF.	SEKUNJALO INVS.
NU WORLD	REDEFINE PROPERTIES	SENTULA MINING
NUTRITIONAL HOLDINGS	REDEFINE PROPS.INTL.RFD	SEPHAKU HOLDINGS
OASIS CRES.PR.FD.	REMBRANDT BELEGGINGS	SHERBOURNE CAPITAL
OCEANA GROUP	REMGRO	SHOPRITE
OCTODEC INVESTMENTS	RESILIENT PR.INC.FD.	SHOPRITE 2ND 5% PREF.
OMNIA	REUNERT	SHOPRITE 5% PREF.
ONELOGIX GROUP	REUNERT & LENZ	SHOPRITE 6% PREF.
ORION REAL ESTATE	REX TRUEFORM 6% CPF.	SHOPRITE HLDG 5 ZAR PRF
PALABORA MINING	REX TRUF.CLOTH.	SIBANYE GOLD
PALLINGHURST RESOURCE	REX TRUF.CLOTH.'N'	SILVERBRIDGE HDG.
PAMODZI GOLD	RGT SMARTINTGE.	SIMMER & JCK.MINES
PAN AFRICAN RES.	RMB	SOUTH AFN.COAL MNG.HDG.
PCC	ROLFES TECHNOLOGY	SOUTH OCEAN
PEREGRINE HOLDINGS	ROYAL BAFOKENG PLAT	SOVEREIGN FOOD INVS.
PETMIN	S & J LAND	SPANJAARD
PHUMELELA GMG.& LEIS.	S A DRUGGISTS	SPAR GROUP
PICK N PAY HOLDINGS	SA CORPORATE.FUND	SPUR
PICK N PAY STORES	SABLE PLATINUM	SQUARE ONE SLTN.GP.
PINNACLE	SABVEST	STANDARD BK.GP.

STANDARD BK.GP.PREF.	TRUSTCO GROUP HOLDINGS
STD.BK.GP.6.5% CPF.	TRUWORTHS INTL.
STEFANUTTI STOCKS HDG.	TSOGO SUN
STEINHOFF INTL.	UBUBELE HOLDINGS
STEINHOFF INTL.INVESTMENT HOLDINGS.	UNIDEV
STERLING WTF.CCN SP ETN	UNION CORP. SA.
STOCKS&STOCKS	UNION STEEL CORP.
STRATCORP	VALUE GROUP
SUN INTERNATIONAL	VENTERSPOST GOLD
SUPER GROUP	VERIMARK
SWIX TOP 40 PORTFOLIO	VILLAGE MAIN REEF
SYCOM PROPERTY FUND	VIVIDEND INCOME FUND
SYNERGY INCOME FUND 'A'	VODACOM GROUP
SYNERGY INCOME FUND 'B'	VOLKSKAS GP.
TASTE	VUKILE PR.FUND
TELEMASTER HDG.	VUNANI
TELKOM SA SOC	VUNANI PROPERTY INV.FUND
THABEX EXPLORATION 15.3% DEB.	W G WEARNE
THE FOSCHINI GROUP	WESCOAL
THE FOSCHINI GROUP PREF.	WESIZWE PLATINUM
TIGER BRANDS	WILLIAM TELL HDG.
TIMES MEDIA GROUP	WINHOLD
TONGAAT-HULETT	WITBANK COLLIERY
TORRE INDUSTRIAL HLDGS	WITS.CONS.GD.RES.
TOTAL CLIENT SERVICES	WLSN.BAYLY HOLMES-OVCON
TOWER	WOOLTRU 6% CPF.
TOWLES EDGAR JACOBS VAR. PREF.	WOOLTRU 6.75% CPF
TRACKHEDGE PROPERTY	WOOLTRU 'N'
TRADEHOLD	WOOLWORTHS HDG.
TRADEHOLD	WORKFORCE HDG.
TRANS HEX GROUP	YORK TIMBER HDG.
TRANSACTION CAPITAL	ZCI
TRANSPACO	ZEDER INVESTMENTS
TREMATON CAP.INVS.	ZURICH INSURANCE
TRENCOR	

APPENDIX B

List of companies that delisted at some stage during the study

A M MOOLLA GP.	ANGLOVAAL PREF.	BEST CUT
ABACUS TECH.	ANGLOVAAL INDUSTRIAL	BESTER INV.
ABBEY	ANGLOVAAL INSURANCE	BEV.& CONSUMER IND.
ABERDARE CABLES	ANGLOVAAL 'N'	BID
ABRAXAS INV.	APEX PROPERTY FUND	BIDBEE -
ACCORD TECHS.	APEXHI PROPERTIES 'A'	BILLBOARD
ACUMEN	APEXHI PROPERTIES 'B'	BK.MILLENNIUM GDR
ADMIRAL LEIS.WLD.	APEXHI PROPERTIES 'C'	BLYVOORUITZICHT G M
ADVANCED TCHN.SYSTEMS	APEXHI PROPS.	BOE CORP
ADVENT PROPS.	APL.	BOE CV.PREF.
ADVSOURCE HDG.	APS TECHNOLOGIES	BOE CV.PREF.
AFGEM	AQUA ONLINE HDG.	BOE
AFLEASE GOLD	AQUILA GROWTH	BOE
AFRIBRAND	ARCAY GP.	BOLAND BANK
AFRICAN BRICK CENTRE	ARCH EQUITY	BOLAND BANK PREF.
AFRICAN CABLES	ARIES INVESTMENT HDG.	BOLTON FOOTWEAR
AFRICAN HARVEST	ARMATO	BOLTON INDL.
AFRICAN LIFE ASR.	ASSMANG	BOLTON INDL.5.5% CPF.
AFRICAN PARTNERSHIP	ATLAS PROPERTIES	BONNITA
AFROX HEALTHCARE	AUKLAND HEALTH	BOTSWANA RST
AG INDUSTRIES	AUTOMAKERS	BOWLER METCALF LTD.'N'
ALACRITY FINL.SVS.	AUTOPAGE HDG.	BOYMANS
ALAN GRAY PR.INVS.	AUTOQUIP	BRACKEN MINES
ALEX WHITE	AVGOLD	BRAEMORE RESOURCES (JSE)
ALEXANDER FORBES	AVIS STHN.AFRICA	BRANDCORP
ALLIANCE PHARM.'N'	AVMIN	BRANSBY INV.
ALLIANCE PHARMACEUTICALS	AVUSA	BRIAN PORTER
ALLWEAR	AWETHU BREWERIES OPT	BRYANT TECHNOLOGY
ALUDIE	AXIAM	BUFFELSFONTEIN GD.MNS.
AMAL.APPC.	BARNARD JAC.MELLET	BURLINGTON INDS.
AMAL.BEVERAGES IND.	BARNATO EXPLORATION	BURLINGTON INDS.6% CPF.
AMALIA GOLD MNG.& EXP.	BARPLATS INVS.	BYNX
AMB	BARPROP - UNITS	BYTES TECH.GP.
AMBIT PROPERTIES	BARPROP LU	CADBURY SCHW.OF SA.
AMLAC	BATEMAN INDUSTRIAL	CANADIAN OS.PACK.
ANGLO AMER.COAL	BATEMAN PROJECT HDG.	CAPE EMPOWERMENT
ANGLO AMER.GOLD.INVESTG.	BDGSN.FRSTN.MXPR.	CAPESTAR
ANGLO AMER.INV.TST.	BEARING MAN	CAPEVIN INVESTMENTS
ANGLO AMERICA INDL.	BEATRIX MINES	CAPITAL ALL.
ANGLO PLATINUM PF	BEGET HOLDINGS	CARLTON PAPER
ANGLO TVAAL.COLR.	BEIGE HOLDINGS PREF.	CARSON
ANGLO-AMERICA PROPERTIES	BENGEULA CONCESSION	CASEY INVESTMENT HDG.'N'
ANGLOVAAL 'A'	BERGERS TRADING	CAXTON NEW
ANGLOVAAL HDG.	BERZACK BROS.	CAXTON PUBLISHERS& PRNT.

CBD PROPERTY FUND	CONSHU	DIAMOND CORE RES.
CBS PROPERTY PRTF.	CONSOL	DIVERSIFIED PR.FD.
CCI	CONSOL	DJI CLOTHING INV.HDG.
CCN HOLDINGS	CORNICK GP.	DNA SUPPLY CHN.INV.
CELCOM GROUP	COROHEDGE CAP.	DOORNFONTEIN GOLD
CELTRON TECHS.	CORONATION	DUIKER MINING
CEMENTATION 6% CPF.	CORONATION 'N'	DUNLOP AFRICA 6% CPF.
CEMENTATION CO.OF AF.	CORPCAPITAL BK.CNTLG.	DUNLOP AFRICA
CENTRAL INFORMATION	CORPCAPITAL	DUNLOP SA.
CENTRECITY PR.FUND	CORPCAPITAL	DYNAMO RETAIL
CENTURY CARBON MNG.	CORPCOM	EAST RAND GOLD & UR.
CERAMIC INDUSTRIES	CORPORATE AFRICA	EAST RAND PTY.MINES
CG SMITH	CORPORATE MAN.	EAST TRAN.CONS.MNS.
CG SMITH FOODS	COUNTRY FOODS	EASTVAAL GOLD
CGU	CREDCOR	EC HOLD
CHARIOT LAND	CROWN CONS.GOLD	EDGARS CONS.STORES
CHARTER (JSE)	CRUSADER LIFE ASSURANCE	EDUCOR
CHEMICAL SERVICES	CRUX TECHS.	EERSTELING GD.MNG.
CHESTER INV.	CS COMPUTER SVS.	ELAND PLATINUM
CHET INDS.	CULLINAN HOTELS & LEIS.	ELANDSRAND GLDMG.
CHILLERS GROUP	CYCAD FINL.HDG.	ELB 6%CUM PREF.
CHOICE	DA GAMA TEXTILE	ELLERINE
CHROMECORP	DAEWOO ELTN.OF SA.	ELVEY SECURITY TECHS.
CHUBB	DALYS	ENERGY AFRICA
CIPLA MEDPRO	DARMAG	ENGEN
CLIENTELE LF.ASR.	DATAKOR	ENTER.RS.MAN.
CLINIC	DB AMPLATS 10000 C	ENVIRONMENTAL RES.
CLOVER INDUSTRIES PREF.	DB BARLOWS 6000C	ENVIROSERV
CLYDE INDUSTRIAL	DB COMPAREX 5000C	EQUIKOR
COASTAL GROUP	DB FINL.95000 C	EQUINOX
COATES BROS.SA.	DB INVESTEC 35000	ETTINGTON INV.
COMMERICAL FIN.CO.	DB ISCOR 200 C MAROO	EUREKA INDUSTRIAL
COMMUNITY TECHS.	DB REBHOLD 3500 C	EVANDER GOLD MINES
COMPASS PR.HDG.	DB SASOL 7000 C	EVERITE
COMPUTER CONFIG	DE BEERS 8% 2ND.CPF.	EVERITE GROUP
CONAFEX HOLDINGS (JSE)	DE BEERS CONS.40% CPF.	EXCEL MEDICAL
CONCOR	DE BEERS CONS.MINES	EXCELLERATE HDG.
CONGELLA FEDN.	DECOMAC	EXXOTEQ
CONGELLA FEDN.6% CPF.	DEELKRAAL GDMNG.	FASHION AFRICA
CONNECTION GP.	DEL MONTE ROYAL	FASIC
CONS.METALLURG IND.	DEL MONTE ROYAL FOODS	FBC FIDELITY BANK
CONS.MINING	DEL MONTE RYL.HDG.	FBC FIDELITY BANK LS
CONS.MODDFTN.MINES	DIAL A MOVIE	FBC 'N'
CONS.PROPERTY & FIN.	DIALOGUE GROUP HDG.	FE SQUARED

FEDSURE 135C CV.PREF.	GLOBAL TECHNOLOGY	IFOUR PROPERTIES
FEDSURE	GLOBAL VILLAGE	I-FUSION
FELTEX	GLODINA	IGI INSURANCE CO.
FINTECH	GLOHOLD	IMPERIAL BANK PREF.
FIRST INTL.TST.	GOLD FIELDS COAL	IMPERILOG
FIRST LIFESTYLE	GOLD FIELDS	IN.OUTSC.MGRS.
FIRST NAT.BANK HOLDINGS	GOLD FIELDS OF SA.	INCENTIVE
FIRST URANIUM (JSE)	GRAY SECURITY SERVICES	INDEPENDENT NEWSPAPERS
FIRSTRAND B1 PREF.	GRIFFIN SHIPPING	INDL.& COML.HDG.GP.
FOODCORP	GRINAKER CON.	INDL.CR.CO.AF.
FORIM HOLDINGS	GRINDROD 'N'	INFINITI TECHNOLOGIES
FORTUNE BEVERAGES	GRINTEK	INGWE COAL
FORZA GP.	GRIQUALAND EXP.&FIN.	INMINS
FRALEX	GROOTVLEI PTY.MINES	INTEGRATED TECH.HDG.
FRALEX 'N'	GROUP FIVE HDG.	INTERLEISURE
FRAME GP.	GROUP FIVE LTD.'N'	INTERTRADING
FRAME GP.5.5% CPF.	GROVE PROPERTY FD.	INTERVID
FRANSAF	GUARDIAN NAT.INS.	INVEGO INVESTMENT
FRASER ALEXANDER	GUBB & INGGS	INVESTEC HDG.
FREE STATE CONS.GD.MNS.	GUNDLE	INVESTEC INV. TRUST
FREE STATE DEV.& INV.	GYPSUM INDS.	INVESTMENT SOLUTIONS
FREESTONE PR.HDG.	HAGGIE	INVMANAG
FREEWORLD COATINGS	HALOGEN HOLDINGS (JSE)	IOTA FINL.SVS.
FRONTRANGE SLTN.	HARDWARE WAREHOUSE	IPROP
FS GROUP	HARTEBEEST.GOLD MINING	IRVIN & JOHNSON
FS GROUP PREF.	HARWILL INVESTMENT	ISLAND VIEW STORAGE
FURNCO INVS.	HICKSON CHEMICAL	IST GROUP
FURNEX CAP.	HICOR	JCI GOLD
FUSION CAPITAL	HIGHGATE PR.FD.	JD GROUP CUM.PREF.
GALLAGHER ESTATE	HIGHSTONE PR.FD.	JIGSAW
GAZANKULU GOLD	HIX TECH.	JOHANNESBG.I CERT.(PAR)
GEM DIAMOND MINING	HJ JOEL GD.MNG.	JOHNNIC
GEN.TYRE INDS.'A'	HOECHST SOUTH AFRICA	KAGISO MEDIA
GEN.TYRE INDS.'B'	HOMECHOICE	KAIROS INDL.
GENBEL SECURITIES	HORTORS	KALAHARI GOLDRIDGE MNG.
GENBEL SOUTH AFRICA 'A	HUNT LEUCHARS & HEPBURN	KAROS HOTELS
GENBEL SOUTH AFRICA	HUNT LEUCHARS 7% CV.CPF.	KAROS HTLS.12% CPF.
GENCOR 6% CPF.	HUNTCOR	KELGRAN
GENCOR BEHEREND	HYPROP INVEST	KETTER GRANITE HDG.
GENCOR	IBM SOUTH AFRICA	KING CONS.
GENCOR LTD.FPL	ICS	KIRCHMANN-HURRY PR.
GENERAL OPTICAL	IDION TECH.	KLIPTON
GLENRAND M I B	IFA HOTELS & RSTS.	KLOOF GOLD MINING
GLOBAL CAPITAL PRIV.EQ.	IFANET	KNIGHTS GOLD MINING CO.

KOHLER	MAS	MORESPORT
KOPP ELECTRONICS	MASTERFRIDGE (JSE)	MOULDED MED.SUPS.
KROONDAL PLATINUM MINES	MATHESON & ASHLEY HDG.	MSAULI ASBESTOS BPK
KUDU GRANITE HDG.	MATHOMO GROUP	MUTUAL & FEDERAL IN.
KUNENE TECH.	MAXTEC	MUVONI TECH GROUP
KWIKSPACE MODULAR BDGS.	MAXTEL	MVELAPHANDA GROUP PF
L T A	MAXTEL 'N'	MVELASERVE
LA GROUP	MB TECHS.	M-WEB
LA GROUP 'N'	MCCARTHY	NAMIBIAN FSHG.IND. (JSE)
LANGEBERG	MCCARTHY GROUP	NAMIBIAN SEA PRDS.
LEBOWA PLAT.MINES	MDM GW.INV.	NANDO'S GP.
LEISURENET	MEGACOR	NATAL OCEAN TRAWLING
LENCO	MERCANTILE BANK	NATIONAL CHICK
LESLIE GOLD MINES	MERCHANT & INDL.PROPS.	NATIONAL SPORTING INDEX
LEWIS FOSHINI INV.'N'	MERHOLD INV.	NATURAL HEALTH
LIBERTY GROUP	MERHOLD INVESTMENT	NBS BOLAND GP.
LIBERTY INVESTORS	MESSINA	NEDCOR INVESTMENT BK.
LIBLIFE STGC.INVS.	MESSINA INV.	NEDENTRE
LINDUM REEFS GOLD MINING	METBOARD PROPERTY FUND	NEDGROW
LITHOTECH	METBOARD PROPS.	NEDMAN
LOGOPT	METCLICK LTD.	NEDSYNCHR
LOGTEK HDG.'N'	METJE & ZIEGLER	NEI AFRICA
LONGRAIL	METKOR GROUP	NET 1 APPLIED TECH.
LONRHO	METMONEY	NEW AF.INV.
LONRHO SUGAR	METOREX	NEW AF.INVT.
LORAINE GOLD	METOZ HOLDINGS	NEW BOND CAPITAL
LYDENBURG EXP.	METROPOLIS TRANSACT	NEW CTL.WITS.AREAS
LYDENBURG PLATINUM	METTLE	NEW WITS
LYONS FINL.SLTN.HDG.	MHANGURA CPR.MNS. (JSE)	NEWPORT PROPERTY FUND
M CUBED HOLDINGS	MICC PR.INC.FD.	NEXTTVEST
MACADAMS BAKERY SUPPLIES	MICOR	NIMBUS
MACMED HEALTH CARE	MIDAS	NINIAN & LESTER
MACPHAIL	MIH HDG.	NOBLE MINERALS
MADISON PROP FD.MGRS.	MILLENIUM PR.	NORTHERN BAKERIES
MAGNUM GLB.FUND.	MILLIONAIR CHARTER	NORWICH SA.
MAIN STREET PR.FUND	MINE WASTE SLTN.PREF	NRB
MAKALANI HOLDINGS	MINORCO SC.ANONYME	NTHN.ENGR.INDS.AF.
MALBAK	MMW TECHNOLOGY	OCEAN DIA.MNG.HDG.
MARANDA MINES	MOBILE INDUSTRIES	OCEANA INV. (JSE)
MARLIN CORPORATION	MOBILE INDUSTRIES 'N'	OFS INVESTMENTS
MARLIN	MOLOPE GROUP	O'HAGAN'S INV.
MARSHALL MONTEAGLE (JSE)	MOLOPE GROUP 'N'	OK BAZAARS
MARSHALLS	MONEX	O-LINE HOLDINGS
MARSHALLS 'N'	MONYETLA PROPERTY FUND	OMEGA ALPHA INTL.ITECH.

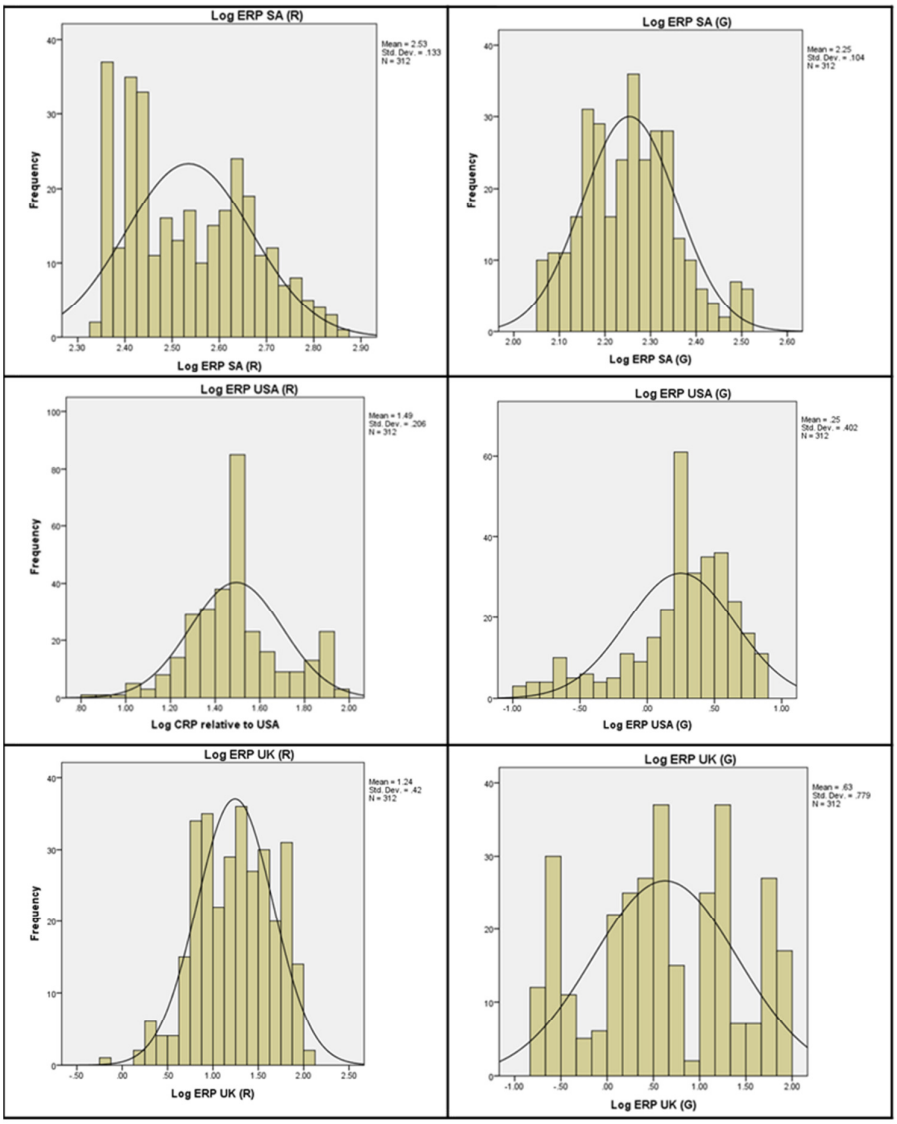
OMEGA	POWER TECHS.	RENTSURE HDG.
OPTIMUM COAL HOLDINGS	PRADA TECHS.	RETAIL APPAREL GP.
ORION SELECTIONS	PREMIER GP.5.5% CPF.	RETAIL
ORION SELECTIONS	PREMIER GROUP	REUNERT 5.5% CPF.ZAR2
ORYX GOLD HOLDINGS	PREMIER PHARM.	RHOEX
OSI	PRESIDENT STEYN GOLD MIN	RHOMBUS VAN ADIUN
OTIS ELEVATORS	PRIMA PROPERTY TST.	RICHWAY RET.PROPS.
OTR MINING	PRIMA TOY&LEISURE GP.	RL.AF.INVT.
OXBRIDGE ONLINE	PRIMEDIA	RL.PEOPLE FIN.
OZZ	PRIMEDIA 'N'	RMS PROPERTY HDG.
PACIFIC ASIA INVESTMENTS	PRIMEDIA PREF.	ROADCORP
PACIFIC	PRIMEGRO PROPS.	ROADCORP
PALADIN CAPITAL	PRISM	ROMATEX
PALS	PROFURN	RRM INVS.HDG.
PANGBOURNE PROPS.	PROGRESS IND.	S A DRUGGISTS
PARACON	PROPERTY CORP.OF SA.	S M GOLDSTEIN
PARADIGM CAPITAL	PROSPUR PACK&PLASTICS	SA EMPOWERMENT FD.INV.
PARAGON BUS.COMM.	PROTEA ASR.	SA FRENCH
PARAMOUNT PR.FD.	PSG FINL.SVS.	SA.RESERVE BANK
PASDEC RESOURCES	PSG INVEST BK.	SAAMBOU
PEERMONT GLOBAL	PSG NOBLE CAP.	SABHOLD GROUP
PENNYSTOCKS INVS.	PUTCO	SABLE
PENROSE	PUTRA STERLING LTD.	SAB-T UBUNTU
PENTACOM	Q DATA	SAFICON INV.
PEP	Q MART	SAFMARINE & RENNIES
PEPGRO	QUICK	SAFN.BREWS.6.2% CPF.
PEPGRO 'N'	RACEC GROUP	SAGE GROUP CUM. PREF.
PEPKOR	RADIOSPOOR TECH.	SAGE GROUP
PERSKOR BELEGGINGS BPK	RALE	SAIL GP.
PGM INVS.	RAND LEASES GOLD	SAKERS FIN.& INV.
PICARDI BELEGG.	RAND LEASES PROPS.	SALLIES
PICK N PAY 'N'	RAND LONDON	SAMANCOR
PICK N PAY STORES 'N'	RAND MINES	SAMGRO INV.
PIONEER PROPERTY FD.	RANDEX	SAMGRO INV.7.78
PLACOR HOLDINGS	RANDFNT.ESTS.	SAMRAND DEV.
PLANIT TECH.	RARE EARTH EXTN.	SASANI
PLASGROUP	REAL AFRICA	SBSA ABSA 3000 C JAN00
PLATE GLASS 6.5% B CPF.	REAL AFRICA DUROLINK	SBSA ALSI40 5000 C MAR00
PLATE GLASS IND.	RECTRON	SBSA ALSI40 5500 P MAR00
PLATMIN (JSE)	REDEFINE PROPS.INTL.	SBSA ALSI40 6000 C MAR00
PLESSEY	REF FIN.&INV.	SBSA AMP 15000 C NOV 99
POLIFIN	REGAL TREASURY BANK	SBSA FSR 800 C OCT99

PORTLAND	RELYANT RETAIL	SCHARRIGHUISEN
POTGIETERSRUST PLAT.	RENAISSANCE RETAIL GP.	SEA HARVEST
SEARDEL CONS.HDG.	STILFONTEIN GDMNG.	TOLERAM 2000
SEARTEC	STOCKS & STOCKS	TOMKOR
SEEFF	STOCKS RESORTS&HOTELS	TOP INFO TECH.
SEMPRES INTL.TECH.HDG.	STOCKS&STOCKS HDG.	TOURISM INV.
SENTRACHEM	STORECO	TOYOTA SA.
SENTRY GP.	STORECO N	TRADEK HDG.
SERVEST	STRAND GP.	TRANSKEI SUN INTL.
SET POINT GROUP	STREAMWORKS GROUP	TRANS-NATAL COAL
SHAWCELL TELECOM.	SUN INTER CISKEI	TRIDELTA MAGNET TECH.
SHOREDITS	SUN INTL.(SA)LD	TWEEFONTEIN UTD.COLR.
SILTEK	SUNCRUSH	TWP HOLDINGS
SILVEROAKS IND.	SWEETS FROM HEAVEN	UBS ALSI R4200 P MAR00
SIYATHENGA PR.FUND	T&N	UBS ALSI R5000 C MAR00
SMACSOFT GROUP	TAMBOTI PROPS.FUND	UBS INDI R5000 P MAR00
SMART CENTRE	TAUFIN	UBS INDI R6000 C MAR00
SMG	TAVISTOCK COLLIERIES	UCS GROUP
SNA	TEAL EXP.& MNG. (JSE)	UMBONO INV.CORP.'N'
SOFTLINE	TECHNICAL & INDUSTRIAL	UMDONI PROPERTY FUND
SOLCHEM INV.	TECHNIHIRE	UNIFER HDG.
SONDOR INDS.	TEDELEX	UNIHOLD
SOUTH AF.RET.PROPS.	TEGNIESE BEL	UNION MINES
SOUTH AFRICAN BIAS INDS.	TELEMETRIX (JSE)	UNISPIN
SOUTH DEEP EXPLS.	TELJOY	UNITED SERVICE TECHS.
SOUTH ROODEPORT MAIN	TELTRON	UNITRANS
SOUTHERN ELTY.	TEMPORA	UNIVERSAL GW.
SOUTHERN LIFE AS.	TEREXKO	UNIVERSAL INDS.CORP.
SOUTHERN MINING	TERRAFIN	URANIUM ONE (JSE)
SOUTHVAAL	TEXTILE MILLS	VAALAUTO
SPEARHEAD PROPS.	THABEX	VAALTRUCAR
SPECIALITY STORES 'N'	THE CLICKS GROUP	VALUECOM
SPESCOM	THE FEDICS GP.	VANSA VANADIUM
SPICER	THE HOUSE OF BUSBY	VEKTRA CORP. (JSE)
SPUR	THE INET.GMG.	VELOCITY
SPUR STEAK RANCHES	THE LASER GROUP	VENFIN
ST.HELENA GDMNG.	THEBE FINANCIAL SERVICES	VENTER LEIS.COML.TLR.
STANDARD BRASS	THUTHUKANI GROUP	VENTRON
STANTRONIC GP.	THW INVS.	VESTACOR
STEERS 'N'	TIGER AUTOMOTIVE	VIK.INVS.& ASST.MAN.
STELLA VISTA TECHS.	TIGER BRANDS 5.5% CPF.	VLAKFONTEIN GOLD MNG.
STELLENBSCH FARMERS WINE	TIGER WHEELS	VOGELSTRUISBULT MTL.
STERLING WATERFORD	TIGON	VOLTEX
STH.AFN.BREWS. 7% CPF.	TILE AFRIKA	VOXTELECOM

STHN PLAT
TIMES MEDIA
TOCO HDG.
WACO INTERNATIONAL
WAICOR
WALTONS STATIONERY
WELKOM GOLD HDG.
WESCO INVESTMENTS
WEST RAND CONS.MINES
WESTERN AREAS
WESTERN CAPE PROPERTY
WESTERN DEEP LEVELS
WETHERLYS INV.
WHETSTONE INDUS LD
WHOLESALE PHARM.
WILSON BAYLY HOLMES 'A'
WINBEL
WINECORP
WINHOLD 9% CPF.
WINKELHAAK MINES
WITWATERSRAND GD.MNG.
WOMEN INVESTMENT PRTF.
WORLD EDUCATIONAL TECH.
WS.WITWATERSRAND GD.HDG.
YABENG INV.
ZANDPAN GOLD MNG.
ZAPTRONIX
ZARARA EN.
ZENITH CONCESS.OPTS.

APPENDIX C

Histograms of log transformed equity risk premiums



APPENDIX D:

Principal components and country risk premiums used in the analysis

YEAR	*P1*	*P2*	*P3*	*CRP (USA)*	*CRP (UK)*
Jan-03	46.51919306	-3.142791427	9.222986069	7.95	7.94
Feb-03	45.62188915	-3.253920157	8.87956575	7.87	7.84
Mar-03	45.81056654	-3.449233011	9.038714474	7.89	7.89
Apr-03	46.96883499	-3.869139721	9.07948499	7.83	7.84
May-03	45.98491544	-2.132804875	8.689283353	7.67	7.69
Jun-03	45.75271134	-1.680731878	8.283832168	7.55	7.63
Jul-03	45.48103355	-1.041407283	8.457819411	7.52	7.61
Aug-03	45.46010968	-0.677447774	8.011533258	7.5	7.6
Sep-03	44.75510632	0.726455617	8.06127033	7.45	7.61
Oct-03	44.68557752	1.129973336	7.952110636	7.38	7.58
Nov-03	46.13085969	1.496329244	8.538126014	7.37	7.59
Dec-03	45.8814311	1.315488197	8.599423098	7.21	7.48
Jan-04	44.98811953	1.693565592	8.692916315	7.16	7.43
Feb-04	44.81902004	1.783084933	8.446565266	7.16	7.42
Mar-04	45.38637485	2.065532737	8.602190124	7.1	7.38
Apr-04	44.52695611	2.321619687	8.505793284	7.04	7.3
May-04	43.93508434	1.997270286	8.188948744	6.99	7.26
Jun-04	44.97045789	1.525315683	8.262307654	6.97	7.27
Jul-04	45.31793778	1.511936948	8.123096891	6.9	7.18
Aug-04	45.21420818	1.787045634	7.947813776	6.81	7.09
Sep-04	44.71788256	1.468518868	7.605980721	6.86	7.14
Oct-04	44.65226481	0.945859795	7.065547556	6.77	7.01
Nov-04	45.26015037	0.726159813	7.037781307	6.65	6.86
Dec-04	45.73959767	0.340551226	6.875287095	6.8	7
Jan-05	45.94212865	0.768789163	6.907525119	6.76	6.9
Feb-05	46.00124938	1.00198928	7.259261093	6.71	6.77
Mar-05	46.05268582	1.160796551	7.470728019	6.86	6.91
Apr-05	47.25031418	0.98016952	7.59895797	6.79	6.77
May-05	46.86961633	1.088424929	7.368475381	6.8	6.81
Jun-05	46.86991199	0.947733177	7.029468095	6.95	6.96
Jul-05	46.58288629	1.116795573	7.101291539	6.9	6.9
Aug-05	46.94988025	1.129284106	7.116387185	6.88	6.86
Sep-05	47.2275786	0.852581156	6.95693724	6.89	6.89
Oct-05	46.84833441	0.529375539	6.566708493	6.81	6.75
Nov-05	46.53748509	0.48267209	6.262071378	6.8	6.6
Dec-05	46.68488984	0.454141141	6.123034	6.93	6.7
Jan-06	47.13198194	0.581857061	6.197581378	7.03	6.79

Feb-06	47.06795458	0.891336409	5.97661373	7	6.67
Mar-06	48.42900008	0.79929354	6.346178825	7.03	6.75
Apr-06	49.43321322	1.126113573	7.236318863	6.99	6.83
May-06	49.69426495	1.091220991	7.495191022	6.95	6.65
Jun-06	49.50162082	0.938845864	7.587307792	7.11	6.85
Jul-06	50.42897514	0.416519626	8.075705239	7.14	6.97
Aug-06	51.15712889	0.044045357	8.092251182	7.09	6.97
Sep-06	50.773299	-0.845261035	7.532060775	7.09	7.03
Oct-06	50.62845218	-0.900831102	7.407512215	7.07	7.11
Nov-06	51.15605611	-1.282699114	7.325341032	7.02	6.96
Dec-06	51.35481819	-1.713178748	7.190001771	7.04	7.02
Jan-07	51.66399707	-1.615555085	7.45052517	7.34	7.37
Feb-07	51.4572752	-1.14414074	7.303154481	7.28	7.33
Mar-07	51.2541401	-1.172262396	7.138377677	7.23	7.31
Apr-07	51.57439637	-0.904842447	7.375599646	7.21	7.28
May-07	51.22023017	-1.156120043	7.440495682	7.27	7.33
Jun-07	51.51573759	-1.202516263	7.849098499	7.41	7.46
Jul-07	51.20167029	-1.169119656	7.886815438	7.42	7.43
Aug-07	50.79323904	-1.574883324	7.378322951	7.47	7.46
Sep-07	50.65010394	-1.920259074	7.559403114	7.77	7.79
Oct-07	50.59166382	-2.269523901	7.650038316	7.7	7.56
Nov-07	50.52019948	-2.438366687	7.92915018	7.66	7.29
Dec-07	52.17455778	-2.285625678	8.659101386	7.73	7.37
Jan-08	53.0443048	-1.791216385	9.435982882	7.61	7.24
Feb-08	52.50960684	-1.593840443	9.135802895	7.47	7.14
Mar-08	51.86372038	-1.22090078	9.056989057	7.45	7.12
Apr-08	52.30719202	-0.771700993	9.678896277	7.77	7.76
May-08	51.90314481	-1.795605521	9.312136366	7.87	7.76
Jun-08	51.64701865	-2.589420099	8.684677865	7.76	7.79
Jul-08	51.83601609	-2.76598028	8.880444755	8.1	7.88
Aug-08	54.89055116	-2.745783743	10.08237769	7.99	8.73
Sep-08	54.47126115	-3.144988011	9.891694305	8.21	8.69
Oct-08	53.19485382	-3.738356736	9.900103771	8.66	8.76
Nov-08	52.81209684	-3.558989754	9.709662553	8.73	8.72
Dec-08	53.05580005	-3.043955621	9.85997626	8.75	8.7
Jan-09	52.62973151	-1.445978795	10.04938881	8.78	8.6
Feb-09	50.75439457	-0.495509265	9.542668503	8.87	8.76
Mar-09	50.11322616	0.071614205	9.093264201	8.87	8.79
Apr-09	50.32836237	0.828467725	8.900106141	8.77	9.11
May-09	49.68386146	1.550326144	9.127637147	8.94	9.17
Jun-09	50.18819273	1.078473072	8.880562899	8.83	9.05
Jul-09	48.90369399	1.332688169	8.624084571	8.79	8.9
Aug-09	48.4697611	2.000678329	8.842628802	8.81	8.89
Sep-09	49.07819692	1.857984348	8.845929455	8.82	8.82

Oct-09	48.91910822	1.853200934	8.678841163	8.76	8.63
Nov-09	48.70939945	2.020538556	8.688308788	8.87	8.56
Dec-09	48.86778855	1.845646286	8.693522191	8.79	8.52
Jan-10	48.16550768	1.813315911	8.261839147	8.76	8.39
Feb-10	48.47018891	1.769636064	8.057997467	8.79	8.53
Mar-10	48.14716522	2.342087524	8.609274271	8.8	8.76
Apr-10	48.04448252	2.364083353	8.77651363	8.76	8.52
May-10	48.22845278	2.164200175	8.768557559	8.76	8.51
Jun-10	48.12878619	1.652993001	8.428051248	8.68	8.49
Jul-10	47.86084718	1.520366131	8.16677678	8.64	8.62
Aug-10	47.45915201	2.000315216	8.199933376	8.58	8.6
Sep-10	47.85122085	2.178843533	8.192039583	8.56	8.6
Oct-10	47.51274455	2.840331206	7.907612042	8.53	8.63
Nov-10	47.80012394	3.011621797	8.005600552	8.44	8.47
Dec-10	48.85199617	3.139440316	8.265500051	8.45	8.5
Jan-11	47.96231716	3.482541721	8.294734834	8.36	8.39
Feb-11	47.94179385	3.346838517	8.008816657	8.31	8.37
Mar-11	48.14363877	3.181883216	8.181163064	8.29	8.36
Apr-11	47.79351616	3.163282567	8.172394684	8.14	8.09
May-11	47.7401323	3.221472915	8.190186082	8.15	8.1
Jun-11	48.53662049	2.662557989	8.54496259	8.18	8.12
Jul-11	49.03758446	2.753389197	9.067019525	8.16	8.09
Aug-11	49.96607597	2.796050221	9.383821007	8.13	7.98
Sep-11	50.43077884	2.805279016	9.660143621	8.09	8
Oct-11	50.22749916	2.851311615	9.689263985	7.9	7.9
Nov-11	49.86580435	2.836201239	9.485125017	7.87	7.73
Dec-11	49.44814236	2.725987879	9.144697929	7.84	7.68
Jan-12	49.37598743	2.850771668	9.070331161	7.81	7.65
Feb-12	50.01612903	2.634527176	9.287068765	7.77	7.61
Mar-12	50.48129519	2.524861341	9.672228012	7.76	7.6
Apr-12	50.61060467	2.364801074	9.845242129	7.67	7.54
May-12	50.80925348	1.752771413	9.353045907	7.61	7.46
Jun-12	51.23324892	1.905361748	9.271542001	7.57	7.43
Jul-12	51.70312744	2.115299632	9.30101252	7.5	7.41
Aug-12	52.39054392	2.39854389	9.736846233	7.4	7.37
Sep-12	52.64920601	2.336750094	9.870355787	7.38	7.36
Oct-12	52.63533202	2.096012457	9.570412914	6.99	7.01
Nov-12	53.11320223	1.919837348	9.449234983	7.06	7.05
Dec-12	52.99523384	1.90229744	9.390210176	7.02	7
Jan-13	53.21381209	1.983567413	9.616624603	6.95	6.94
Feb-13	53.33860751	1.536847625	9.47276113	6.89	6.89
Mar-13	54.02452883	1.37897123	9.52970881	6.84	6.87
Apr-13	55.26034779	2.240440464	10.48883906	6.85	6.82
May-13	54.94357571	2.247255318	10.17696645	6.85	6.79

Jun-13	55.50684212	2.57458825	10.53154091	6.83	6.79
Jul-13	55.81315095	2.365442954	10.35811863	6.71	6.76
Aug-13	55.95881131	2.092664594	10.29858546	6.65	6.73
Sep-13	56.49039112	2.339247522	10.65631309	6.63	6.72
Oct-13	57.21770461	2.341421733	10.80875979	6.63	6.76