EVALUATING THE SHARE PERFORMANCE OF SOCIALLY RESPONSIBLE INVESTMENT ON THE JOHANNESBURG STOCK EXCHANGE

A thesis submitted in partial fulfillment of the requirements for the degree

of

MASTER OF BUSINESS ADMINISTRATION

in the

RHODES BUSINESS SCHOOL

by

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Submission date: 1 July 2016

DECLARATION

I, Bradley Alexander Cormack, the researcher, hereby declare that the work presented in this thesis is my own original work and does not, in its entirety or part, exist as someone else's work. All the sources used in this research have been presented and acknowledged with utmost integrity.

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BRADLEY ALEXANDER CORMACK Date

ABSTRACT

Socially responsible investing (SRI) integrates environmental, social and governance (ESG) issues into the investment decision-making process. Growing ESG concerns and the uncovering of corporate scandals have catalysed the substantial growth in SRI portfolios worldwide. Notwithstanding its increasing popularity, barriers to further SRI growth have been identified. Traditional investing practices suggest that theoretically, SRI may underperform conventional investment strategies. However, despite the vast amount of literature on SRI, empirical studies have yielded a mixture of results regarding fund performance.

The JSE SRI Index was launched in 2004 to promote transparent business practices. It was discontinued at the end of 2015 succeeded by a new Responsible Investment Index established by the JSE in association with FTSE Russell. The aim of the research was to evaluate the share performance of the JSE SRI Index from 2004-2015. Additionally, the indices were categorised by environmental impact to further analyse disparity among share returns. The study was also divided into two sub-periods, 2004-2009 and 2010-2015, with the latter following the endorsement of integrated reporting by the King III Code as a listing requirement in 2010.

A single-factor Capital Asset Pricing Model (CAPM) was used to assess differences in risk-adjusted returns. Engle-Granger and Johansen tests were employed to explore the possibility of a cointegrating relationship between the indices.

No significant difference between returns was observed for 2004-2009, with the SRI Index exhibiting statistically significant inferior risk-adjusted returns for the latter half of the study. Overall, a significant difference between share returns was found, with CAPM results suggesting that the JSE SRI Index underperformed the All Share Index by -2.33% per annum throughout the time span of the study. Engle-Granger and Johansen test results indicated the existence of a cointegrating relationship over the first half of the study. However, there was no cointegration between the two indices for 2004-2015, which may be attributed to no significant relationship found for the latter years.

Results support the notion that investors pay the price to invest ethically on the JSE. Inferior risk-adjusted returns associated with SRI may be a major barrier to its development in South African markets.

ACKNOWLEDGEMENTS

First and foremost, I would like to thank my supervisor Professor Owen Skae for his continuous guidance and confidence in me. I wish to acknowledge the contributions of Professor Sarah Radloff, the Head of the Statistics Department at Rhodes University for advice on statistics central to my research. I am also grateful for Professor Mark Bunting from the Rhodes University Accounting Department for his pragmatic insight into socially responsible investing in South Africa and the challenges presented by the underlying work.

I am immensely grateful for my mom and dad's belief in my abilities and funding my time at the Rhodes Business School. Thank you for bringing me up in a nurturing environment that has always allowed me to strive to do my best. I hope to provide a return on the investment of your time and patience with me in the forthcoming years.

I wish to express my gratitude for my girlfriend, Lauren, for your endless love and support. Thank you to my roommates and best friends, Steven and Basil, for making my time at Rhodes University an absolute pleasure, and a memory I can look fondly upon. Lastly, I am grateful for my feline friends, Taz and Raúl, for their companionship in the absence of human company.

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LIST OF ABBREVIATIONS

ADF – Augmented Dickey Fuller

ALSI – All Share Index

BBBEE – Broad-Based Black Economic Empowerment

CAPM – Capital Asset Pricing Model

CRISA – Code for Responsible Investing in South Africa

CSR – Corporate Social Responsibility

EG – Engle-Granger

EMH – Efficient Market Hypothesis

EPFI – Equator Principles Financial Institutions

ESG – Environmental, Social and Governance

GRI – Global Reporting Initiative

GSIA – Global Sustainable Investment Alliance

IIRC – International Integrated Reporting Council

JHP – Joint Hypothesis Problems

JSE – Johannesburg Stock Exchange

SML – Security Market Line

SRI – Socially Responsible Investing

UNPRI – United Nations Principles for Responsible Investment

1. INTRODUCTION

1.1. INTRODUCTION TO SOCIALLY RESPONSIBLE INVESTMENT

Socially responsible investing (SRI) incorporates social and environmental considerations, underpinned by good governance as a means of investment decision-making (Revelli and Viviani, 2015). The ever-increasing materiality of global challenges surrounding sustainability issues have started to traverse thresholds of significance pertaining to businesses' strategies, as well as their respective stakeholders (International Finance Corporation, 2012).

The Pioneer Fund is considered to be one of the first funds to adopt ethical considerations in investment decisions. It was founded in 1928 in the US and employed religious prohibitions as screening criteria for investments (Junkus and Berry, 2015). Ethical funds were further developed and were popularised by the anti-Vietnam War and anti-Apartheid movements (Viviers and Eccles, 2012). Over the last couple decades, SRI stocks and funds have exhibited considerable growth (Nilsson, 2008). The most recent report by the Global Sustainable Investment Alliance (GSIA) (2015, p. 7) suggest that SRI strategies constituted approximately 30 percent of professionally managed assets in financial markets worldwide at the beginning of 2014 (see Table 1).

Table 1: Proportion of SRI relative to total managed assets

	2012	2014	Growth
Europe	49.0%	58.8%	20.0%
Canada	20.2%	31.3%	55.0%
United States	11.2%	17.9%	59.8%
Australia	12.5%	16.6%	32.8%
Asia	0.6%	0.8%	33.3%
Global	21.5%	30.2%	40.5%

Source: GSIA, 2015

SRI funds and markets have displayed sizeable growth over the last couple decades, seemingly coinciding with the emergence of the concept of sustainable development (Nilsson, 2008). The Brundtland Report, 'Our Common Future', defines sustainable development as "meeting the needs and aspirations of the present generation without compromising the ability of future generations to meet their needs" (World Commission on Environment and Development, 1987, pp. 292).

Similarly, the International Institute for Sustainable Development in conjunction with Deloitte & Touche derived a definition aimed at businesses. "Sustainable development means adopting strategies and activities that meet the needs of the enterprise and its stakeholders today while protecting, sustaining and enhancing the human and natural resources that will be needed in the future" (Deloitte and Touche, 1992). The notion of sustainability exemplifies intergenerational equity and creating long-term value by examining financial, environmental and social factors (Bardy and Massaro, 2012). The combination of the three respective aspects is referred to as the 'triple bottom-line' (Bardy and Massaro, 2012).

Notwithstanding evident SRI portfolio growth, there have been concerns with such strategies, which may include sacrificing risk-adjusted returns (Becchetti et al., 2015). Managi, Okimoto and Matsuda (2012, p. 1511) suggests that SRI growth is a derivative of a combination of expanding stock markets and concerns pertinent to Corporate Social Responsibility (CSR). CSR involves transparent business practices that strive to satisfy economic, environmental and social expectations from stakeholders and society (Hack, Kenyon and Wood, 2014). It has been proposed that CSR can indicate a company's ability to produce a high-quality product translating into superior financial performance of socially responsible companies (Managi, Okimoto and Matsuda, 2012). In stark contrast, adherence to environmental and social standards may also be viewed as a restriction, and thus, SRI portfolios may be outperformed by conventional investment strategies (Managi, Okimoto and Matsuda, 2012).

1.2. THE JSE SRI INDEX

The Johannesburg Stock Exchange (JSE) introduced the SRI index in 2004, which identifies listed companies that incorporate triple bottom line principles into their business practices (JSE, 2014). The index was designed to facilitate responsible investment and adoption of a holistic business approach by investors and companies respectively (JSE, 2014). Since its launch, the index has grown from 51 to 82 companies, further exemplifying the trend of SRI growth (JSE, 2014; JSE, 2015).

All companies are required to show that they meet a set of core principles, which are aligned with globally accepted standards (JSE, 2014). Listed companies vary greatly in the nature of their business activities and are therefore classified as high, medium

or low impact, strictly for environmental purposes (see Appendix A). Companies with similar activities are grouped with respect to their environmental impacts, with both direct and indirect impacts reviewed. Direct impact relates to issues such as water pollution and consumption, whereas indirect impacts consider supply chain and product life-cycle effects. All companies listed on the JSE SRI Index are subject to minimum requirements, outlined by certain core and desirable indicators, which differ according to the classification of environmental impact (see Appendix A) (JSE, 2014).

Criteria indicators have been constructed in conjunction with three general themes, which include environmental, social and governance (ESG) concerns (JSE, 2014).

Table 2: Principles relating to ESG concerns (JSE, 2014)

Environment	Society	Governance
Reduce and manage adverse environmental impacts	Treat all stakeholders in a fair manner, with dignity and respect	Support good corporate governance
Promote awareness of both direct and indirect impacts	Encourage empowerment of employees and community	Aim for long-term growth and sustainability by controlling risk
Utilise natural resources sustainably	Meet labour standards and foster good relations with employees	Identify the company's extent of influence and manage its broader impact
Commit to risk mitigation, reporting and auditing	Promote health and safety of employees	

Source: JSE, 2014

Indicators measure the degree to which companies integrate principles associated with each ESG category (see Table 2) throughout three distinct business areas:

1. Policy and Strategy
2. Management and Performance
3. Reporting

The SRI Index was calculated until the end of 2015 to accommodate the development of a new Responsible Investment Index in collaboration with FTSE Russell, which requires companies to achieve a minimum of a 2.0 ESG rating (JSE, 2015; FTSE Russell and JSE, 2016).

1.3. MOTIVATION FOR THE STUDY AND PROBLEM STATEMENT

Globally, SRI has displayed substantial growth in recent years (GSIA, 2015). This trend led to the establishment of 43 SRI funds in South Africa between 1992 and 2006 (Viviers et al., 2008a). The heightened sensitivity of modern investors to ESG factors is indicated by the development of mainstream SRI benchmarks, including the launch of the JSE SRI Index in May 2004 (Viviers et al., 2008b).

Principles of rational investing encompass the aim of maximising returns (Miller and Modigliani, 1961). The perception of inferior return performance are a major barrier to SRI, as Nilsson (2008) suggests investors pay the price for being socially responsible. Furthermore, the broad consensus of empirical evidence points to either no statistical significant difference or lower risk-adjusted returns associated with SRI strategies relative to their conventional benchmarks (Bauer, Koedijk and Otten, 2005; Renneboog, Ter Horst and Zhang, 2008).

There is minimal amount of literature regarding the performance of SRI in South Africa. Bondera (2014) found no significant difference between SRI and conventional investing on the JSE from 2000-2013. The recent discontinuation of the JSE SRI Index at the end of 2015 enables a study of its performance over the full duration of its lifespan, which may provide more meaningful results.

By and large, cointegration has received little attention in South Africa and in literature pertaining to SRI research. Wei (2015) established that there is a cointegrating relationship between the FTSE SRI and the Global 100 indices, suggesting the existence of a long-run equilibrium. This study aims to provide insight into the gaps in the literature by evaluating the share performance of SRI from 2004 to 2015 and investigating the potential of cointegration between the JSE SRI Index and the All Share Index.

1.4. RESEARCH GOALS AND OBJECTIVES

The aim of the research is to evaluate the share performance of companies listed on the JSE SRI Index. Objectives have been established to facilitate a comprehensive

understanding of the research and share performance. Each objective is accompanied by a hypothesis, which will provide the basis for statistical assessment.

The objectives of the research are:

1. To assess differences in share performance between the JSE SRI and All Share Index (ALSI).

   H_0: SRI risk-adjusted returns = ALSI risk-adjusted returns

   H_1: SRI risk-adjusted returns ≠ ALSI risk-adjusted returns

2. To explore the relationship between the SRI Index and its ALSI counterpart

   H_0: There is no cointegration between the SRI Index and the ALSI

   H_1: There is cointegration between the SRI Index and the ALSI

2. LITERATURE REVIEW

This chapter discusses the literature and concepts that are central to SRI and rational investing. Section 2.1. examines the various approaches to SRI, as well as barriers and drivers of responsible investing. Section 2.2. introduces several key traditional financial theories underpinned by the notion of rational investing. Section 2.3. alludes to ramifications of SRI and how adopting such strategies may differ from rational investing. Section 2.4. discusses the influence that ESG factors may have on financial performance. Lastly, Section 2.5. reviews previous empirical research done on SRI fund performance.

2.1. SOCIALLY RESPONSIBLE INVESTMENT

2.1.1. APPROACHES TO SRI

There is no evident consensus of what SRI explicitly entails despite its rapidly growing significance. Traditionally, SRI is associated with adopting an exclusionary approach to screen stocks. The European Social Investment Forum (2014; p. 7) discovered that exclusions account for approximately 41% of total professionally managed assets across Europe, further substantiating the prominence of this strategy. However, Berry and Junkus (2013; p. 707) suggests investors' preference to employ a more holistic method when incorporating ethical and ESG considerations into the investment analysis and decision making. Viviers et al. (2008a; p. 15) propose that SRI primarily comprises of three strategies, which includes screening, shareholder activism and cause-based or targeted investing. These approaches have been further refined by the GSIA (2015; p. 3) who postulate that SRI consists of several strategies and activities:

1. Negative (exclusionary) screening
2. Positive (best-in-class) screening
3. Norms-based screening
4. Integration of ESG issues
5. Sustainability-themed investing
6. Impact (community) investing
7. Corporate engagement (shareholder activism)

The exclusionary approach involves the application of negative screens that prevent investing in countries, companies or industries that are deemed to be undesirable regarding certain ESG criteria (Junkus and Berry, 2015). Ethical screening may be used to avoid investing in alleged sin industries such as tobacco, alcohol or gambling. Furthermore, responsible investors in the 1980s excluded companies associated with South Africa as a response to the social injustices incurred during the Apartheid era (Hussein and Omran, 2005).

Best-in-class screening entails investing in industries or firms based on positive performance concerning ESG measures relative to peers in the same sector (GSIA, 2015). Positive screening adopts an inclusionary approach, with market portfolios consisting of companies that are regarded as good corporate citizens. From a South African perspective, this strategy acknowledges social issues and development, placing a great amount of emphasis on Broad-Based Black Economic Empowerment (BBBEE) (Viviers et al., 2008a). Integration is similar to positive screening as it involves methodical inclusion of ESG factors into conventional financial analysis (GSIA, 2015).

Norms-based screening utilises both domestic and international standards of business practice to facilitate portfolio management and guide investment decision making (GSIA, 2015). The Equator Principles Financial Institutions (EPFI) and the United Nations Principles for Responsible Investment (UNPRI) have been established as a framework to provide a set of international standards in the attempt to encourage SRI (EPFI, 2013; United Nations, 2007). At a domestic level, norms-based screening is guided by the Code for Responsible Investing in South Africa (CRISA) (CRISA, 2011).

Target investment described by Viviers et al. (2008a; p.15) is congruent with sustainability-themed and impact investing as they both support particular causes. The former involves investment in assets directly related to addressing sustainability issues such as renewable energy, green technology and sustainable agricultural practices (GSIA, 2015). Impact or community investment on the other hand, is generally conducted in private markets that support causes relating to social and environmental issues, which may involve resolving concerns regarding BBBEE (GSIA, 2015; Viviers et al., 2008a).

Corporate engagement uses the right of a shareholder to influence the behaviour of firms. This may include direct communication with senior management or a company's board of directors, filing shareholder resolutions and voting at annual general meetings (GSIA, 2015). In South Africa, this form of shareholder advocacy primarily focuses on good corporate governance and labour concerns (Viviers et al., 2008a).

Table 3: Global Growth of SRI Strategies 2012 – 2014 (in US $ billions)

	2012	2014	Growth
Negative screening	8 280	14 390	74%
Positive screening	999	992	-1%
Norms-based screening	3 038	5 534	82%
ESG integration	5 935	12 854	117%
Sustainability-themed investing	70	166	136%
Impact investing	86	109	26%
Corporate engagement	4 589	7 045	54%

Source: GSIA, 2015

The most recent report from the GSIA (2015; p.8) indicates that negative screening remains the most popular strategy of SRI, closely followed by ESG integration (see Table 3). Sustainability-themed and impact investing account for a negligible amount of the total SRI assets. This may be attributed to lack of accessibility to such investment vehicles as most impact investment occurs in private markets, whereas other SRI strategies can be performed more readily through the convenience of a stock exchange (GSIA, 2015).

2.1.2. BARRIERS TO FURTHER SRI GROWTH

Notwithstanding the undisputed growth of SRI both globally and domestically, there are several concerns associated with such investment strategies. Viviers et al. (2008b) conducted a survey to provide a comprehensive understanding of potential barriers that may hinder the growth of SRI portfolios in South Africa. The importance of the following barriers to pension fund managers was identified:

Table 4: Barriers to SRI in South Africa (Viviers et al., 2008b)

	Very Important	Important	Not Important
Negative perceptions of SRI risk-adjusted returns	35%	10%	55%
No proof of enhance risk-adjusted returns	26%	16%	58%
Issues regarding fiduciary responsibilities	27%	40%	33%
Deficiency of SRI expertise	23%	10%	68%
Short-term investor focus	19%	29%	52%
Cost of ESG information	19%	23%	58%
Quality and availability of ESG performance	42%	29%	29%
Aversion from moral debates	13%	16%	71%
Insufficient SRI demand	13%	35%	52%

Source: Viviers et al., 2008b

It is evident that the greatest concern regarding the prospect of SRI involves both the quality and accessibility to ESG performance (see Table 4). Screening techniques associated with SRI are labour-intensive (Junkus and Berry, 2015). Additional ESG filters applied to standard financial analysis may contribute to higher expense ratios associated with SRI portfolios (Gil-Bazo, Ruiz-Verdu and Santos, 2010; Bauer Koedijk and Otten, 2005).

A deficiency of SRI expertise is acknowledged as another major barrier as traditional fund managers may not have been trained how to analyse ESG factors and their importance involved in a long-term-strategy (World Economic Forum, 2011). Furthermore, some fund managers may be reluctant to adopt SRI strategies as regulations regarding fiduciary duties have increased sensitivity towards the risk (Viviers et al., 2008b). This adherence to conventional investment approaches discourages the implementation of SRI (World Economic Forum, 2011).

Viviers et al. (2008b; p.39) suggests that the disparity between time horizons of financial reporting and the long-term focus of SRI represent another major impediment. Investors generally evaluate their fund performance using a short-term benchmark (Herringer, Firer and Viviers, 2009). This short-term focus undermines SRI strategy as integration of ESG factors is meant to facilitate long-term value creation (World Economic Forum, 2011).

There is much speculation regarding the perception of inferior risk-adjusted returns of SRI portfolios and strategies (Viviers et al., 2008b). Qualifying ESG criteria may limit the potential for maximum diversification for SRI portfolios and may be deemed theoretically inferior as investments may be weighted according to socially responsible metrics and not rational investment efficiency measures (Junkus and Berry, 2015). This may be ascribed to overconfidence in traditional financial theories such as the Efficient Market Hypothesis and Modern Portfolio Theory (World Economic Forum, 2011).

The lack of a universal definition of SRI has resulted in the confusion surrounding the nature of this investment strategy (Viviers et al., 2008b). There has been an extensive ambiguity of what constitutes SRI (Herringer, Firer and Viviers, 2009). The exclusion of industries such as tobacco and alcohol is widely accepted as a form of SRI (Hussein and Omran, 2005). However, South African Breweries and British and American Tobacco have been listed on the JSE SRI Index despite being major players in the so-called sin industries.

2.1.3. DRIVERS OF SRI

Several global trends have resulted in the rapid growth of SRI in recent years. One of the major drivers includes evidence contradicting theoretically expected inferior SRI fund performance (Herringer, Firer and Viviers, 2009). Globally, the difference in performance of SRI and conventional funds are not statistically significant (Bauer, Koedijk and Otten, 2005). Furthermore a meta-analysis conducted by Viviers and Eccles (2012), suggest that approximately 80% SRI fund exhibit either neutral or positive financial performance relative to their conventional benchmarks.

Concern regarding climate change and its potential risks for investment portfolios has encouraged investors to consider ESG factors (World Economic Forum, 2011). This has resulted in growth of sustainability-themed investing including renewable energy and green technology (Herringer, Firer and Viviers, 2009). The recent uncovering of corporate scandals has further stimulated SRI growth (Guyatt, 2005). Scandals, which include Enron and more recently VW, have caused private investors to become more interested in how their money is invested and in some instances have disputed various investment policies (Herringer, Firer and Viviers, 2009).

The development of appropriate benchmarks is considered to play a major role in the growth of SRI (Viviers et al., 2008b). Mainstream benchmarks such as SRI indices not only enable responsible investors to evaluate their fund performance, but also help create awareness of ESG issues (Herringer, Firer and Viviers, 2009).

Various amendments to legislation, particularly relating to European and Australian pension funds, have stimulated SRI growth. Due to the magnitude of such pension funds, these regulations have a large overall effect on the SRI sector (Herringer, Firer and Viviers, 2009). Additionally, voluntary initiatives such the UNPRI, Equator Principles and CRISA provide frameworks for both institutional and private investors to adopt SRI (World Economic Forum, 2011).

2.2. TRADITIONAL RATIONAL INVESTING

The notion of rational investing underpins traditional financial theories including the Capital Asset Pricing Model (CAPM), Modern Portfolio Theory and the Efficient Market Hypothesis (EMH) (Lintner, 1965; Sharpe, 1964; Treynor, 1962; Markowitz, 1952; Fama, 1970). Rational investment implicitly suggests logic is involved in the investment-decision making process. Rational investors are perceived to be objective, traditionally using non-emotional criteria for investment strategy implementation (Peylo, 2014; Statman, 2005). Miller and Modigliani (1961, p. 412) suggests that rational investment is epitomised by preferring more wealth than less. Furthermore, to maximise return on investment, investors must deem risk and return as relative decision-making criteria (Peylo, 2014). Risk and return characteristics considered by rational investors are central to the CAPM, Modern Portfolio Theory and the EMH (Lintner, 1965; Sharpe, 1964; Treynor, 1962; Markowitz, 1952; Fama, 1970)

2.2.1. MODERN PORTFOLIO THEORY

Seminal work by Markowitz (1959; 1952), Tobin (1958) and Roy (1952) is widely regarded as the foundation of Modern Portfolio Theory (Calvo, Ivorra and Liern, 2015; Peylo, 2012). Modern Portfolio Theory incorporates relevant risk and returns when selecting a share portfolio (Peylo, 2014). This theory implements the notion of rational investment, facilitating the allocation of capital assets in a balanced manner, in the attempt to achieve optimal share performance. Therefore, a portfolio attains the best possible risk-return efficiency through extensive diversification by cross-subsidising losses and volatilities between the various individual investment components (Markowitz, 1952). In comparison to an arbitrarily selected portfolio, maximising diversification should result in an optimal portfolio from a given set of possible assets (Peylo, 2014).

Investment portfolios are assessed on the basis of return and risk characteristics. Markowitz (1952; p.79) proposes that all rational investors seek to maximise returns and minimise risk pertaining to their portfolio selection. Expected returns of individuals assets are considered as random variables, which are generally determined by calculating the arithmetic mean of previous returns (Calvo, Ivorra and Liern, 2015). However, due to the volatility of asset prices, maximising returns on a portfolio may not materialise. Hence, the risk component of a portfolio must be considered, which is traditionally characterised by its variance or standard deviation (Peylo, 2012; Markowitz, 1952). Markowitz's (1952) original model is also known as the mean-variance model as a result of chosen risk and return measures (Calvo, Ivorra and Liern, 2015).

Markowitz (1952) suggests the presence of an efficient frontier, which is constructed by using the best possible combination of risk and return combinations of various portfolios (Peylo, 2012). If the market solely consists of risky assets, the efficient portfolio frontier assumes a hyperbolic shape (see Fig. 1). The efficient frontier proposed by a set of optimal portfolios theoretically maximises returns while calibrating for the associated risk (Huang et al., 2014). Due to the principle of portfolio efficiency, rational investors ought to limit their portfolio selection to those located on the efficient frontier (Peylo, 2012).

Skae (2014; p.153) suggests that rational portfolio selection involves two options:

1. Portfolios are chosen on the basis of highest expected returns for those with similar levels of risk or volatility
2. Portfolios with lower levels of risk are selected from those with similar expected returns

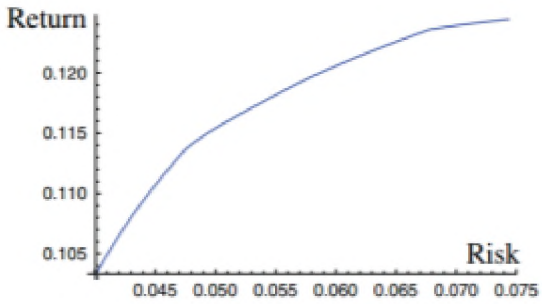

Figure 1: Markowitz's efficient portfolio frontier (Calvo, Ivorra and Liern, 2015; p.54)

Despite the seemingly sound theoretical concept of efficient portfolios, there are a few criticisms regarding its practicality (Calvo, Ivorra and Liern, 2015). Generally, population mean and variance is unknown and are approximated using sample mean and variance. Consequently, the mean-variance model is susceptible to estimation errors arising from the differences between population and sample parameters (Huang et al., 2014). Furthermore, population estimators may be predisposed to estimation errors if asset returns are not normally distributed (Calvo, Ivorra and Liern, 2015). The assumption that all investors are rational, described by Miller and Modigliani (1961; p.412) has been criticised. Rational investors are deemed to invest in companies or industries that may violate personal values, providing the risk and return profile of their portfolio remains unchanged. Therefore, Statman (2005; p.33) suggests that mean-variance portfolio theory considers the notion of social responsibility and personal beliefs to be irrelevant in the investment decision-making process. On the contrary, Beal, Goyen and Phillips (2005; p.70) argues that homogeneity amongst investors does not exist as modern investors integrate ethical considerations into investment strategies.

Notwithstanding several concerns regarding its underlying assumptions, Modern Portfolio Theory is extensively used in portfolio management and numerous economic theories such as the CAPM (Calvo, Ivorra and Liern, 2015).

2.2.2. THE CAPITAL ASSET PRICING MODEL

Following work done by Markowitz (1952), Sharpe (1964), Treynor (1962) and Lintner (1965) developed the CAPM. Modern Portfolio Theory proposes the efficient frontier produces a hyperbola (see Fig. 1), assuming the market exclusively consists of risky assets. Tobin (1958) further expanded on the work of Markowitz by including a riskless asset into the analysis. Subsequently, once a risk-free asset is introduced, the efficient portfolio frontier is represented by a straight line known as the capital market line (Huang et al., 2014). The CAPM highlights the assumption of a linear relationship between risk and expected returns of the associated share or portfolio (Sharpe 1964).

$$R_i = R_f + \beta_i (R_m - R_f) \quad (1)$$

Where:

R_i = Rate of return on stock i

R_f = Risk-free rate of return

β_i = Systematic risk for stock i

R_m = Rate of return on market portfolio

$R_m - R_f$ = The market risk premium

Markowitz (2005), Jensen (1968; p.390) and Jensen, Black and Scholes (1972; pp.1–2) highlight the fundamental assumptions that underpin the CAPM:

1. Investors have the tendency to be risk-averse and seek to maximise returns over a single period
2. Investors have homogenous expectations and identical investment decision horizons
3. Investors have the ability to select portfolios by exclusively using the mean and variance of returns (i.e. employ Markowitz Modern Portfolio Theory)
4. All investors may borrow and lend at a specified risk-free rate of interest
5. Capital markets are frictionless and assume zero taxes or transaction costs
6. All assets are infinitely divisible

This financial model is of particular importance to evaluating portfolio management as it addresses two distinctive aspects of performance, namely return and risk. The former is a measure of enhancing returns through successful stock selection, whereas the latter refers to the portfolio manager's ability to mitigate risk borne by the shareholders (Jensen, 1968). The CAPM is a valuable tool for analysing investment decisions when used in conjunction with the Security Market Line (SML). The SML essentially uses the CAPM to represent the linear relationship between expected returns and systematic risk associated with the capital market. Individual securities may then be plotted on the same graph of the SML. A security that lies beneath the SML may indicate the stock is overvalued, as investors accept lower returns for the given amount of risk assumed. Contrarily, undervalued securities are situated above the SML, and provide investors with greater expected returns for their inherent levels of risk (Sinha, 2012).

Risk in the CAPM is defined as the extent of covariance between share portfolio and market returns and is represented as beta (Vendrame, Tucker and Guermat, 2016). Alternatively, beta is seen as a measure of the share portfolio's volatility relative to the market portfolio. A beta-value greater than 1 implicitly suggests that the returns on the share or portfolio are more volatile than the overall market. On the other hand, if beta is less than 1, the associated return is less volatile than the market (Skae, 2014). Expected return is also a function of the risk-free rate of return (R_f) and the market portfolio's expected return (R_m) (Laubscher, 2002). Despite the theoretical rigour of this model, empirical evidence suggests that it does not apply in a practical sense (Jensen, Black and Scholes, 1972; Fama and French, 1992). The applicability of the CAPM has several parameters that limit the accuracy and predictability of the model. Firer (1993, pp. 25) implies that issues surrounding the accuracy of parametric estimation suggests that the pure form of the CAPM is not relevant in practicality. Parameters which limit the feasibility of the traditional CAPM include, risk-free rate of return, return on the market, as well as the beta-value.

- *Risk free rate of return (R_f).* The CAPM derivation necessitates the consideration of a capital asset with zero covariance with another asset (Firer, 1993). Despite the sound theoretical basis of this parameter, there is much doubt regarding the practical existence of a purely risk-free asset (Laubscher, 2002). Typically, R_f is estimated using various proxies such as government bonds and treasury bills

(Firer, 1993). However, these surrogates of R_f may be subjected to uncertainties, such as inflation and thus are not absolutely risk-free.

- *Return on the market (*R_m). R_m is considered substantially more difficult to estimate than R_f (Firer, 1993). It has been suggested that financial analysts have relied on historical trends of share returns and the associated summary statistics to estimate R_m (Carletone and Lakonishok, 1985).Theoretically, the market portfolio is comprised of risky assets and is extensively diversified (Laubscher, 2002). As with R_f, R_m proves difficult to estimate and is usually approximated using stock exchange indices (Ward, 1994; Laubscher, 2002). Empirical research conducted by Ward (1994, pp. 111) indicated that the All Share index proved to be a suitable market proxy for the Johannesburg Stock Exchange (JSE). This suggests that the All Share Index may be used as an acceptable approximation of the market portfolio.
- *Beta.* The third constraint concerning the CAPM, beta, is generally approximated by looking at historical beta-values (Laubscher, 2002). Additionally, there is criticism suggesting that beta is not the only relevant measure of systematic risk that fully accounts for the relationship between risk and returns (Jensen, Black and Scholes, 1972; Vendrame, Tucker and Guermat, 2016). Empirical studies conducted by Banz (1981), Bhandari (1988) and Penman, Richardson and Tuna (2007) suggest the explanatory power of market capitalisation, leverage and book-to-market ratios for returns respectively.

In light of several criticisms regarding the accuracy of the CAPM estimators, various asset pricing models have been developed. The most notable modifications of the CAPM include the three-factor and four-factor models introduced by Fama and French (1993) and Carhart (1997) respectively. Fama and French's (1993) present two additional variables alongside the market portfolio, namely market capitalisation and book-to-market ratios. The work of Carhart (1997) is an extension of the three-factor model as a momentum factor is introduced. Despite numerous concerns surrounding the CAPM, the single-factor model remains an important means of asset analysis due to its theoretical appeal and relative simplicity (Vendrame, Tucker and Guermat, 2016).

2.2.3. EFFICIENT MARKET HYPOTHESIS

Market efficiency is a concept that may have major implications for various market participants, namely investors, speculators and financial analysts (Lee, Tsong and Lee, 2014). Prior to the EMH, various chartist theories, such as the Dow Theory, were implemented to make provisions for future expectations regarding a stock price (Fama, 1965). Chartist theories attempt to maximise gains through the use historical data to identify trends in markets to predict future stock behaviour. However, Fama (1965, pp.34) suggests that chartist theories are flawed and lack empirical rigour as a result of the fundamental assumption that history repeats itself.

On the contrary, Fama (1965, pp.34) developed the Random Walk Theory, otherwise known as the EMH, which implies that successive changes in stock price are independent of one another. His theory advocates that past market behaviours may not be used to make meaningful predictions of future prices (Fama, 1965). Fama (1970, pp. 383) proposes that stock prices are ascertained by all available information. An efficient market is considered to be one whereby prices fully reflect existing information at any given time (Fama, 1970).

Contrary to some principles of Modern Portfolio Theory, EMH insinuates that uninformed investors with a diversified share portfolio are just as likely to achieve returns of a financial expert operating in the same market (Malkiel, 2003).The EMH suggests that when new information arises it spreads rapidly and is almost immediately featured in the stock price (Malkiel, 2003). Therefore, the EMH proposes that predicting future price movements are highly unlikely to prove profitable as market prices impartially adjust in immediate effect upon the arrival of new information (Malkiel, 2003; Clarke, Jandik and Mandelker, 2001). Hence, a prospective investor has negligible time to make a profitable trade on a new piece of information (Clarke, Jandik and Mandelker, 2001). The key driver of efficiency in markets is postulated to be the intensity of competition between investors to benefit financially from any new information (Clarke, Jandik and Mandelker, 2001). Unsurprisingly, with an increased number of analysts and investors, the likelihood to take advantage of potentially mispriced stocks declines (Clarke, Jandik and Mandelker, 2001). This implicitly suggests that the bulk of investors would most likely

not benefit from information analysis as any gains would be offset by the presence of transaction costs incurred (Clarke, Jandik and Mandelker, 2001).

Fama (1970, pp. 383) indicates that there are different types of information that have an influence on stock values. As a result, three versions of the EMH have been developed that are pertinent to the three information subsets, namely weak form efficiency, semi-strong form efficiency and strong form efficiency (Malkiel, 2003; Fama, 1970). These adaptations of the EMH account for the connotations associated with 'all available information' (Malkiel, 2003).

- *Weak Form Efficiency.* The weak form of the EMH declares that present market prices are determined by information relating to previous price changes and historical prices only (Fama, 1970). This implies that no one can profit from analysing historical prices as stock prices are the most accessible form of information to the public (Clarke, Jandik and Mandelker, 2001). Furthermore, after considering transaction costs, it proves to be highly improbable to profit from publicly available information such as past stock prices (Clarke, Jandik and Mandelker, 2001)
- *Semi-strong Form Efficiency.* This modification of the EMH is concerned with whether prices adjust in an efficient manner and reflect all publicly available information (Fama, 1970). The associated subset of relevant information includes not only past stock prices, but also extends to data that is disclosed in a firm's annual reports and financial statements (Clarke, Jandik and Mandelker, 2001). It is acknowledged that such relevant information is not confined to being financial in nature (Clarke, Jandik and Mandelker, 2001). This suggests that the JSE may exhibit this form of market efficiency as relevant information are prerequisite for listed companies in the form of integrated reports, underpinned by compliance to the King III Code (JSE, 2014). Empirical evidence of the semi-strong form of market efficiency was discovered regarding stock splits (Fama et al., 1969). Prior to this research, conventional thinking regarded long held stock splits as a precursor for increased dividends, and hence it was believed that such information was good news for speculators and investors (Clarke, Jandik and Mandelker, 2001). The study found that generally, strong stock performance was rather the antecedent of a split, suggesting that firms prefer stock splits in times of good performance (Fama et al., 1969). Additionally, it was observed that following the

split, there was no abnormal performance of the respective stock prices (Fama et al., 1969; Clarke, Jandik and Mandelker, 2001). The research clearly indicates that purchasing stocks on the date of the split would not prove to be profitable for investors, and thus reinforcing the rationale of the EMH (Fama et al., 1969).

- *Strong Form Efficiency.* The strong form model of the EMH includes the potential of investing on the basis of available inside information (Clarke, Jandik and Mandelker, 2001). Fama (1970, pp. 383) refers to this information subset as knowledge of investors with monopolistic access to relevant information that will influence the stock price. If this modification of the EMH is correct, then inside trading would not be profitable (Clarke, Jandik and Mandelker, 2001). Research has shown some evidence against this, following observations of insider trading resulting in 3% profit after the deduction of transaction costs, assumed to be 2% (Rozeff and Zaman, 1988). Findings of the study do not appear to be consistent with the EMH and therefore this market exhibits inefficiency in the strong form efficiency model (Rozeff and Zaman, 1988; Clarke, Jandik and Mandelker, 2001).

Despite the vast empirical evidence supporting the EMH, there are some studies which contradict and contest the theory (Clarke, Jandik and Mandelker, 2001). De Bondt and Thaler (1985) observed that stocks associated with previously low long-term returns (loser stocks) have a propensity to achieved higher returns in the future. Similarly, stocks with high long-term returns (winner stocks) in the past tended to yield lower future returns (De Bondt and Thaler, 1985). This is referred to as the Overreaction Hypothesis, whereby past loser stocks tend to outperform those previously considered as winner stocks (De Bondt and Thaler, 1985). A study conducted by Ali, Ahmad and Anusakumar (2011) found that long-term reversals prevailed in the Malaysian market, substantiating the research performed by De Bondt and Thaler (1985), and further reinforcing the Overreaction Hypothesis. These findings contradict the EMH which proposes that investors react quickly and without bias to any new information (Malkiel, 2003; Clarke, Jandik and Mandelker, 2001). Under the assumption of the EMH, it would be expected that the long-term reversals of stock returns would not prevail (Clarke, Jandik and Mandelker, 2001). Although the findings appear to be incompatible with the EMH, they have endured over longer periods of time (Clarke, Jandik and Mandelker, 2001). Despite the complex nature of the issues pertaining to the studies, recent research conducted by Fama and French

(1996) suggest that the findings inconsistent with the EMH arise from methodological problems associated with determining risk.

Furthermore, there are some arguments that the EMH is not falsifiable (Alajbeg, Bubas and Sonje, 2012). The underlying assumptions of the EMH including zero transaction costs and freely available information may be considered a gross oversimplification of financial market conditions (Fama, 1991; Alajbeg, Bubas and Sonje, 2012). Ambiguity surrounding these assumptions has led to the development of the Joint Hypothesis Problem (JHP) (Fama, 1991). The JHP considers the EMH unable to be empirically tested (Alajbeg, Bubas and Sonje, 2012). Fama (1991, pp. 1576) proposes that the EMH must be tested in conjunction with the relative equilibrium model of stock price determination. Resultantly, anomalous returns behaviour can constitute of either market inefficiency, a poor pricing model at market equilibrium or an ambiguous mixture of them both (Fama, 1991).

The EMH is supported by the vast majority of empirical research, despite the opposing JHP (Clarke, Jandik and Mandelker, 2001). Notwithstanding the contest provided by the Overreaction Hypothesis of De Bondt and Thaler (1985), the findings corresponding controversial studies have not withstood the test of time (Clarke, Jandik and Mandelker, 2001). The EMH remains to be widely considered the best description of stock price changes in security markets (Clarke, Jandik and Mandelker, 2001).

2.3. SRI AND RATIONAL INVESTING

SRI may be perceived as a vogue, which has exhibited substantial growth in SRI related investments and share portfolios (Nilsson, 2008; GSIA, 2015; European Social Investment Forum, 2014). In recent years, there have been considerable developments in SRI due to the ever-growing concern regarding the social and environmental implications of firms and investments (Peylo, 2014). Ernst & Young and GreenBiz Group (2012) conducted a study which identified major trends surrounding SRI. It was observed that executives are becoming increasingly aware of resource scarcity, with particular interest in water availability. Employees are also considered to be a primary stakeholder and the CFO and executives play a major role in sustainability of a firm (Ernst & Young and GreenBiz Group, 2012). Furthermore, the study indicated that rankings and ratings are of material concern to

executives as it provides signals of performance to prospective investors (Ernst & Young and GreenBiz Group, 2012). In light of growing trends in sustainability, guidelines pertaining to management of ecological and social risks have been established by the EPFI and the UNPRI to assist responsible investment (EPFI, 2013; United Nations, 2007).

These guidelines are confined in particular to large institutional investments (EPFI, 2013; United Nations, 2007). Responsible investment is considered to be the incorporation of ESG factors into decision-making and investments (United Nations, 2007). The principles prescribed take into account that firms do not operate in a vacuum and the decentralisation of focus from shareholder to stakeholder is necessary for sustainable value creation taking into account growing concerns and challenges posed by climate change and social and ethical standards (EPFI, 2013; United Nations, 2007).

In the context of the proposed study, it is important to bear in mind the guiding principles of SRI within the South African environment. CRISA provides a set of principles that help encourage and facilitate responsible investment in South Africa, which influences investment on the JSE (CRISA, 2011). As with the Equator Principles and UNPRI, CRISA encourages institutional investors to consider ESG factors when investing as well bear in mind existing frameworks, such as the King III Code which facilitates corporate governance in JSE listed companies (CRISA, 2011). It suggests that SRI may play an important role in an institutional investor's fiduciary duty to deliver superior risk-adjusted returns (CRISA, 2011).

The prevalence of SRI, both in the global and South African context, has attracted much interest in the role and performance of responsible investment. Comparing and differentiation between SRI and rational investment aims to develop a greater understanding of potential benefits and limitations of SRI. Furthermore, the foundations of rational investment including informed decisions and risk diversification and decision criteria will be used to evaluate the rationale of SRI (Peylo, 2014).

2.3.1. INFORMED DECISIONS

The need to make an informed decision is recognised as a prerequisite for rational investment (Peylo, 2014). The EMH describes how aggregation of available information is a determinant of stock prices, which infer return and risk information (Fama, 1970). Despite opposition to the EMH (Ali, Ahmad and Anusakumar, 2011; Alajbeg, Bubas and Sonje, 2012; De Bondt and Thaler, 1985), it is widely regarded that information provides the basis for investment decisions (Peylo, 2014).

This principle of rational investment is consistent with SRI as SRI investors utilise the same information as conventional rational investors, with the additional use of ESG or non-financial information disclosed by firms (Barnett and Salomon, 2006; Peylo, 2014). Various frameworks for SRI encourage the disclosure of financial, as well as non-financial information of businesses (CRISA, 2011; EPFI, 2013; United Nations, 2007). Furthermore, the Global Reporting Initiative (GRI) and the International Integrated Reporting Council (IIRC) have established a comprehensive set of guidelines and standards for integrated reporting (GRI, 2013; IIRC, 2013). Integrated reports are instruments which firms may use to disclose financial and non-financial matter in one document (IIRC, 2013). This encourages businesses to adopt the triple-bottom line approach, whereby ESG factors material to the company's operations are considered to be interdependent with financial performance (Bardy and Massaro, 2012; IIRC, 2013; GRI, 2013). This provides investors with ample information of both financial and non-financial nature to facilitate an informed decision (Peylo, 2014). This is of particular significance when assessing share performance on the JSE and its SRI Index as it is a listing requirement to comply with the King III Code, which requires disclosing an array of information in integrated report (JSE, 2014).

With regards to the fundamental of making an informed decision, SRI exhibits negligible differences with respect to conventional rational investment (Peylo, 2014). Both investment styles use available information to select stock portfolios, with traditional investment focus solely on financial criteria, whereas SRI also considers ESG factors before making an investment decision (Barnett and Salomon, 2006). The South African market environment is of particular interest as all listed on the JSE, whether it is on the SRI Index or not, are mandated to disclose financial and non-financial data in their integrated reports (JSE, 2014).

2.3.2. RISK DIVERSIFICATION AND DECISION CRITERIA

SRI encourages investments to consider a multitude of factors that are not strictly financial, such as environmental and social risk factors (Barnett and Salomon, 2006). This aspect is the central focus of most criticism of SRI (Peylo, 2014; Iqbal et al., 2012). An optimal portfolio is achieved when risk diversification is maximised in the market portfolio as the sum of all available assets (Sharpe, 1964). Application of ESG screening criteria for stock portfolio selection promoted by UNPRI, EPFI and CRISA simply limit the universe of potential securities to invest in (Barnett and Salomon, 2006; United Nations, 2007; EPFI, 2013; CRISA, 2011). Thus, constraints imposed by ESG screening prohibit the maximum diversification of a market portfolio, and hence inferior investment performances are theoretically likely to be associated with SRI (Lee et al., 2010). The narrowing of the investment universe insinuated by SRI strategies may thus account for negative perceptions with respect to the performance of risk-adjusted returns suggested by Viviers et al. (2008b; p.38).

Despite the distinct differences in risk diversification and screening criteria for decision-making, Markowitz (2005) acknowledges the optimal market portfolio is merely a hypothetical entity. Rational investors invest in a small fraction of a financial market and hence, conventional investment strategies struggle to maximise risk diversification (Markowitz, 2005). Traditional rational investors may seek a close approximation of the market portfolio through passive investing, whereby they attempt to replicate an index as a proxy for the respective market (Malkiel, 2003).

With regards to risk diversification, SRI may be considered theoretically inferior to conventional investment, due to limited potential stocks that satisfy the various ESG screening criteria (Barnett and Salomon, 2006; Lee et al., 2010). However, empirical results indicating no significant difference of risk-adjusted returns between conventional and SRI portfolios contradict the theoretical perception of SRI underperformance with regards to Modern Portfolio Theory (Managi, Okimoto and Matsuda, 2012; Renneboog, Ter Horst and Zhang, 2008). Furthermore, high-intensity ESG screening may result in reduction of risk and hence implementation of SRI could be considered a means of outperforming the anachronistic style of traditional rational investment strategies (Lee et al., 2010).

2.4. ESG FACTORS AS AN INFLUENCE ON FINANCIAL PERFORMANCE

2.4.1. ENVIRONMENTAL AND FINANCIAL PERFORMANCE

Traditionally, environmental concerns have been considered to be a major limitation for businesses (Wingard and Vorster, 2001). This perspective has influenced conventional mangers to adopt a compliance-based approach, which is reactive rather than proactive (Metcalf et al., 1996). While looking at sustainability from a triple bottom-line approach, traditional views suggest that there is a distinct trade-off between the environmental and financial dimensions (Bardy and Massaro, 2012; Wingard and Vorster, 2001). However, recent schools of thought has considered integrative thinking and using the tensions existing between the two dimensions in a constructive manner, recognising effective environmental management as a driver for enhanced financial performance (Metcalf et al., 1996; Wingard and Vorster, 2001) Empirical studies conducted by Wingard and Vorster (2001) indicate a small but positive correlation between environmental responsibility and corporate financial performance, which further exemplifies the use of environmental management as a means of achieving superior financial performance.

Weybrecht (2014, pp. 24) recognises that environmental management can enhance financial performance through reducing costs. Focusing on being more efficient, particularly in process-intensive industries, facilitates cost reduction directly through the use of fewer resources. Mitigation of waste also permits enhanced profitability as waste management practices may prove to be costly (Weybrecht, 2014). Furthermore, regarding the survey of Ernst & Young and GreenBiz Group (2012), environmental management and efficient use of resources allows for sustainable value, particularly when considering the anticipated resource scarcity in forthcoming years.

Market dynamics have indicated that customers are increasingly becoming more aware of environmental practices of firms and some buyers are conscious when considering certain products and services (Wingard and Vorster, 2001). Therefore, accounting for increased environmental concern of society at large can help increase the market share through product differentiation. Firms that exhibit responsible environmental practices are theoretically less likely to incur penalties relating to regulations and legislation (Weybrecht, 2014). Some investors, particularly those

related with SRI are interested in information that regards environmental risk. Therefore, implementation of more responsible management practice reduces environmental risks and may be perceived to be an attractive investment (Wingard and Vorster, 2001).

Firms that consider environmental risks and impacts are more likely to avoid creating trade barriers by avoiding contravening various international standards, including ISO 14000 (Wingard and Vorster, 2001). Due to pressures of climate change and resource availability, environmental standards are probably going to become more stringent and hence assessing environmental impacts of business operations can help create long-term value (Weybrecht, 2014). In light of the research being conducted with SRI and the associated ESG screening, firms are able to create value by attracting investment by applying environmental management (Wingard and Vorster, 2001; Weybrecht, 2014).

2.4.2. SOCIAL AND FINANCIAL PERFORMANCE

Managi, Okimoto and Matsuda (2012, pp. 1511) suggests that the upward trend in SRI popularity is merely a by-product of the market's heightened concerns surrounding 'corporate social responsibility' (CSR). The phrase 'CSR' was coined by Howard Bowen in 1953 and refers to the concept as "the obligations of businessmen to pursue those policies, to make those decisions, or to follow those lines of action which are desirable in terms of the objectives and values of our society" (Bowen, 1953, pp. 6). Due to the lack of a universal definition, CSR may be viewed as an instrument through which integration of a business's financial, social and environmental mandates may be achieved (Managi, Okimoto and Matsuda, 2012).

There are ongoing debates whether or not firms should exhibit responsible corporate citizenship. Friedman (1970) argues that the sole responsibility of a firm is to maximise its shareholders' wealth. This traditional economic approach to CSR suggests that SR behaviour should be avoided unless it supports the wealth of equity holders (Mackey, Mackey and Barney, 2007). Empirical research has shown that CSR has no effect or a negative effect on corporate financial performance and share value respectively (Iqbal et al., 2012). With increasing awareness and focus on environmental and social standards, CSR may be viewed as a sacrifice of a firm's profit (Managi, Okimoto and Matsuda, 2012). One particular criticism of CSR

suggests that it detracts value from a business based on certain agency costs (Friedman, 1970; Tirole, 2001). Managerial incentives may lead to the over-allocation of resources to external activities in order to exhibit responsible corporate citizenship (Tirole, 2001). Furthermore, the relationship between the principal (investor) and the respective agent (manager) may be jeopardised as CSR may not act in the best interests of the equity holders (Tirole, 2001). From this perspective, opting to assume expenditure for social betterment results in an unnecessary rise in the firm's costs (Friedman, 1970; Barnett and Salomon, 2006). If a firm is positioned in a market with a high level of competition intensity, avoidable discretionary expenditure on CSR initiatives may lead to an economic disadvantage through raised costs and result in poorer financial performance (Managi, Okimoto and Matsuda, 2012).

In stark contrast, it has been disputed that by extending the responsibilities of businesses beyond their shareholders, effective CSR can be considered a source of competitive advantage (Ackermann and Eden, 2011; Freeman and McVea, 2001). Empirical studies have found evidence of a positive relationship between CSR performance and corporate financial performance (Orlitzky, 2011; Sun, 2012; Van de Velde, Vermeir and Corten, 2005). It is widely understood that businesses today do not operate in a vacuum, whereby there is a distinct interdependent relationship with both social and natural environments (Bardy and Massaro, 2012). In the attempt to achieve strategic goals, some businesses have expanded their scope beyond the shareholder and focused on engaging with a variety of stakeholders (Ackermann and Eden, 2011). A stakeholder may be referred to as a group or individual who either affects or is affected by a firm's operations and objectives (Freeman and McVea, 2001). Stakeholders may include customers, suppliers, local communities, employees and investors (Wingard and Vorster, 2001). Effective stakeholder engagement and management has the potential to develop competitive advantage in numerous ways (Ackermann and Eden, 2011). Porter (1979, pp.140) indicates that the power of customers and suppliers plays a major role in the profitability of a company. Successful stakeholder management customer and supplier relations may result in reducing the power of both groups, alleviating potential pressure on profitability (Porter, 1979). Furthermore, CSR entails transparent business practices and may result in improving social credibility and market presence (Managi, Okimoto

and Matsuda, 2012). Some scholars have claimed that improving social performance through CSR has the potential to attract resources, top quality employees, enhance marketing and realise opportunities previously unforeseen (Greening and Turban, 2000; Barnett and Salomon, 2006). CSR can thus be viewed as an instrument to signal the trustworthiness of a firm to provide a high-quality product or service as well as reduce the intensity of competition within a given market (Managi, Okimoto and Matsuda, 2012).

2.4.3. CORPORATE GOVERNANCE AND FINANCIAL PERFORMANCE

In light of the recent financial crisis and corporate scandals such as VW, Enron and BP, corporate governance has become one of the focal points for investors (Adekunle and Maurice, 2014). In essence, corporate governance refers to the extent to which firms operate and engage in a transparent manner (Aggarwal, 2013). Corporate governance is an overarching principle of sustainability whereby it is the responsibility of a corporate to safeguard the interests of all associated stakeholders (Aggarwal, 2013).

Corporate scandals have resulted in loss of credibility among the public and investors and hence corporate governance is a mechanism that can be used to enhance credibility and financial performance (Adekunle and Maurice, 2014; Aggarwal, 2013). Adekunle and Maurice (2014, pp. 54) acknowledge that effective corporate governance improves investor confidence. Furthermore, empirical studies conducted by Aggarwal (2013) indicate a positive association between governance rating and financial performance. With respect to the aims of the research, it is important to realise that corporate governance of JSE listed firms are guided by the principles of the King Code, which are designed to buffer companies against scandals and enhance confidence of investors (Adekunle and Maurice, 2014).

2.5. SRI VS CONVENTIONAL FUND PERFORMANCE

Previous research relating to the performance of SRI stock portfolios and indices exhibit a mixture of results (Managi, Okimoto and Matsuda, 2012). Most literature has focused on the US and the UK markets (Bauer, Koedijk and Otten, 2005). SRI fund performance is typically compared with the Standard & Poor's 500 Stock Index (S&P 500 Index) for US studies (Managi, Okimoto and Matsuda, 2012; Bauer, Koedijk and Otten, 2005)

Rathner (2013) conducted research in the Austrian financial market, observing no significant difference between SRI and conventional fund performance. Similarly, Managi, Okimoto and Matsuda (2012) found no significant difference among SRI performance and the respective stock indices in the UK and Japan. The negligible statistical difference between SRI and traditional funds were further supported by Renneboog, Ter Horst and Zhang (2008), who observed similar performances of both SRI and traditional funds in Japan, France and Sweden. Research by Bondera (2014) found no statistically significant difference between SRI stocks and their conventional benchmarks in South Africa between 2000 and 2013.

Empirical evidence from Renneboog, Ter Horst and Zhang (2008) indicates SRI funds underperform conventional portfolios in the US, United Kingdom, as well as Asia-Pacific regions. The findings are consistent with the notion that investors pay the price for SRI (Nilsson, 2008). Bauer, Koedijk and Otten (2005) found evidence of inferior SRI fund performance in the US, while the UK funds significantly outperform the domestic benchmark.

Despite the vast amount of evidence suggesting inferior and indifferent SRI performance, some studies show that SRI strategies may yield better risk-adjusted returns than their conventional counterparts. Blanchett (2010) reported superior risk-adjusted returns across an array of SRI funds. However, these results were not significant. Viviers and Eccles (2012) performed a meta-analysis of SRI practices over a period of 35 years. Their results indicate that SRI funds exhibit superior or insignificantly different risk-adjusted returns in approximately 80% of the cases.

Evidence from literature suggests that there is no universal consistency among SRI and benchmark performances (Renneboog, Ter Horst and Zhang, 2008; Bauer, Koedijk and Otten, 2005; Managi, Okimoto and Matsuda, 2012; Viviers and Eccles, 2012). Managi, Okimoto and Matsuda (2012) exemplify the need for empirical research to consider two distinct market regimes when performing a comparative analysis between SRI and conventional stocks. Therefore, this study aims to bridge the gap in the literature by examining SRI performance relative to the domestic benchmark, within the South African market.

3. METHODOLOGY

3.1. RESEARCH GOALS, OBJECTIVES AND HYPOTHESES

The goal of the study is to evaluate the share performance of the JSE SRI Index. Below are objectives that provide a comprehensive understanding of SRI Index and the ALSI share performance:

Objective 1: To assess differences in share performance between the JSE SRI and the ALSI

H_0: SRI risk-adjusted returns= ALSI risk-adjusted returns

H_1: SRI risk-adjusted returns ≠ ALSI risk-adjusted returns

Objective 2: Explore the relationship between the SRI Index and its ALSI counterpart

H_0: There is no cointegration between the SRI Index and the ALSI

H_1: There is cointegration between the SRI Index and the ALSI

3.2. RESEARCH PARADIGM

This study was conducted in a positivistic paradigm. Positivism refers to an approach that acquires knowledge through facts (Dunne, Kurki and Smith, 2006). The methodology associated with the positivistic paradigm involves the use of quantitative methods, including the verification of hypotheses. The ontology of naïve realism suggests a certain truth or reality regarding the findings. The epistemology will be objectivist as the research can be easily conducted without bias or influence (Guba and Lincoln, 1994).

3.3. DATA COLLECTION

All financial data was obtained from INET BFA's database for the period of May 2004 to the end of December 2015, representing the entire lifespan of the JSE SRI Index. The JSE ALSI was chosen as a suitable proxy for the market portfolio as it accounts for approximately 99% of the market capitalisation of listed companies on the JSE. Furthermore, two sub-periods were identified as Managi, Okimoto and Matsuda (2012) highlighted the importance to consider potentially different market regimes in comparative studies.

The study consists of three distinct time periods of interest:

1. 2004 – 2015: The full duration of the SRI Index
2. 2004 – 2009: Time period preceding integrated reporting as a listing requirement
3. 2010 – 2015: After the introduction of the King III code and integrated reporting

Monthly log returns of the following were obtained to assess risk-adjusted performance:

1. SRI Index
2. ALSI
3. All companies on the SRI Index
4. ALSI industry-specific indices

Data pertaining to all companies that had been on the SRI Index matched the time periods in which they were listed. Low, medium and high environmental impact indices based on their industry's impact classification stipulated by the JSE (2014) (see Appendix A) were constructed using company-specific data and industry-specific indices for SRI and ALSI proxies respectively. A market capitalisation weighted method was used to construct the environmental impact indices, which is consistent with the weighting method employed by the JSE. Monthly log returns were calculated using equation (2).

$$Log\ Return = ln(Price_t) - ln(Price_{t-1}) \quad (2)$$

Cointegration analysis used the natural logarithm of weekly closing prices of the SRI Index and the ALSI. Guidi and Gupta (2013; p.266) suggest that the use of daily data tends to lead to the rejection of the Random Walk Hypothesis, which may have misleading implications for cointegration testing. Therefore, weekly index prices were used as a compromise between the volatility of daily price changes and the relative low frequency of observations associated with monthly data. EViews 9 was used to conduct cointegration analysis.

3.4. DESCRIPTION OF ANALYTICAL TECHNIQUES

Each objective of the study was addressed using separate sets of measures and statistical techniques.

Objective 1: To Assess differences in share performance between the JSE SRI and the ALSI

Jensen's alpha was used as the measure for assessing the differences in share performance between the JSE SRI Index and the ALSI. Jensen's alpha was computed for both SRI and ALSI benchmark indices. Additionally, a 'difference' metric suggested by Bauer, Koedijk and Otten (2005; p.1759) was established. This is determined by subtracting ALSI returns from SRI returns (SRI Returns – ALSI Returns).

Objective 2: Explore the relationship between the SRI Index and its ALSI counterpart

Engle-Granger (EG) and Johansen tests were utilised to verify the potential existence of a cointegration, which would indicate that the SRI Index and the ALSI move in tandem in the long-term.

3.4.1. JENSEN'S ALPHA

The single-factor CAPM was utilised to estimate risk-adjusted returns for the JSE SRI Index and its counterparts. The intercept, α_i, otherwise known as Jensen's alpha, is generally used as a measure of performance relative to a market proxy (Jensen, 1968).Jensen's alpha was obtained by performing a regression model:

$$(R_{it} - R_{ft}) = \alpha_i + \beta_i(R_{mt} - R_{ft}) + \varepsilon_{it} \quad (3)$$

Where:

R_{it} = Return on fund *i*in month *t*

R_{ft} = Return on a 3-month South African government bond in month *t*

R_{mt} = Rate of return on market portfolio (ALSI)

ε_{it} = Error term

3.4.2. COINTEGRATION

The majority of financial and economic variables are known to be non-stationary time series (Engle and Granger, 1987). The Ordinary Least Squares method to determine a linear relationship between non-stationary variables tends to yield a spurious regression which may lead to false results (Liu and Shrestha, 2008). Cointegration analysis is employed in the presence of non-stationary variables. Cointegration occurs when a linear combination of two non-stationary time series yields a stationary process, thus sharing a common stochastic drift (Deo, 2014). A cointegrating relationship indicates series that exhibit similar co-movements and a long-run equilibrium (Granger, 1981). The EG procedure, in conjunction with unit root test and Johansen tests have been used extensively for conducting cointegration analysis (Liu and Shrestha, 2008).

3.4.2.1. UNIT ROOT TESTS

Augmented Dickey Fuller (ADF) tests are used to establish the presence of a unit root in each of the time-series, which would suggest the associated data series is non-stationary (Dickey and Fuller, 1979). An *I*(d) time-series is integrated of order *d*, and stationarity may be achieved by differencing *d* times. Cointegration tests require variables to be integrated of order 1 or I(1). This implies that each time-series follows a random walk but are stationary variables after their first difference (Wei, 2015).

The null hypothesis of the ADF test suggests the presence of a unit root. Failure to reject the null hypothesis confirms a non-stationary variable.

3.4.2.2. ENGLE AND GRANGER COINTEGRATION TEST

Engle and Granger (1987) suggest a two-step procedure to test for cointegration. Firstly, an Ordinary Least Squares regression was estimated using weekly logarithmic closing prices of the SRI Index and ALSI. Deo (2014) suggests that EG test results may vary according to which variable is elected as the dependent variable in the regression model. Therefore, the EG test was run twice for all time periods, allowing both the SRI Index and ALSI logarithmic prices to be considered as the dependent variable in the following regression models:

$$ln(SRI)_t = \alpha_0 + \alpha_1 ln(ALSI)_t + \varepsilon_t \quad (4)$$

$$ln(ALSI)_t = \alpha_0 + \alpha_1 ln(SRI)_t + \varepsilon_t \quad (5)$$

The variables are assumed to be non-stationary, which was confirmed using aforementioned ADF unit root tests. For a cointegrating relationship to exist, the residual, ε_t, must be stationary or I(0). Therefore, the second step of the Engle and Granger (1987) process involved performing an ADF test on the residual series once the regression represented by equations (4) and (5) was estimated.

3.4.2.3. JOHANSEN COINTEGRATION TEST

In contrast to EG tests which could only identify one cointegrating relationship, Johansen (1988) and Johansen and Juselius (1990) developed tests that could identify multiple cointegrating vectors. The number of cointegrating relationships is determined by either trace or maximum eigenvalue statistics. The null hypothesis of no cointegration applies to both variations of the test (Wei, 2015).

EViews offers five various models of Johansen's test of cointegration, each with specified parameters. Sjö (2008) suggests that Models 2, 3 and 4 are applicable in empirical work. Furthermore, Model 3, which includes an intercept with no trend in cointegrating equations, is the useful in most applications (Sjö, 2008; Deo, 2014).

3.5. RESEARCH ETHICS

The use of publicly available information limits the number of ethical considerations pertaining to this study. Ethical considerations regarding the research involve ensuring the data is treated in an impartial manner to obtain unbiased results. Additionally, misrepresentation of findings must be avoided to conclude any meaningful results.

4. RESULTS

This chapter is divided into two sections:

4.1. Risk-adjusted returns

4.2 Cointegration

The former addresses the performance of share returns, whereas the latter explores the relationship between the SRI Index and the ALSI.

Chosen levels of statistical significance are denoted by:

* Significant at the 5% level

** Significant at the 1% level

4.1. RISK-ADJUSTED RETURNS

Analysis of risk-adjusted returns includes the overall SRI Index, as well as Low, Medium and High Environmental Impact indices.

4.1.1. SRI INDEX VS ALSI

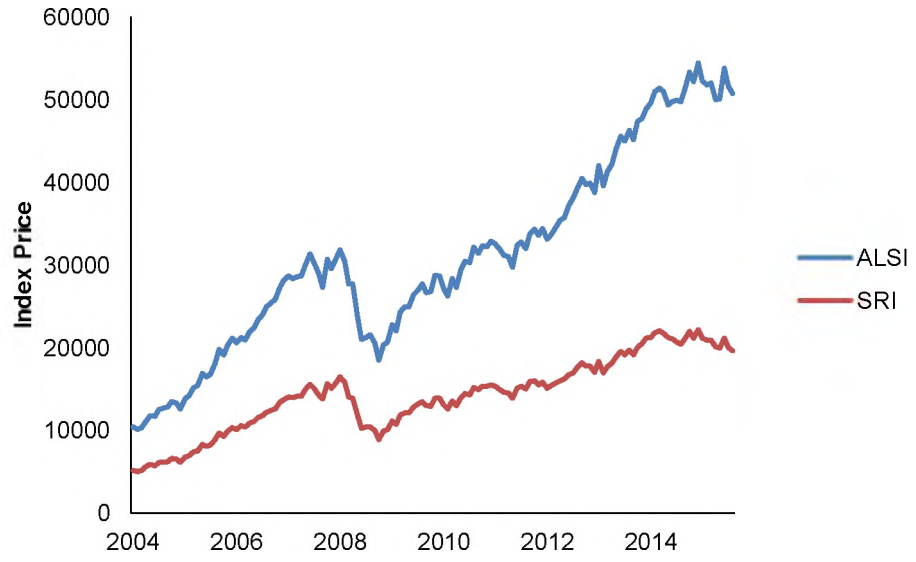

Figure 2: Plot of SRI Index and ALSI prices 2004-2015

Figure 2 tracks the SRI Index and the ALSI using their raw prices and provides an indication of the individual performance of the two indices between 2004 and 2015. However, due to disparity between the index values at the start of the time period, it is difficult to deduce their performance in relation to one another. Therefore, both indices were given a base level of 100 in May 2004, coinciding with the inception of

the SRI Index (see Fig. 3). This provides an indication of their performance relative to one another from 2004-2015. It is evident that both indices closely track one another until 2010. This period included the financial crisis in 2008 and 2009. Figure 3 suggests that the two indices have drifted further apart from 2010 until the discontinuation of the SRI Index at the end of 2015. These preliminary results prompted the following analysis to encompass the entire time period, as well as two sub-periods from 2004-2009 and 2010 to 2015.

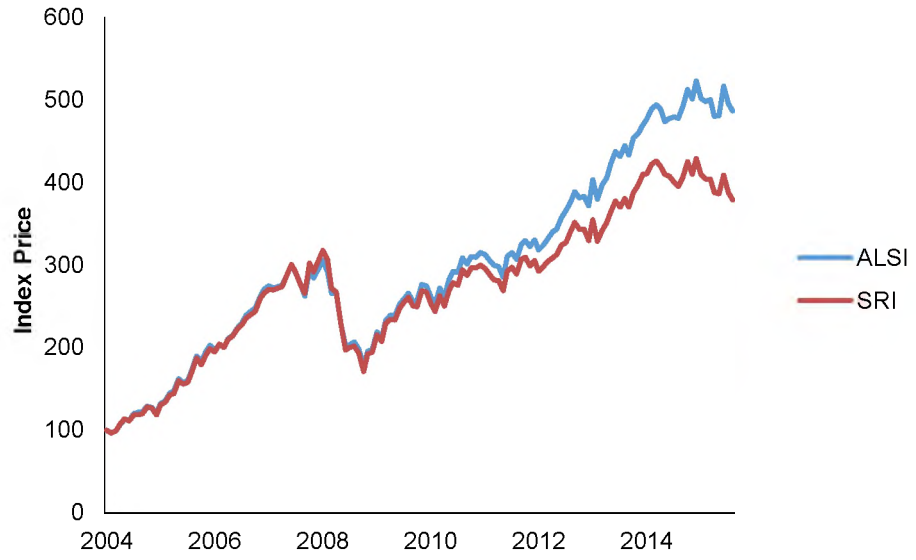

Figure 3: Plot of SRI Index and ALSI prices based at 100

Table 5: SRI Index CAPM results

SRI Index	2004-2015	2004-2009	2010-2015
Jensen's alpha (α)	-0,214%**	-0,080%	-0,336%**
Annualised Return	-2.33%**	-0.88%	-3.63%**
Beta (β)	1,062	1,070	1,040

$$\text{Annualised return} = (1 + \text{monthly return})^{12\text{-}1} - 1 \qquad (6)$$

The observations from Table 5 suggest that the SRI Index displayed negative risk-adjusted returns relative to the ALSI for all three time periods of interest. Additionally, Jensen's alpha measures indicate the underperformance of the SRI Index by 2.33% and 3.63% per annum (calculated from equation 6) were deemed to be statistically significant at the 1% level for both the entire duration, as well as the latter half of the study respectively. There is no significant difference in risk-adjusted returns between the SRI Index and its conventional benchmark, the ALSI, for 2004 until the end of

2009. Furthermore, all beta-values are greater than 1, indicating greater volatility in share returns of the SRI Index relative to the market.

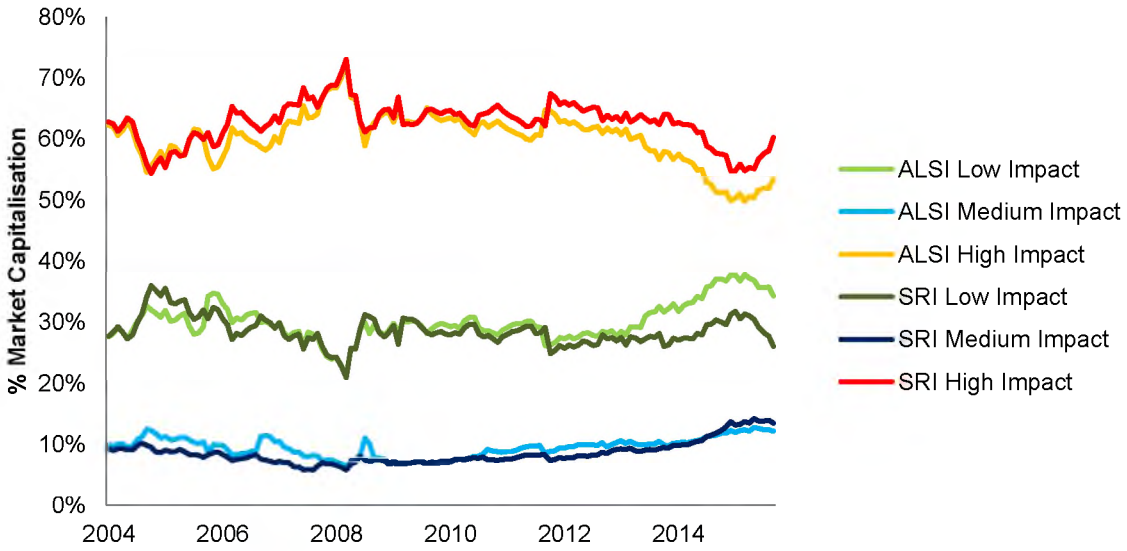

Figure 4: Market Capitalisation by environmental impact category

Figure 4 illustrates the composition of the ALSI and SRI Index according to the environmental impact categorisation suggested by the JSE (2014) (see Appendix A). It is evident that High Environmental Impact industries constitute the bulk of both indices. This is indicative of South Africa's dependence on industries such as mining and construction. The JSE SRI Index assumes similar or greater exposure to High Impact industries throughout the entire time period. In stark contrast, Medium Impact industries form the smallest portion of the JSE, with no significant difference observed between the two indices as they closely track one another (see Fig. 4). A similar trend is exhibited for the Low Impact category, before drifting apart in the latter years. Figure 4 suggests that industries considered having a low impact on the environment accounted for a greater proportion of the ALSI relative to the SRI Index.

4.1.2. LOW ENVIRONMENTAL IMPACT

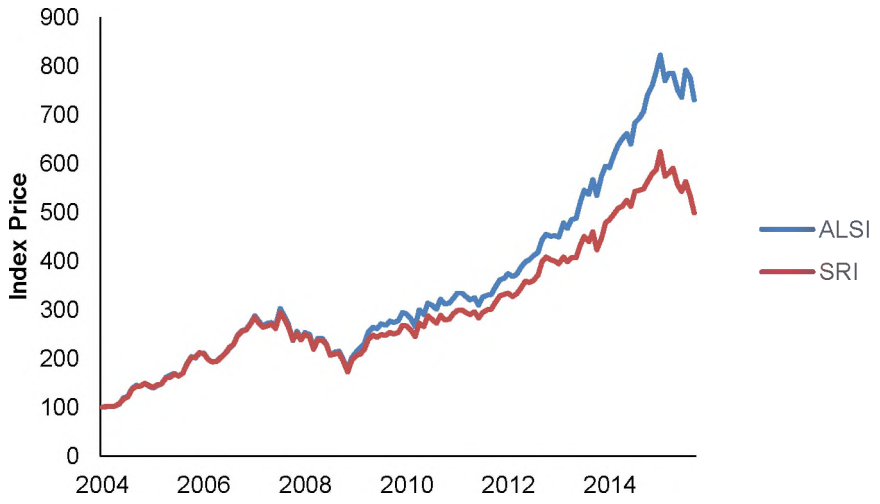

Figure 5: Plot of Low Environmental Impact Indices

The performance of Low Environmental Impact indices depicted in Figure 5 illustrates a similar trend to the overall performance of SRI relative to the ALSI (see Fig. 3). The two indices seem to move in tandem before drifting apart.

Table 6: CAPM results – Low Environmental Impact

Low Environmental Impact		2004-2015	2004-2009	2010-2015
SRI Low Impact	Jensen's Alpha (α)	0,137%	0,107%	0,160%
	Beta (β)	0,749	0,709	0,841
ALSI Low Impact	Jensen's Alpha (α)	0,387%	0,204%	0,550%*
	Beta (β)	0,804	0,770	0,889
Difference (SRI–ALSI)	Jensen's Alpha (α)	-0,250%**	-0,098%	-0,391%**
	Annualised Return	-2.72%**	-1.07%	4.22%**
	Beta (β)	-0,056	-0,061	-0,048

By and large, the Low Environmental Impact classification of both the SRI Index and ALSI exhibit positive but statistically insignificant performance, with the exception of the latter achieving significant positive risk-adjusted returns relative to the market for 2010 – 2015. Inferior SRI performance is indicated by significant negative α-values at the 1% level for both 2004-2015 and 2010-2015. This evidence supports the disparity between the two indices portrayed in Figure 4. All beta-values indicate that Low Impact portfolios are less volatile than the overall market, with the SRI returns exhibiting lower volatility than the ALSI derivative.

4.1.3. MEDIUM ENVIRONMENTAL IMPACT

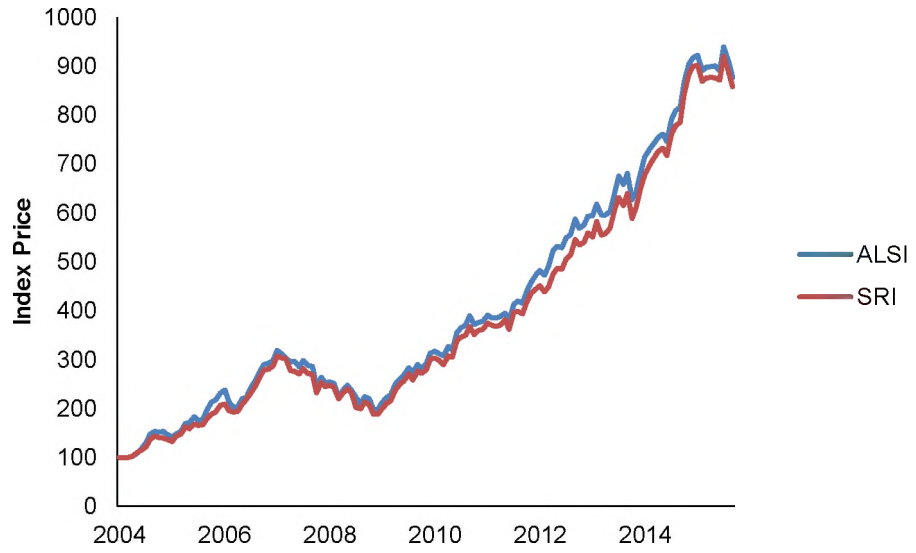

Figure 6: Plot of Medium Environmental Impact Indices

Figure 6 shows that both Medium Environmental Impact indices closely track one another throughout the entire period of the study. This may indicate that there is no significant difference in the performance of their risk-adjusted returns.

Table 7: CAPM results – Medium Environmental Impact

Medium Environmental Impact		2004-2015	2004-2009	2010-2015
SRI Medium Impact	Jensen's Alpha (α)	0,566%*	0,306%	0,800%**
	Beta (β)	0,722	0,684	0,817
ALSI Medium Impact	Jensen's Alpha (α)	0,606%*	0,404%	0,788%**
	Beta (β)	0,686	0,662	0,746
Difference (SRI–ALSI)	Jensen's Alpha (α)	-0,040%	-0,098%	0,012%
	Annualised Return	-0.44%	-1.07%	0.13%
	Beta (β)	0,037	0,022	0,071

Both indices' Medium Environmental Impact counterparts displayed significantly positive risk-adjusted returns at the 5% and 1% for 2004-2015 and 2010-2015 respectively. However, there was no statistically significant difference in performance between SRI and conventional Medium Environmental Impact indices across all three time periods. All beta-values are lower than 1, implicitly suggesting that Medium Environmental Impact portfolios have less volatile returns than the market. Furthermore, associated SRI stocks are observed to have a greater volatility than conventional stocks within the same environmental category.

4.1.4. HIGH ENVIRONMENTAL IMPACT

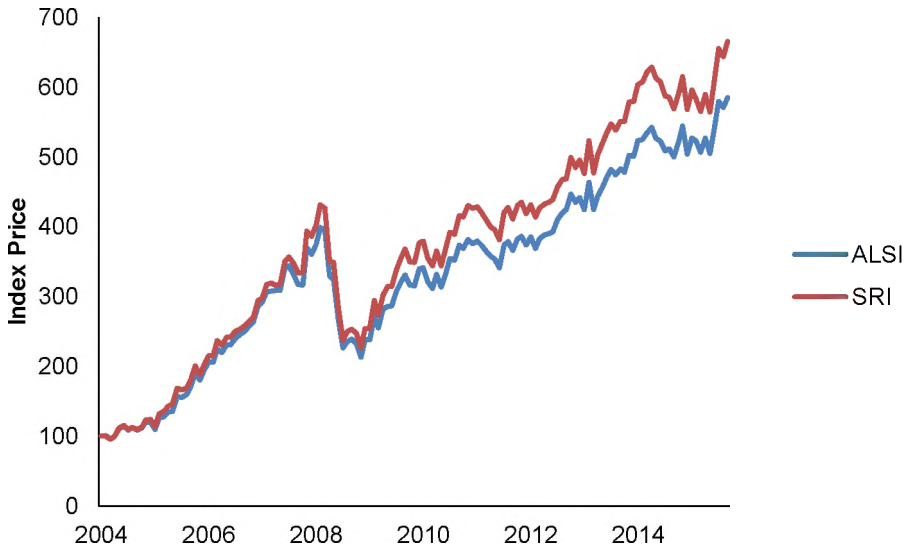

Figure 7: Plot of High Environmental Impact Indices

Figure 6 depicts a trend similar to that of the overall and Low Environmental Impact indices. Initially the two indices follow each other closely, before drift apart in the second half of the study's time period. In stark contrast to the overall and Low Impact indices, SRI stocks exhibit a seemingly superior performance. However, it is important to note that once disparity between the ALSI and SRI High Environmental Impact indices was established, they moved in parallel, which may indicate the absence of sustained superior performance by SRI shares.

Table 8: CAPM results – High Environmental Impact

High Environmental Impact		2004-2015	2004-2009	2010-2015
SRI High Impact	Jensen's Alpha (α)	0,122%	0,300%	-0,035%
	Beta (β)	1,177	1,231	1,048
ALSI High Impact	Jensen's Alpha (α)	0,052%	0,175%	-0,054%
	Beta (β)	1,128	1,177	1,007
Difference (SRI–ALSI)	Jensen's Alpha (α)	0,069%	0,125%	0,019%
	Annualised Return	0.76%	1.38%	0.21%
	Beta (β)	0,049	0,052	0,041

No statistically significant risk-adjusted returns were observed for the ALSI, SRI or Difference portfolio in the High Environmental Impact category. In all three cases, SRI stocks exhibited superior risk-adjusted returns, but were not considered significant. This evidence reinforces the observations made pertaining to Figure 7.

All beta-values are greater than 1, with the related SRI High Environmental Impact Index displaying returns more volatile than both the ALSI and its associated counterpart.

4.2. COINTEGRATION

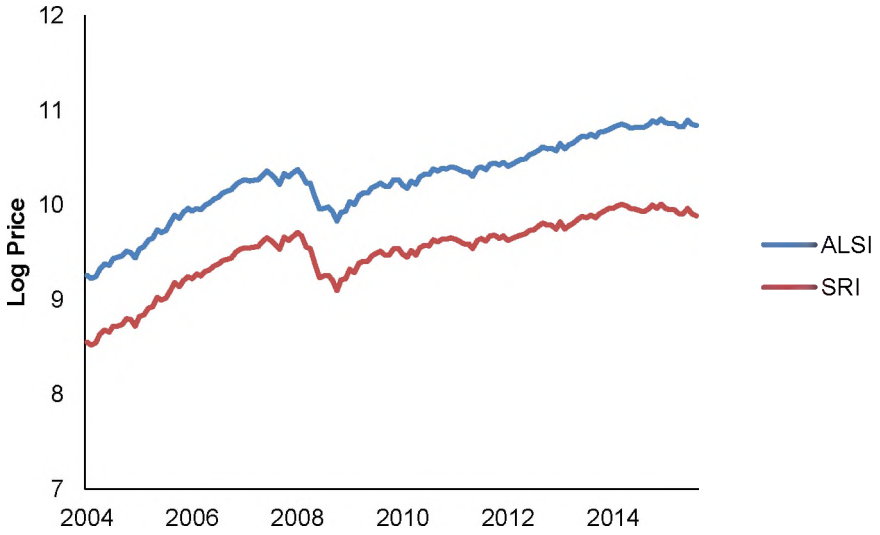

Figure 8: Log Prices of SRI Index and ALSI

Time-series are required to be non-stationary for cointegration to be considered (Deo, 2014). Unit root tests such as the ADF test are essential in verifying the presence of non-stationary variables.

Table 9: ADF test results at level

	2004-2015	2004-2009	2010-2015
P-values	Level	Level	Level
SRI Index	0,335	0,843	0,960
ALSI	0,200	0,825	0,094

H_0: Variable has a unit root

Results from Table 9 indicate the failure to reject the null hypothesis, thus suggesting that both the level SRI Index and the ALSI contain unit roots. Hence, both variables are non-stationary.

Table 10: ADF test results at first difference

	2004-2015	2004-2009	2010-2015
P-values	1st Diff	1st Diff	1st Diff
SRI Index	0,000**	0,000**	0,000**
ALSI	0,000**	0,000**	0,000**

All cases indicate the rejection of the null hypothesis at both the 5% and 1% levels of significance. It can be concluded that both variables are stationary after the first difference. Therefore the SRI Index and the ALSI are I(1) variables. Confirmation that both time-series are I(1) enabled the research to proceed without any further amendments to the data.

Table 11 shows the results of the EG tests, given the chosen dependent variable for the Ordinary Least Squares regression model.

Table 11: EG test results

	2004-2015		2004-2009		2010-2015	
Dep. Variable	t-Statistic	P-value	t-Statistic	P-value	t-Statistic	P-value
SRI Index	-2,879	0,170	-3,376	0,056	-2,195	0,490
ALSI	-3,007	0,131	-3,572*	0,034	-2,404	0,377

H_0: Residual series has a unit root (i.e. no cointegration)

EG test results suggest the failure to reject the null hypothesis for both the full extent of the study and between the years of 2010 and 2015. However, the presence of a potential cointegrating relationship between the ALSI and the SRI Index for 2004-2009, is indicated by the rejection of the null hypothesis at the 5% level of significance. This only applies when the ALSI is considered as the dependent variable in the regression. However, when the SRI Index is deemed as the dependent variable, the p-value of 0.056 approximates to the level of significance (5%). Therefore, Johansen tests for cointegration were conducted to verify the results observed using Engle and Granger's (1987) two-step procedure.

Johansen test results are sensitive to the number of lags included in the model. Hence, an unrestricted vector autoregression model was used to determine the appropriate lag length used in Johansen's tests. The number of lags for the various time periods were chosen based on a multitude of criteria (see Appendix B, C and

D). The period 2004-2015 yielded two different suitable lag lengths, each endorsed by two selection criteria (see Appendix B).

Table 12: Johansen test results using Model 3 (with intercept, no trend)

Number of Cointegrating Equations			None	At most 1
Time Period	Lag Length	Test	Test Stat.	Test Stat.
2004-2015	11	Trace Test	8,767	0,054
		Max Eigenvalue Test	8,713	0,054
2004-2015	15	Trace Test	10,099	0,648
		Max Eigenvalue Test	9,451	0,648
2004-2009	15	Trace Test	24,107**	6,151*
		Max Eigenvalue Test	17,956*	6,151*
2010-2015	14	Trace Test	5,677	1,398
		Max Eigenvalue Test	4,278	1,398

H_0: There is no cointegration

Results from Johansen's test suggest that there is no cointegration for both 2004-2015 and 2010-2015. In contrast, the null hypothesis was rejected for 2004-2009 in the case of both the trace and maximum eigenvalue test. This indicates that there was a cointegrating relationship between the ALSI and the SRI during the sub-period.

Both EG and Johansen tests yielded the same results:

1. 2004-2015: No cointegrating relationship between the SRI Index and the ALSI
2. 2004-2009: Cointegrating relationship between the SRI Index and the ALSI
3. 2010-2015: No cointegrating relationship between the SRI Index and the ALSI

5. DISCUSSION

This chapter discusses the results obtained from the study and discusses their implications with the use of literature.

5.1. RISK-ADJUSTED RETURNS

The results obtained in the previous chapter suggest that the JSE SRI Index underperformed its conventional benchmark, the ALSI. Jensen's alpha (α = -0.214%) indicated that statistically significant inferior risk-adjusted returns were obtained throughout the lifespan of the SRI Index. Sub-period analysis showed that while SRI consistently underperformed the ALSI, only the 2010-2015 period returns were deemed significant. The SRI High Impact Index exhibited superior risk-adjusted returns, but were not found to be significant at the 5% level. In associated process-intensive industries, implementation of environmentally responsible practices may have a great effect on financial performance supported by empirical evidence by Wingard and Vorster (2001). In stark contrast, the SRI Low Impact Index underperformed its benchmark, displaying significant inferior risk-adjusted returns. This may be indicative of the general notion of a distinct trade-off between environmental, social and financial performance (Bardy and Massaro, 2012).

Overall results support the notion that investors pay to be socially responsible (Nilsson, 2008). Consequently, the findings of this study are consistent with work done by Bauer, Koedijk and Otten (2005) and Renneboog, Ter Horst and Zhang (2008). Both groups of researchers established that SRI underperforms its conventional benchmarks in the US, with the latter reporting similar results in United Kingdom and Asia-Pacific regions. Inferior risk-adjusted returns associated with SRI stocks and indices may be attributed to the failure to achieve optimal portfolio diversification due to a restricted investment universe (Barnett and Salomon, 2006; Lee et al., 2010). Additionally, no significant difference between risk-adjusted returns for 2004-2009 is consistent with the findings of Bondera (2014) over the period of 2000-2013 for JSE SRI Index. However, overall results contradict those of Bondera (2014) which may be attributed to the disparity between SRI and the ALSI in the latter years of this study.

Beta-values pertaining to SRI indices were found to be greater than their conventional counterparts, with the exception of the Low Environmental Impact Index. Lower levels of risk pertinent to Low Impact were offset by greater beta-values observed throughout both High and Medium Impact indices. The predominance of High Impact industries (see Fig. 4) could be considered a major determinant of overall heightened sense of risk relating to the SRI Index. This opposes the perception of Junkus and Berry (2015) that SRI has the propensity to be less exposed to chemicals and other basic industries, which may extend to the mining sector in the South African context. Greater SRI beta-values indicate a general higher level of volatility amongst the associated share returns. Schröder (2004) obtained similar results, which may be put down to the inability to further diversify portfolio risk due to constraints of ESG criteria (Junkus and Berry, 2015).

5.2. COINTEGRATION

Results obtained from both EG and Johansen tests suggest that there is no cointegration between the JSE SRI Index and the ALSI. These results contradict the findings of Wei (2015) who discovered a long-run equilibrium relationship between the FTSE SRI and Global 100 indices.

Upon further analysis, the existence of a cointegrating relationship was verified for the period 2004-2009, whereas the subsequent sub-period 2010-2015 showed no indication of cointegration. These results implicitly support evidence of the two indices moving in synchrony before drifting apart (see Fig. 3). Significant inferior risk-adjusted returns sustained by the SRI Index over the latter half of the study could explain the disparity between the indices and the resultant erosion of the cointegrating relationship.

Cointegration analysis has been extensively used in research pertaining to the market efficiency (Diamandis and Kouretas, 1995; Guidi and Gupta, 2013; Bernier and Mouelhi, 2009). Granger's (1986) assumption that two asset prices that are I(1) processes cannot exhibit a cointegrating relationship in an efficient market, is the premise for empirical work regarding cointegration and market efficiency. The weak-form of the EMH proposes that asset prices are determined exclusively using information regarding previous prices and returns (Fama, 1970). The presence of cointegration suggests that it may be possible to predict market price changes based

on movement of another, which contravenes weak-form market efficiency (Jeon and Lee, 2002). The cointegrating relationship between the two indices for 2004-2009 may have been an opportunity to achieve abnormal returns through statistical arbitrage. This suggests the market may have been weak-form inefficient during this sub-period. However, no cointegration was found over the second half of the study, implying the markets were efficient.

The reversion to market efficiency after 2009 coincides with the JSE and King III encouraging all companies to publish integrated reports as of 2010 (JSE, 2015). Disclosure of financial and non-financial data in such reports could guide investors' decision-making processes, also accounting for ESG factors. The semi-strong form of market efficiency encompasses all public company information, including non-financial data (Clarke, Jandik and Mandelker, 2001). Therefore, public access to integrated reports may have played a role in internalising ESG criteria into the market prices, reflecting a semi-strong form of market efficiency. Subsequently, weak-form market inefficiency experienced during 2004-2009 was eroded in the latter years of the study.

It is advised to err on the side of caution with regards to drawing conclusions involving cointegration and market efficiency. A number of authors claim that cointegration does not necessarily translate to market inefficiency (Dwyer and Wallace, 1992; Engle, 1996; Lence and Falk, 2005). However, the use of cointegration analysis can be useful in gaining a fundamental understanding of a market's behaviour (Azad, 2009).

6. CONCLUSION

The aim of the study was to evaluate the share performance of the JSE SRI Index. This was achieved through assessing risk-adjusted returns and exploring the relationship between the JSE SRI Index and the ALSI.

Results suggest that the SRI Index achieved significantly inferior risk-adjusted returns of 2.33% per annum relative to the ALSI over the duration study. The findings were consistent with Bondera (2014) displaying no significant difference in performance between 2004 and 2009. However, significantly negative risk-adjusted returns of 3.63% per annum associated with the JSE SRI Index over the latter half of the study resulted in a significant overall performance. Generally, beta-values of SRI indices were observed to be greater than those of the ALSI portfolios. This may lead to the conclusion that SRI portfolios tend to exhibit a greater volatility among returns than the market portfolio and hence be exposed to a greater degree of systematic risk.

No cointegration with ALSI was found for the full duration of SRI Index's lifespan. The presence of a cointegrating relationship for 2004-2009 indicated that there might have been a violation of the EMH in its weak-form. However, the study suggests that the reversion back to market efficiency, implied by no cointegration for 2010-2015, may be attributed to the introduction of the King III Code and encouraging listed companies to comply with integrated reporting standards.

Overall, the study justifies negative perceptions regarding inferior risk-adjusted returns associated with SRI. However, the launch of the new Responsible Index may prove to redress the SRI performance through more stringent ESG criteria. In conclusion, evidence suggests that investors pay the price to be socially responsible in South Africa, which may be a limiting factor for SRI growth domestically.

6.1. LIMITATIONS OF STUDY

The current study utilises the JSE SRI Index as a proxy for SRI in South Africa. Subsequent results may therefore not apply to research conducted on the performance of actively managed SRI funds. Furthermore, results only pertain to the JSE and any conclusions drawn are may not be valid for foreign markets. This is supported by the lack of universal consistency of empirical findings on SRI in a multitude of foreign markets (Managi, Okimoto and Matsuda, 2012).

The use of Jensen's alpha in a single-factor model CAPM may yield meaningful preliminary results. However results may have greater ramifications if a three or four-factor model is used (Fama and French, 1993; Carhart, 1997).

Additionally, the obtained results may not extend to studies that use different frequencies of data such as daily closing and log prices. Statistical procedures are sensitive to the choice of the data frequency which may lead to different results (Guidi and Gupta, 2013).

6.2. RECOMMENDATIONS FOR FURTHER RESEARCH

Considering the recent launch of the JSE/FTSE Russell Responsible Investment Index, a retrospective study could be conducted. Unlike the JSE SRI Index, the novel index has explicit criteria. Companies listed on the SRI Index from 2004-2015 could be screened against the minimum 2.0 ESG rating. Subsequently, a comparative analysis could be performed between screened companies and the discontinued SRI Index. Additionally, actively managed SRI funds may be used as a suitable proxy and benchmarked against a different set of conventional funds.

Due to limitations associated with the single-factor CAPM, various models could be applied in a similar study. Applying Fama and French's (1993) and Carhart's (1997) three and four-factor models respectively could reveal more comprehensive results.

Replication of the study in various Southern African markets could yield interesting results. Insight into cointegration between African markets may have implications on policy development.

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APPENDICES

APPENDIX A: INDUSTRIES CLASSIFIED BY ENVIRONMENTAL IMPACT

IMPACT CLASSIFICATION

High impact	Medium impact	Low impact
Air transport	Banks*	Consumer / mortgage finance
Airports	DIY and building supplies	Financials not elsewhere classified*
Building materials (includes quarrying)	Electronic and electrical equipment	Information technology
Chemicals and pharmaceuticals	Energy and fuel distribution	Leisure not elsewhere classified (gyms and gaming)
Construction	Engineering and machinery	Media
Fast food chains	Hotels, catering and facilities management	Property investors
Food, beverages and tobacco	Manufacturers not elsewhere classified	Research and development
Forestry and paper	Ports	Support services
Major systems engineering	Printing and newspaper publishing	Telecoms
Mining and metals	Property developers	Wholesale distribution
Oil and gas	Public transport	
Pest control	Retailers not elsewhere classified	
Power generation	Vehicle hire	
Road distribution and shipping		
Supermarkets		
Vehicle manufacture		
Waste		
Water		

APPENDIX B: JOHANSEN TEST LAG LENGTH CRITERIA (2004-2015)

VAR Lag Order Selection Criteria
Endogenous variables: ALSI_LOG_PRICE SRI_LOG_PRICE
Exogenous variables: C
Date: 05/24/16 Time: 19:38
Sample: 5/03/2004 11/30/2015
Included observations: 553

Lag	LogL	LR	FPE	AIC	SC	HQ
0	554.6569	NA	0.000465	-1.998759	-1.983152	-1.992662
1	2409.050	3688.665	5.76e-07	-8.690957	-8.644135	-8.672664
2	2416.793	15.34623	5.69e-07	-8.704494	-8.626459	-8.674007
3	2421.877	10.03968	5.66e-07	-8.708415	-8.599166	-8.665733
4	2431.296	18.53143	5.55e-07	-8.728014	-8.587550	-8.673136
5	2441.782	20.55442	5.42e-07	-8.751471	-8.579793	-8.684398
6	2463.554	42.52117	5.09e-07	-8.815747	-8.612855	-8.736479
7	2519.305	108.4773	4.22e-07	-9.002911	-8.768805	-8.911448
8	2625.556	205.9686	2.91e-07	-9.372714	-9.107394	-9.269056
9	2674.576	94.67298	2.48e-07	-9.535538	-9.239004	-9.419685
10	2696.982	43.10942	2.32e-07	-9.602104	-9.274356	-9.474056
11	2712.095	28.96925	2.23e-07	-9.642297	-9.283334*	-9.502053*
12	2713.162	2.036691	2.25e-07	-9.631688	-9.241511	-9.479249
13	2722.083	16.97076	2.21e-07	-9.649485	-9.228094	-9.484851
14	2727.635	10.52177	2.20e-07	-9.655098	-9.202493	-9.478269
15	2734.756	13.44421	2.17e-07*	-9.666387*	-9.182567	-9.477363
16	2735.954	2.253610	2.20e-07	-9.656254	-9.141220	-9.455035
17	2742.693	12.62440	2.17e-07	-9.666159	-9.119911	-9.452745
18	2745.906	5.996915	2.18e-07	-9.663314	-9.085852	-9.437705
19	2747.820	3.556858	2.20e-07	-9.655768	-9.047091	-9.417964
20	2749.609	3.312983	2.21e-07	-9.647772	-9.007881	-9.397773
21	2752.847	5.971851	2.22e-07	-9.645015	-8.973910	-9.382821
22	2756.199	6.159952	2.23e-07	-9.642674	-8.940355	-9.368285
23	2756.861	1.211234	2.25e-07	-9.630601	-8.897068	-9.344017
24	2758.123	2.300592	2.28e-07	-9.620699	-8.855952	-9.321920
25	2758.556	0.784767	2.31e-07	-9.607796	-8.811835	-9.296822
26	2760.302	3.157755	2.33e-07	-9.599645	-8.772470	-9.276476
27	2762.209	3.435186	2.34e-07	-9.592076	-8.733687	-9.256712
28	2762.719	0.915290	2.37e-07	-9.579455	-8.689852	-9.231896
29	2764.084	2.438453	2.40e-07	-9.569925	-8.649107	-9.210170
30	2764.643	0.995036	2.43e-07	-9.557481	-8.605449	-9.185531
31	2766.415	3.138888	2.45e-07	-9.549420	-8.566174	-9.165275
32	2767.554	2.010407	2.47e-07	-9.539073	-8.524613	-9.142733
33	2769.584	3.569173	2.49e-07	-9.531951	-8.486276	-9.123416
34	2769.913	0.575039	2.53e-07	-9.518672	-8.441784	-9.097942
35	2770.779	1.509002	2.55e-07	-9.507336	-8.399234	-9.074411
36	2771.168	0.676613	2.59e-07	-9.494279	-8.354962	-9.049159
37	2772.084	1.583753	2.62e-07	-9.483126	-8.312595	-9.025811
38	2775.158	5.290618	2.63e-07	-9.479774	-8.278029	-9.010264
39	2776.795	2.807196	2.65e-07	-9.471230	-8.238271	-8.989525
40	2778.397	2.734655	2.68e-07	-9.462557	-8.198384	-8.968657
41	2780.023	2.763884	2.70e-07	-9.453971	-8.158584	-8.947876
42	2781.942	3.247638	2.72e-07	-9.446444	-8.119842	-8.928154
43	2787.990	10.19302*	2.70e-07	-9.453851	-8.096035	-8.923366
44	2791.405	5.731785	2.71e-07	-9.451738	-8.062707	-8.909057
45	2795.833	7.397713	2.70e-07	-9.453283	-8.033039	-8.898408
46	2798.949	5.184302	2.71e-07	-9.450087	-7.998629	-8.883016
47	2801.154	3.652057	2.73e-07	-9.443595	-7.960922	-8.864329
48	2803.071	3.161269	2.76e-07	-9.436061	-7.922174	-8.844600
49	2805.681	4.286527	2.77e-07	-9.431036	-7.885935	-8.827380
50	2807.207	2.494213	2.80e-07	-9.422087	-7.845772	-8.806236
51	2808.656	2.357812	2.82e-07	-9.412860	-7.805331	-8.784814
52	2810.970	3.748945	2.84e-07	-9.406762	-7.768018	-8.766521

APPENDIX C: JOHANSEN TEST LAG LENGTH CRITERIA (2004-2015)

VAR Lag Order Selection Criteria
Endogenous variables: ALSI_LOG SRI_LOG
Exogenous variables: C
Date: 05/31/16 Time: 12:42
Sample: 5/03/2004 12/28/2009
Included observations: 244

Lag	LogL	LR	FPE	AIC	SC	HQ
0	312.9272	NA	0.000268	-2.548583	-2.519918	-2.537039
1	962.8357	1283.836	1.35e-06	-7.842916	-7.756920	-7.808281
2	968.1376	10.38635	1.33e-06	-7.853587	-7.710260	-7.795863
3	974.2770	11.92665	1.31e-06	-7.871123	-7.670466	-7.790309
4	982.4110	15.66791	1.26e-06	-7.905008	-7.647020	-7.801105
5	1003.821	40.89045	1.10e-06	-8.047717	-7.732398	-7.920724
6	1070.486	126.2255	6.56e-07	-8.561361	-8.188712*	-8.411278
7	1074.727	7.960000	6.55e-07	-8.563334	-8.133354	-8.390162
8	1083.423	16.18150	6.30e-07	-8.601831	-8.114521	-8.405569
9	1099.252	29.19237	5.72e-07	-8.698788	-8.154147	-8.479437*
10	1104.871	10.27125	5.65e-07	-8.712061	-8.110089	-8.469620
11	1110.988	11.07951	5.55e-07	-8.729407	-8.070105	-8.463877
12	1112.503	2.720699	5.67e-07	-8.709044	-7.992411	-8.420423
13	1114.753	4.001170	5.75e-07	-8.694695	-7.920732	-8.382986
14	1118.298	6.248494	5.78e-07	-8.690971	-7.859677	-8.356172
15	1127.612	16.25970*	5.53e-07*	-8.734521*	-7.845896	-8.376632
16	1129.549	3.351129	5.63e-07	-8.717616	-7.771661	-8.336638
17	1134.385	8.284273	5.59e-07	-8.724467	-7.721181	-8.320399
18	1136.340	3.317225	5.69e-07	-8.707705	-7.647089	-8.280547
19	1139.894	5.971855	5.72e-07	-8.704049	-7.586102	-8.253802
20	1143.860	6.599229	5.73e-07	-8.703771	-7.528493	-8.230434
21	1145.417	2.565444	5.85e-07	-8.683748	-7.451139	-8.187321
22	1146.527	1.810917	5.99e-07	-8.660061	-7.370122	-8.140545
23	1149.148	4.231048	6.07e-07	-8.648751	-7.301482	-8.106145
24	1150.857	2.732317	6.19e-07	-8.629976	-7.225376	-8.064281
25	1152.165	2.069758	6.34e-07	-8.607913	-7.145983	-8.019128
26	1152.598	0.676618	6.54e-07	-8.578669	-7.059407	-7.966794
27	1152.897	0.463877	6.75e-07	-8.548337	-6.971744	-7.913372
28	1153.601	1.078436	6.95e-07	-8.521317	-6.887394	-7.863263
29	1155.981	3.610296	7.06e-07	-8.508045	-6.816791	-7.826901
30	1156.583	0.902298	7.27e-07	-8.480189	-6.731605	-7.775956
31	1157.423	1.246181	7.48e-07	-8.454287	-6.648372	-7.726964
32	1158.184	1.115878	7.70e-07	-8.427734	-6.564488	-7.677322
33	1160.517	3.385141	7.82e-07	-8.414072	-6.493496	-7.640570
34	1161.663	1.643936	8.03e-07	-8.390679	-6.412772	-7.594088
35	1164.840	4.505771	8.11e-07	-8.383937	-6.348700	-7.564256
36	1167.103	3.171006	8.25e-07	-8.369694	-6.277126	-7.526923
37	1168.170	1.479035	8.48e-07	-8.345659	-6.195760	-7.479799
38	1169.212	1.425867	8.72e-07	-8.321410	-6.114181	-7.432460
39	1170.349	1.537451	8.96e-07	-8.297941	-6.033381	-7.385902
40	1172.170	2.433555	9.16e-07	-8.280084	-5.958194	-7.344955
41	1172.978	1.065912	9.44e-07	-8.253918	-5.874697	-7.295699
42	1173.636	0.857074	9.74e-07	-8.226521	-5.789970	-7.245213
43	1177.871	5.450339	9.77e-07	-8.228450	-5.734568	-7.224052
44	1179.902	2.580306	9.98e-07	-8.212310	-5.661097	-7.184823
45	1181.507	2.012531	1.02e-06	-8.192677	-5.584134	-7.142100
46	1184.628	3.863582	1.04e-06	-8.185477	-5.519603	-7.111810
47	1186.237	1.964758	1.06e-06	-8.165876	-5.442671	-7.069120
48	1188.859	3.159702	1.08e-06	-8.154584	-5.374049	-7.034738
49	1196.267	8.804204	1.06e-06	-8.182516	-5.344650	-7.039580
50	1199.837	4.185085	1.07e-06	-8.178995	-5.283798	-7.012970
51	1203.515	4.250737	1.08e-06	-8.176355	-5.223828	-6.987240
52	1204.468	1.085218	1.11e-06	-8.151376	-5.141518	-6.939171

APPENDIX D: JOHANSEN TEST LAG LENGTH CRITERIA (2004-2015)

VAR Lag Order Selection Criteria
Endogenous variables: ALSI_LOG SRI_LOG
Exogenous variables: C
Date: 05/31/16 Time: 12:45
Sample: 1/04/2010 11/30/2015
Included observations: 257

Lag	LogL	LR	FPE	AIC	SC	HQ
0	498.5766	NA	7.19e-05	-3.864410	-3.836790	-3.853303
1	1297.519	1579.232	1.48e-07	-10.05073	-9.967871	-10.01741
2	1305.619	15.88567	1.43e-07	-10.08264	-9.944542	-10.02710
3	1309.113	6.797823	1.44e-07	-10.07870	-9.885367	-10.00095
4	1318.063	17.27288	1.38e-07	-10.11722	-9.868648	-10.01726
5	1331.440	25.60917	1.29e-07	-10.19020	-9.886384	-10.06802
6	1358.296	50.99487	1.08e-07	-10.36806	-10.00901	-10.22367
7	1370.541	23.06025	1.01e-07	-10.43222	-10.01794	-10.26562
8	1408.572	71.03083	7.75e-08	-10.69706	-10.22753	-10.50824
9	1422.695	26.15804	7.17e-08	-10.77584	-10.25107*	-10.56480
10	1433.011	18.94686	6.83e-08	-10.82499	-10.24499	-10.59174*
11	1438.185	9.421409	6.76e-08	-10.83413	-10.19888	-10.57866
12	1440.175	3.593307	6.87e-08	-10.81849	-10.12800	-10.54081
13	1447.132	12.45148*	6.72e-08	-10.84149	-10.09577	-10.54160
14	1452.070	8.761365	6.67e-08*	-10.84879*	-10.04783	-10.52669
15	1453.895	3.210391	6.79e-08	-10.83187	-9.975673	-10.48755
16	1455.457	2.721814	6.92e-08	-10.81289	-9.901457	-10.44636
17	1459.977	7.809419	6.90e-08	-10.81694	-9.850267	-10.42819
18	1460.583	1.037381	7.09e-08	-10.79053	-9.768616	-10.37957
19	1461.248	1.128903	7.28e-08	-10.76458	-9.687427	-10.33140
20	1462.104	1.438343	7.47e-08	-10.74011	-9.607719	-10.28472
21	1464.005	3.165775	7.60e-08	-10.72377	-9.536146	-10.24617
22	1464.314	0.509152	7.82e-08	-10.69505	-9.452180	-10.19523
23	1466.206	3.091937	7.96e-08	-10.67864	-9.380537	-10.15661
24	1468.330	3.439398	8.09e-08	-10.66405	-9.310706	-10.11980
25	1471.962	5.822502	8.12e-08	-10.66119	-9.252603	-10.09472
26	1472.683	1.143712	8.34e-08	-10.63566	-9.171843	-10.04699
27	1473.966	2.016502	8.53e-08	-10.61452	-9.095459	-10.00363
28	1476.308	3.645693	8.66e-08	-10.60162	-9.027320	-9.968513
29	1476.656	0.536732	8.92e-08	-10.57320	-8.943664	-9.917882
30	1478.992	3.563349	9.05e-08	-10.56025	-8.875477	-9.882719
31	1480.147	1.742687	9.27e-08	-10.53811	-8.798093	-9.838360
32	1482.812	3.982104	9.39e-08	-10.52772	-8.732466	-9.805757
33	1487.187	6.469667	9.38e-08	-10.53064	-8.680150	-9.786465
34	1492.203	7.337579	9.33e-08	-10.53854	-8.632813	-9.772152
35	1495.285	4.461671	9.42e-08	-10.53140	-8.570434	-9.742797
36	1496.128	1.206882	9.68e-08	-10.50683	-8.490626	-9.696014
37	1500.799	6.615785	9.66e-08	-10.51205	-8.440609	-9.679022
38	1501.105	0.428973	9.97e-08	-10.48331	-8.356626	-9.628062
39	1502.907	2.496219	1.02e-07	-10.46620	-8.284282	-9.588743
40	1505.829	4.001452	1.03e-07	-10.45781	-8.220651	-9.558136
41	1508.291	3.334636	1.05e-07	-10.44585	-8.153449	-9.523958
42	1511.246	3.954442	1.06e-07	-10.43771	-8.090073	-9.493607
43	1515.276	5.331897	1.06e-07	-10.43795	-8.035070	-9.471628
44	1516.899	2.121199	1.09e-07	-10.41944	-7.961329	-9.430912
45	1522.001	6.591614	1.08e-07	-10.42802	-7.914671	-9.417278
46	1525.906	4.983354	1.09e-07	-10.42728	-7.858690	-9.394321
47	1529.275	4.247797	1.10e-07	-10.42237	-7.798544	-9.367200
48	1531.758	3.091410	1.12e-07	-10.41057	-7.731498	-9.333178
49	1533.999	2.755047	1.14e-07	-10.39688	-7.662568	-9.297273
50	1535.084	1.317173	1.17e-07	-10.37419	-7.584645	-9.252373
51	1537.024	2.325609	1.20e-07	-10.35816	-7.513379	-9.214132
52	1544.769	9.161373	1.17e-07	-10.38731	-7.487284	-9.221062