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The Effect of Environmental Performance on Stock Returns: A Study of South African Stock Markets

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List of Abbreviations

CAPM	Capital Asset Pricing Model
CME	Capital Market Expectations
CO₂	Carbon dioxide
COP21	21 st Convention of Parties
ESG	Environmental, Social and Governance
FTSE	Financial Times Stock Exchange
ISO	International Organization for Standardization
JSE	Johannesburg Stock Exchange
NYSE	New York Stock Exchange
OLS	Ordinary Least Squares
SARB	South Africa Reserve Bank
SDG	Sustainable Development Goals
SRI	Socially Responsible Investing
SSE	Sustainable Stock Exchanges
TRI	Toxic Release Inventory
UNFCCC	United Nations Framework Convention for Climate Change
UK	United Kingdom
US	United States

Abstract

Changes in climate change have brought about new strategies in investing. This is further reiterated with the creation of sustainability indices which are able to capture the performance of stocks with a strong sustainable performance and are able to advance on the environmental problem. The question to ask is does the market value companies that have better environmental reputations than those that do not?

This paper researches on the impact of firms' environmental performance on their stock returns, with a focus on the South African market. Environmental performance in this case is captured by an event study following the FTSE and JSE partnership announcement and followed subsequently with the launch of the FTSE/JSE Responsible Index. OLS and M-estimation are used to analyse the coefficients.

With the improved results of the M-estimator of coefficients, the findings are not sufficient to be representative of the JSE All Share Index. This is because only three of the ten sample of stocks listed on the responsibility index show significant changes in risk and only one stock in the responsibility index made an abnormal return with the partnership announcements. Of those not listed on the responsible index, only two companies reported negative abnormal returns at the partnership announcement, with another one company being punished at the launch of the responsible index after reporting negative abnormal returns. Therefore, it is the conclusion that environmental performance does not make a great impact for the stocks listed on the JSE All Share Index.

Further areas of research include a focus on other developing countries with sustainable indices, changes in the model to allow for MM-estimation for regression analysis and the consideration of the impact of environmental performance on economic performance as well.

1. CHAPTER ONE: INTRODUCTION

1.1. Background to the Study

Issues of climate change have evolved greatly over the last two decades ever since the 1992 Rio de Janeiro Earth Summit where the United Nations Framework Convention on Climate Change (UNFCCC) was established. Its aim was to stabilise greenhouse gas emissions at the 1990 levels by 2000. This is because emissions of greenhouse gases have a global impact. Hence the reason why efforts to address climate change have been through international collaboration and agreement (Stern, 2006).

As of 2006, the level of greenhouse gases in the atmosphere was equivalent to 430 parts per million carbon dioxide (CO₂) compared to only 280 parts per million CO₂ before the Industrial Revolution, causing the world to warm by more than half a degree Celsius and will lead to at least a further half degree warming over the next four decades (Stern, 2006). Recent efforts as seen in the 21st Convention of Parties (COP21) as organised by the UNFCCC emphasised on creating a global, binding agreement-the Paris Agreement-to cut carbon emissions as the global plenary conceded that reducing carbon dioxide emissions was a global priority.

This agreement came as part of a new sustainable development agenda as adopted by countries of the world to end poverty, protect the planet, and ensure prosperity for all. The sustainable development goals (SDGs) are 17 in total and each goal has specific targets expected to be achieved by the end of 2030. Sustainable development can be defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs. This means that other than a company's goal of achieving profits for itself, it should also meet the needs of the environment and the social community.

In fact, the changes in climate change have brought about new strategies in investing. Social responsible investing-sustainable investing in its purest form-combines the investor's financial objectives with concerns about Environmental, Social and Governance (ESG) issues (Eurosif, 2014). Sociologists have devoted substantial attention to theorising the change in global society arising from the emergence of high consequence risks such as global warming and climate change, showing how modernity may be viewed as a risk society, characterised by fear of risks with

potentially apocalyptic consequences (Beck, 1992; Beck, 1997; Beck, 1999; Giddens , 1990; Luhmann, 2005; Lupton, 1999)

This is further reiterated with the creation of sustainability indices which are able to capture the performance of stocks with a strong sustainable performance and are able to advance on the environmental problem. These indices are able to drive the ESG movement to be of use to asset managers.

Thus, if one were to observe all these facts, then it would only be logical to invest in companies that are non-polluter or at least have mechanisms put in place to reduce the pollution that they radiate, and so, companies that put an effort in reducing their pollution should therefore gain an advantage in terms of return over other companies that do not put in any effort and are polluter. The question to ask is does the market value companies that have better environmental reputations than those that do not?

Unfortunately, although much is written on the impact of climate change information, few are directly related to developing markets in the African context.

1.2. Problem Statement

On the eve of the launch of the United Nations SDGs, the Sustainable Stock Exchanges' (SSE) SDG Leaders Luncheon hosted by the New York Stock Exchange(NYSE) saw senior UN officials join chief capital market regulators and chief executive officers of stock exchanges, investment houses, and large companies where the general agreements were that stock exchanges were indeed important in promoting good corporate practices and facilitating investments in sustainable development (Sustainable Stock Exchange Initiative , 2015). In fact, four countries committed to join the SSE initiative. Namely: Rwanda, Sri Lanka, Kazakhstan and Mauritius.

This would directly reflect on companies as evidenced by Beatty & Shimshack (2010) who showed that poorly rated firms in the United States suffered from market penalties when information on carbon dioxide emissions on companies was leaked by a ratings company in 2007. However, previous research on corporate social performance and green/socially responsible investing have all documented capital markets in the developed world, in countries such as the United States (US), the United Kingdom

(UK), Canada, Australia, the Netherlands amongst many others, few to be researched on developing markets.

Therefore, the objective of this study is to identify whether this information based on environmental performance is transformed into the stock markets of developing countries in Africa, with a focus on South Africa. This will be through the study of the Johannesburg Stock Exchange (JSE) All share Index and the launch of its responsible index after its partnership with the Financial Times Stock Exchange (FTSE). The name of the index is officially known as FTSE/JSE Responsible Index.

1.3. Research Questions

Does environmental performance affect the returns of stocks in the JSE All Share index?

1.4. Research Objectives

To determine whether or not environmental performance affects the returns of stocks in the JSE All Share Index.

1.5. Justification of the Study

The goal of this study is to find out whether the stocks in the JSE All Share Index are affected by environmental performance and if this has an influence on their stock returns, which is captured through their stock returns. Secondly, this study will aid in understanding if the South African stock markets are efficient to actually reflect information that is released and cannot be used to make abnormal gains.

This study will also be done in a move to research more on developing markets, more so in the African set up to understand investor's consciousness and motivation when making investor decisions. It will be helpful to researchers who seek to understand stock market behaviour within South Africa as well as the importance of environmental performance of companies.

Furthermore, portfolio managers within this market as well as foreign investors stand to gain knowledge and a deeper understanding on the African Emerging and Frontier markets. This is because this study that seeks to determine if stock returns are correlated to environmental performance in capital markets.

Lastly, it is the view that this research will help the managers be more aware on environmental performance and how it affects not only the planet, but as well as profits and people.

2. CHAPTER TWO: LITERATURE REVIEW

2.1. Introduction

The following section reviews concept, theory and empirical evidence on environmental performance and stock market returns in the South African stock market.

2.1.1. Firm Choice and the Environment

Management makes choices each day. They make choices on the quality and source of inputs, product choices, how to optimise resources while minimising costs, how to manage waste and so much more. Whatever decision they make, the end objective is to maximise the profit of the firm in order to give value to their shareholders, thus the most affirmative course of action taken by managers is that which derives value to the firm. That being noted, the decisions a company makes still affects its treatment to its total environment, making the firm's choice, whether good or bad.

According to Anderson-Weir (2010) distinction between these two outcomes (good or bad) can be hard to define and even harder to determine in reality. However, two paths are predicted in economic theory by Konar & Cohen (2001).

One theory suggests that positive benefits will be greater than the costs of the environmentally friendly behavior. The positive benefits arise from things such as: increased demand due to a better public image, less input waste in production, less negative attention from regulators, etc (Konar & Cohen 2001) . If this theory is correct then the end result will be increased profitability to the firm and the stock market should reflect this association.

The other theory suggests that this behaviour leads to high operating costs due to the high cost of pollution reducing technology and other factors that are friendly to the environment. If this theory is true then positive environmental choices will have a negative effect on the value of a company (Anderson-Weir, 2010). Figure 1 summarises the two theories.

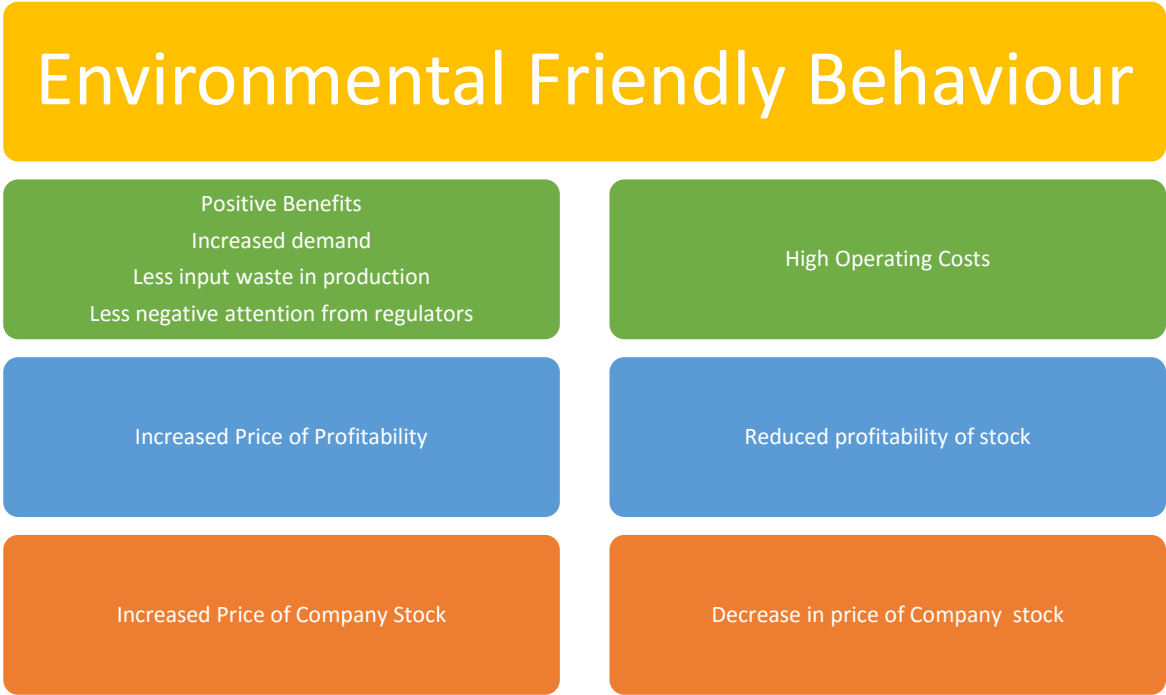


Figure 1 Economic Theory of Environmental Friendly Behaviour

Konar and Cohen (2001) explain that US firms spent more than US\$120 million in 1994 so as to comply with international laws which translated to about 1.5%-2% of the Gross Domestic Product (GDP). In fact Palmer et al. (1995) argue that expenditures on environmental protection may crowd out other more productive investments. Diltz et al. (1995) add on to write that hidden costs of environmental protection can account for as much as 20% of an oil refinery’s budget. Furthermore, Jackson and Heubaum (2013) conclude that even the current institutional framework for delivering climate finance under the UNFCCC is inadequate to meet the challenge of sufficiently quickly scaling up climate change mitigation and adaptation and private sector finance would be required to meet this need.

Despite the costs, more than 1200 firms participated in the United States’ Environmental Protection Agency’s 33/50 program, agreeing to voluntarily reduce certain chemical emissions by 33% by 1988 and 50% by 1995 (Arora & Cason, 1995). More recent updates from the White House fact sheet are that President Obama announced a new target to cut out net greenhouse gas emissions 26-28% below 2005 level by 2025 (Statements and Releases: The White House, 2014). China announced targets to increase the non fossil fuel share of all energy to around 20% by 2030.

Some of the declarations from the Paris Summit of 2015 were from developing countries as well (Paris 2015: tracking country climate pledges, 2015). Kenya pledged to cut emissions by 30% by 2030 relative to a business-as-usual scenario of 143 million tonnes of carbon dioxide equivalent, this was however dependent on international support on the infrastructure required to reduce these levels. Ethiopia pledged to a 64 % reduction on a business-as-usual scenario by 2030, equivalent to a 3% reduction against a 2010 baseline, also subject to support. South Africa took a peak-plateau-decline approach to greenhouse gas emissions. It estimated its peak to be between 2020-2025 with a plan to cut 398-614 million tonnes of carbon dioxide equivalent and plateau for an estimated period of ten years before declining in its reduction of carbon gases emitted.

2.1.2. Market Efficiency

Fama (1970) described efficient markets to be markets whose prices fully reflect all information available. Depending on the how fast this information is reflected into the market price of a publicly traded stock is what defined the efficiency. The slower the transmission rate, as discussed by Fama et al. (1969), the weaker the efficiency and increase in chances for investors to make abnormal gains. This was explained with the fact that the conditions of market equilibrium can be stated by expected returns and that equilibrium expected returns are formed on the basis of the information set. This is to say:

$$E[P_{j,t+1}|\Phi_t] = P_{j,t}[1 + E(R_{j,t+1}|\Phi_t)]$$

Efficiency was divided into three forms: weak form, semi-strong efficiency and strong form efficiency. Weak form efficiency implies that all information from historical prices are already included in the pricing of the stock and so no one investor can make abnormal gains from technical analysis. Semi-strong form alludes to the fact that fundamental analysis is useless since all publicly available information is already translated into the pricing of a stock. The strong form efficiency involves markets whose information that consists of historical pricing, public and private information and are all directly infused in the prices and therefore no one investor can consistently beat the market from insider information as this information is said to be incorporated well before the investor gains this information. Thus, lags in the relay of information

into the prices could be used by investors when inefficiency of some level exists in the market.

2.1.3. Are Markets Efficient?

In terms of testing this efficiency of markets, there have been mixed results from several researchers who attempt to identify the efficiency of markets. In addition, there are those of the opinion that the efficient market hypothesis is inaccurate. This has been argued by previous empirical studies that observe certain irregular phenomena from stock markets such as seasonal effects like the January effect (Ali & Mustafa, 2001). However, there are two ways to view it.

One way may imply inefficiency as markets take long to adjust to new information. Another way might review that the market remains to be efficient but the information is received in a systematic manner, hence the observed patterns.

Whatever way to look at it, Fama (1970) explains, since frictionless markets do not really exist, then, so long as the necessary but not sufficient conditions for capital market efficiency (CME) (2) Disagreement to implications of current information exist but no investor can come up with a metric and consistently make better evaluations of available information than are implicit in market prices and (3) Investors account for all transactions taking place such that even large transaction costs inhibiting the flow of transactions do not affect, then abnormal gains cannot be made since efficiency will hold.

This implies that all information available should then be important to investors, as they stand to make gains from holding this information. However, of importance is the investor's objective. The rational risk-averse investor's objective is to make the highest returns with the least risk. Thus, conventional portfolios are made with this in mind.

Bearing that in mind, investor behaviour is not always rational as explored widely by Kahneman (2003). He explains that investor beliefs can be affected by culture, since what is natural and intuitive in a given situation is not the same for everyone: different cultural experiences favour different intuitions about the meaning of situations, and new behaviours become intuitive as skills are acquired. All the same, even when armed

with such information to predict investor expectations, the results may still be surprising given the randomness of behaviour which cannot be 100% certain.

Thus, how investors regard a publicly traded company can then be influenced by several factors other than the conventional risk measures such as those mentioned by Fama & French (1993) which are derived to assess a company's market value. The investor's choice could then be influenced by the company's ethical decisions. Such examples could include a company's disclosures pertaining to its environmental performance. That is, how well the company acts to the environment, climate change, and what additional costs are taken to influence the company's carbon emissions.

2.2. Empirical Review

2.2.1. On Socially Responsible Investments

While there is no current consensus on the precise definition of Social Responsible Investing (SRI), the general understanding, as mentioned earlier, is that it is any type of investment process that combines investors' financial objectives with their concerns about Environment, Social and Governance (ESG) issues (Eurosif, 2014).

Perhaps the purest of investment strategies are those of sustainability themed investments that covers all investment strategies that are related to sustainability which is focused on the three Ps: People, Planet and Profit. Eurosif (2014) describes the reason for this would perhaps be due to investors' motivations may vary greatly, but it is typical to support particular industries transitioning to more sustainable consumption and production. This can be combined with a belief that a particular theme will outperform the rest of the market over the holding period, or may provide some degree of de-correlation to other investments. However, this remain to be the smallest strategies taken yet. The Eurosif report goes on to explain that the period between 2013-2014, European Sustainability themed assets have increased by 11% per year to reach €59 billion. The growth is even more impressive on a longer time scale - since measurements began in 2005, it has grown on average 30.7% per annum.

However, it is interesting to note the performance of socially responsible investments as compared to conventional methods of investment. According to Cortez et al. (2012) there are two arguments on SRI. One is based on portfolio theory suggests that the construction of portfolios from a restricted universe of stocks will limit the benefits of

diversification (Rudd, 1981). Furthermore, the additional costs of monitoring social performance will also lead to lower returns. Accordingly, these funds should exhibit poorer performance relative to conventional portfolios. Other proponents of SRI argue that social screens represent filters that enable the identification and selection of firms with higher quality of management relative to their less responsible competitors. As a consequence, portfolios composed of socially responsible stocks will benefit from improved performance in the long run (Hill, Ainscough, Shank, & Manullang, 2007; Kempf & Osthoff, 2007)

In general, empirical studies have typically shown that the performance of socially responsible funds is similar to the performance of conventional funds.

Past studies include that of the US markets studies such as those of Hamilton et al. (1993), Reyes and Grieb (1998), Goldreyer & Diltz (1999) and Bello (2005). Unfortunately, they are limited to traditional Capital Asset Pricing Model (CAPM) based measures of performance, which are currently recognized as inappropriate to measure fund performance.

Studies that focus on the UK (Luther et al., 1992; Luther & Matatko, 1994; Mallin et al., 2005; Gregory et al., 1997) have uncovered a small size bias in socially responsible funds. Studies on the performance of social funds also include data from several other individual countries, such as, the Netherlands (Scholtens, 2005), Australia (Bauer, Otten, & Rad, 2006) and Canada (Bauer, Derwall, & Otten, 2007).

A set of other studies has performed a comparative analysis of the performance of socially responsible funds in more than one market. Kreander et al. (2002) were the first to analyse a considerable number of European markets (UK, Sweden, Germany, Netherlands, Norway, Switzerland and Belgium). Schroeder (2004) and Bauer (2005), besides considering the US market, also analyse the performance of socially responsible funds in other European markets. The former focuses on German and Swiss funds, whereas the latter use a larger sample composed of UK and German funds. Cortez et al. (2009) investigate the performance of socially responsible funds for seven European countries (Austria, Belgium, France, Germany, Italy, the Netherlands and UK).

2.2.2. On Impact Investing

While the developed world has mainly focused on SRIs, a newer version or generation has been brought forward and termed *Impact Investing*. First named adequately in the 2007 Bellagio Summit convened by the Rockefeller Foundation in the U.S., it spans various social themes that can be categorised into two main labels. First, social integration, which includes themes revolving around access to affordable housing, health, finance, education, personal care or employability amongst similarly themed areas. Secondly, sustainability-related projects in the field of production and access to, for instance, renewable energy, food, water, sustainable agriculture. This category is heavily focused on developing markets.

There are a few definitions for it that have been attempted by various organisations and have been summarised in Appendix 1.

2.2.2.1. On Corporate Sustainability Performance

When one describes corporate sustainability performance, one must refer to sustainable development, as it is a result in investing in sustainable development. Sustainable development integrates the consideration of economic growth, environmental protection, and social equity, simultaneously on a macro level (Figge & Hahn, 2004). When incorporated by the firm, it is known as corporate sustainability (CS).

Lacey et al. (2010) explain that engaging in activities to contribute to sustainability development is an important dimension of corporate voluntary practice. Porter and Kramer (2006) support this as they believe that engagement in activities promoting sustainable development is increasingly analysed as a source of competitive advantage.

Given this, then perhaps it would be best to analyse how the markets react to environmental performance.

2.2.3. On Environmental Performance vs. Financial Performance

There are a large number of empirical studies that have been performed to identify the stock market reaction to news on environmental performance as far as developed markets are concerned (Ambec & Lanoie, 2007). Three main approaches have been

dominant in that literature: (1) Portfolio analyses, (2) Event studies and (3) Long term studies using regression analysis.

Konar and Cohen (2001) find that there is a significant positive relationship between environmental performance and the intangible asset value of publicly traded firms in the S&P 500. Firms that have worse environmental performance have lower intangible asset values after controlling for other standard variables known to affect the market value of a firm.

2.2.3.1. Portfolio Analysis

Portfolio analysis is used to examine whether socially responsible investment funds exhibit a different performance from funds in a more general investment context. Such analyses compare the economic performance of portfolios consisting of companies with a higher environmental or social performance with portfolios of companies that have not been screened with these criteria. The comparison is done using indicators like Jensen's alpha, Sharpe and Treynor ratios (Bauer, Koedijk, & Otten, 2005). In general, it is expected that ethical funds will under-perform over the long run because funds managers are constrained to a subset of the market portfolio (Ambec & Lanoie, 2007).

Eleven out of sixteen known studies come to the conclusion that there is no statistically significant difference between the performance of SRI funds and conventional ones (Luther, Matatko, & Corner, 1992; Hamilton, Jo, & Statman, 1993; Luther & Matatko, 1994; Diltz, Ranganathan, & Banks, 1995; Guerard, 1997; Sauer, 1997; Gregory, Matatko, & Luther, 1997; Kreander, Gray, Power, & Sinclair, 2002), further reiterated by (Schröder, 2004; Bauer, Derwall, & Otten, 2004; Bauer, Koedijk, & Otten, 2005) while five of them show results confirming that SRI funds outperform conventional ones (White, 1996a; Goldreyer & Diltz, 1999; Statman, 2000; Mallin, Saadouni, & Briston, 1995; Edwards, 1998).

2.2.3.2. Event Studies

For one to carry out an event study, one must assume that capital markets are efficient (Fama, 1970). The reaction to the announcement of an event is obtained by predicting a "normal" return for each firm during an "event window" (usually the day prior to the event, the day of the event and a few days after the event), and then subtracting this

predicted normal return from the actual return observed on those days of the event window. If there is a significant difference between the predicted return and the observed return (i.e., an abnormal return), one can conclude that the event had a significant influence on the stock price. Normal returns are usually predicted using a version of the Capital Asset Pricing Model (CAPM), constant mean return model, market model, market return model, multi-factor models, using calendar time portfolio regressions among many other models.

Many researchers have examined the effects of environmental “events” on stock market performance. The events considered have generally the character of negative news, such as information about illegal spills, prosecutions, fines, or the emission data related to the American Toxics Release Inventory (TRI). Only a few studies consider the effects of positive news, such as information about companies winning environmental awards (Klassen & McLaughlin, 1996; Yamashita, Sen, & Roberts, 1999). Some authors, like (Blacconiere & Patten, 1994), (Jones, Jones, & Phillips-Patrick, 1994) and (White, 1996a), have considered only one major event (the Bhopal explosion, the Exxon Valdez Oil spill). All event studies show that the markets respond to news, regardless of good or bad.

When they are limited to one or at most five trading days after the event to ensure that confounding news do not interfere with the effect of interest, event studies offer strong econometric results of causality, showing that markets respond in the short run, to environment news. However, this research is only limited to the developed markets.

2.2.3.3. Long Term Studies Using Regression Analysis

In these studies, investigators examine, the relationship between certain characteristics of companies (including their environmental performance), and their economic performance by use of regression analysis. Contrary to event studies, the analysis focuses on the characteristics of companies and not on specific news about the companies. In contrast to portfolio analysis, researchers do not examine a portfolio of stocks, but single stocks. Different measures of environmental performances (TRI emissions, ISO 14001 certification, the adoption of other international environmental standards) and economic performance (Tobin’s Q, return on assets, return on sales, return on equity) and are used in the various studies.

Nine studies out of twelve that are known show that better environmental performance is associated with better economic performance. Examples include, (Hart & Ahuja, 1996; Feldman, Soyka, & Ameer, 1996; Russo & Fouts, 1997). Two studies show no impact (McWilliams & Siegel, 2000; Wagner, Van Phu, Azomahou, & Wehrmeyer, 2002), while one concludes on a negative relationship (Cordeiro & Sarkis, 1997).

Generally speaking, one can say that these results suggest that a bad environmental performance is associated with a lower economic performance on a long-term basis, which implies an increase in the cost of capital and by inference, a lower market value.

2.3. Conceptual Framework

The conceptual framework shown below in figure 2 is representative of the relationship between the independent variable of “environmental performance” and the dependent variable of “stock market returns”.

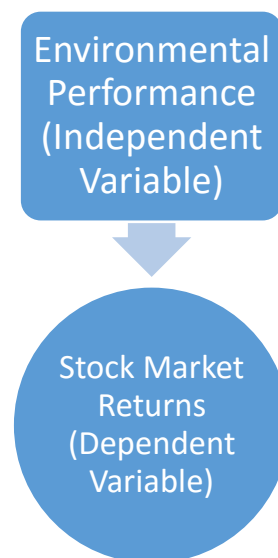


Figure 2 Conceptual Framework

Environmental performance in this study focuses on South Africa’s effort to promote sustainability, under which environment stands as a key pillar. This looks at the series of events that show case that. These events are firstly, the announcement on the FTSE and JSE partnership geared to promote ESG reporting by South African companies. This was secondly followed by the adoption of the FTSE ESG ratings through the launch of the FTSE/JSE Responsible Index.

An event study is carried out to analyse environmental performance which shall be measured by changes in beta, that is market risk of the Johannesburg Stock Exchange

(JSE) All Share Index and any significant changes in alpha, that is, the abnormal returns that may occur due to both the announcement and launch of the FTSE/JSE Responsible Index. Stock returns shall be measured using the log returns of the sample of stocks listed in the JSE All Share Index, of which half of the sample stocks are already listed in the FTSE/JSE Responsible Index Top 30.

However, the foreign exchange market returns as well as the risk-free rate shall be used as control variables in the analysis of the relationship between stock returns and environmental performance.

3. CHAPTER THREE: METHODOLOGY

3.1. Introduction

This paper is aimed at studying the impact of environmental performance in the South African stock market. The general methodology that shall be followed is an event studies surrounding events leading to the launch of the FTSE/JSE Responsible Investment Index in South Africa, following the global planet declarations to commit to reducing current greenhouse gases as an effort towards sustainable development.

Event studies work around the assumption of efficient capital markets as explained by Fama (1970), whereby the market has no reason to misprice stocks and so any abnormal returns to stocks listed in the sustainable index during the event will act as a proxy for the market's reaction. In fact, systematically nonzero abnormal security returns that persist after a particular type of corporate event are inconsistent with market efficiency (Khotari & Warner, 2006).

The rest of this chapter is broken down into various sections detailing: the research design, population and sampling methods, data collection methods, the research procedures, data analysis methods and the chapter summary.

3.2. Research Design

The research design of the paper is one that is quasi-experimental. This is because this research paper attempts to establish the cause-effect relationships between the environmental performance of a company and its return on the stock market, which by definition is a quasi-experimental design approach. However, a relationship between environmental performance and stock market returns must first be established.

This research design is appropriate given the research paper seeks to understand the importance of environmental and sustainable performance and if it can influence investor choices or preferences.

3.3. Population and Sampling Design

3.3.1. Population

The population involved in the study is consistent of stock market returns from South Africa's JSE All Share Index. The average returns of a particular stock i is calculated using the rationale that:

$$R_{it} = K_{it} + \varepsilon$$

That is, it is made up of normal returns (K_{it}) plus any other abnormal or excess return (ε) arrived at a period t . The normal returns are assumed to be the log returns of the closing daily market prices.

3.3.2. Sampling Design and Sample Size

The sampling design approach taken up in this research paper is that of purposive sampling.

Purposive sampling refers to a non-probability sampling technique that is used when a researcher needs to reach a target population fast and non-proportionality is not an issue. However purposive sampling within this study has been narrowed into expert sampling which involves a sampling of persons or things with experience or are known to have experience in one area or another. This is because, in order for one to study the stock in the markets of developing countries, it is prudent to pick the best stock exchanges within the developing countries as they are more mature and can give more accurate results when it comes to the study.

During the time of study, this research will focus on the JSE All Share Index. A sample of 20 stocks shall be picked. Their returns shall be analyzed throughout the event studies. Out of the 20 stocks chosen from each stock market, ten companies were listed on a country's respective sustainability index as well. Having an equal number of stocks brings in uniformity in terms of comparing the different stock markets.

The stocks from each market shall be picked at random. However, representativeness is key and so stocks from at least each industry represented in one market shall be picked. This method of sampling is known as stratified random sampling.

3.4. Data Collection

All historical data is retrieved from the Thomson Reuters Eikon software. The variables needed to control the model shall require a proxy for the market return, risk free rate and the forex market return. The proxy for market return shall be the JSE All Share Index as retrieved from the Eikon software. The risk-free rate proxy shall be the 91-day Treasury Bill rate whose trading values shall be acquired from the South African Reserve Bank (SARB) statistics webpage and the forex market return shall be the real effective exchange rate against the most important currencies as retrieved from the SARB website.

3.5. Research Procedures

The first step into undertaking the event studies shall involve identifying the event. However, the series of events leading to the launch of each index in the countries of study are to be considered. These events are summarized in the appendix. The first event is the announcement of the FTSE and JSE partnership in a bid to improve ESG reporting and takes place on 24th June 2015. The second event is the launch of the FTSE/JSE Responsible Index on 7th September 2015, which consists of stocks with the highest ESG ratings.

Second, one needs to identify the estimation period prior to the event. For this case study, a standard 120 days before the event first window is taken in to account. MacKinlay (1997) cites 120 trading days as commonly implemented in event studies for the estimation period. Furthermore, the post-event window period looks at the stock market reaction immediately after the launch of the responsible index and whose period shall be 120 days after the last event window. The event window is (-1, +1) day as suggested by MacKinlay (1997) since it does not allow for spillovers and weakening of the test.

The model that shall be used to identify if abnormal returns is a modified version of the market model as explained by Sorokina et al (2013). The model is a version of the model geared in event studies for financial regulation which varies from the normal market model since regulation is a process before it actually exists, as is the launch of a new index. This model measures market reaction in the process between announcement of the launch and the actual launch of the index. Dummy variables,

which are equal to one during event windows, are used to capture abnormal returns. The model is able to absorb the market reaction to the events in three timing sections. First, the early stage reaction influenced by the partnership announcement is captured by changes in beta also known as market risk and changes in alpha which signifies abnormal returns. Thereafter, the intermediate stage reaction which measures abnormal returns on the announcement of plan to launch the sustainability index that follows ESG guidelines. Lastly, the final stage in market reaction shall be captured through changes in beta due to the launch of the index. The risk-free rate and the foreign exchange market are used as control variables. It is specified as follows:

$$R_i = \alpha_i + \alpha'_i D' + \alpha_{oi} D_o + \beta_i R_m + \beta'_i D' R_m + \beta_{oi} D_o R_m + \sigma_i R_{rf} + \lambda_i R_{fx} + \gamma_i D + \varepsilon$$

Where

R_i is the daily return on the stock

α is the index alpha

α' is the difference between alpha index before/after the FTSE and JSE partnership announcement

α_o is the difference between alpha index before/after the launch of the FTSE/JSE Responsible Index

D' is the dummy variable representing before/after the FTSE/JSE partnership announcement where $D'=0$ before and $D'=1$ after.

D_o is the dummy variable representing before/after the launch of the FTSE/JSE Responsible Index

R_m is the market return

β_i is the index beta

β'_i is the change in index beta after the launch of the FTSE and JSE partnership announcement

β_o is the change in index beta after the launch of the FTSE/JSE Responsible Index

σ is the risk-free rate coefficient

λ is the forex return coefficient

R_{fx} is the forex market return

R_{rf} is the risk-free rate of return

γ is the coefficient for cumulative abnormal returns

D is the dummy variable of the event periods, that is, the (-1, +1) of partnership announcement date of 3rd June 2015 and the (-1, +1) of the launch of the index on 12th October 2015.

ε is the error term

Data Analysis

Data analysis shall begin with tests of stationarity. All data must first be stationary in order for the model to predict the estimators accurately. Any non-stationary data is then made stationary through the method of first differencing. This research will then carry out a simple ordinary least squares method in order to carry out data analysis. Thereafter, robust regression method, the M-estimator is also used to identify if the results acquired using the OLS regression are indeed accurate and yield the same results.

However, before this is done, outliers within the OLS results must first be identified. This is done by calculating Cook's distance, whose objective is to identify the influence of data points in least square regression (Cook, 1977). It measures the effect of deleting a given observation and identifies both outliers and high leverage points. A Cook's distance of $4/(n - k - 1)$ is chosen as the cutoff for identifying an observation as an outlier, where n = number of observations and k = number of independent variables, as suggested by Belsley, Kuh and Welsch (2005).

Therefore, the market model will be estimated using the M-estimator. The M-estimator was introduced by Huber (1973). This approach utilizes median values of the sample and mitigates the influence of outliers by assigning them a weight based on a repeating algorithm until the result is sufficiently improved. M-estimation is well-established for the purpose of financial data analysis. The OLS regressions are performed in Excel, with the robust regression performed in Eviews.

The expectation of results is summarised with three hypotheses (stated in null form) below:

H_0 (1) there are abnormal returns for stocks listed in the FTSE/JSE Responsible Top 30 Index using OLS regression.

H_0 (2) there are abnormal returns for stocks listed in the FTSE/JSE Responsible Top 30 Index using M-estimator.

H_0 (3) there is no difference between the event effect-related coefficients obtained using OLS and an M-estimator robust to outliers.

4. Findings and Results

The data was checked for stationarity using unit root test in levels on Eviews and the results were that all the independent variables other than D' , D_0 , $D'R_m$ and D_0R_m were stationary. The results of the tests are shown below from Table 1 to 8. However, the method of first differencing was used as a solution to the non-stationary variables in levels to ensure that the model could then be used with the appropriate data. Their results of the unit root tests in first difference are also shown below from Table 9 through 12.

Table 1 Test for Unit Root in levels for D0

Null Hypothesis: D0 has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=16)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-0.748863	0.8313
Test critical values: 1% level	-3.450812	
5% level	-2.870444	
10% level	-2.571584	

Table 2 Test for Unit Root in levels for D

Null Hypothesis: D01 has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=16)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-10.35178	0.0000
Test critical values: 1% level	-3.450878	
5% level	-2.870473	
10% level	-2.571600	

Table 3 Test for Unit Root in levels for D0Rm

Null Hypothesis: D0RM has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=16)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-19.98357	0.0000
Test critical values: 1% level	-3.450812	
5% level	-2.870444	
10% level	-2.571584	

Table 4 Test for Unit Root in levels for D'

Null Hypothesis: D_ has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=16)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-1.345339	0.6091
Test critical values: 1% level	-3.450812	
5% level	-2.870444	
10% level	-2.571584	

Table 5 Test for Unit Root in levels for D'RM

Null Hypothesis: D_RM has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=16)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-19.83550	0.0000
Test critical values: 1% level	-3.450812	
5% level	-2.870444	
10% level	-2.571584	

Table 6 Test for Unit Root in levels for Rfx

Null Hypothesis: RFX has a unit root
 Exogenous: Constant
 Lag Length: 3 (Automatic - based on SIC, maxlag=16)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-5.267154	0.0000
Test critical values: 1% level	-3.451011	
5% level	-2.870532	
10% level	-2.571631	

Table 7 Test for Unit Root in levels for Rm

Null Hypothesis: RM has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=16)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-19.03031	0.0000
Test critical values: 1% level	-3.450812	
5% level	-2.870444	
10% level	-2.571584	

Table 8 Test for Unit Root in levels for Rrf

Null Hypothesis: RRF has a unit root
 Exogenous: Constant
 Lag Length: 1 (Automatic - based on SIC, maxlag=16)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-2.134574	0.2313
Test critical values: 1% level	-3.450878	
5% level	-2.870473	
10% level	-2.571600	

Table 9 Test for Unit Root in first difference for D0

Null Hypothesis: D(D0) has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=16)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-17.77639	0.0000
Test critical values: 1% level	-3.450878	
5% level	-2.870473	
10% level	-2.571600	

Table 10 Test for Unit Root in first difference for D'

Null Hypothesis: D(D_) has a unit root
 Exogenous: Constant
 Lag Length: 0 (Automatic - based on SIC, maxlag=16)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-17.77639	0.0000
Test critical values: 1% level	-3.450878	
5% level	-2.870473	
10% level	-2.571600	

Table 11 Test for Unit Root in first difference for D0RM

Null Hypothesis: D(D0RM) has a unit root
 Exogenous: Constant
 Lag Length: 4 (Automatic - based on SIC, maxlag=16)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-14.11379	0.0000
Test critical values: 1% level	-3.451146	
5% level	-2.870591	
10% level	-2.571663	

Table 12 Test for Unit Root in first difference for D'Rm

Null Hypothesis: D(D_RM) has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on SIC, maxlag=16)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-12.72349	0.0000
Test critical values: 1% level	-3.451214	
5% level	-2.870621	
10% level	-2.571679	

4.1. Results using OLS Regression

Table 13 represents the results of the model using OLS Regression. The model is compared by first using a sample of stocks not listed on the FTSE/JSE Responsible Index Top 30 as can be seen in panel A1. The model is also tested using a second sample, that is, a sample of stocks listed on the FTSE/JSE Responsible Index Top 30 presented in panel A2. The total sample of 20 stocks are however included in the JSE All Share Index, of which its index was used as the proxy for calculating market risk, also known as beta. In each panel, the coefficient of the event parameters is split based on their timing: the change in risk when FTSE and JSE partnership was announced, abnormal returns throughout the event process focused on ESG reporting and import of ESG ratings for companies and finally, the change in risk when the FTSE/JSE Index was launched.

4.1.1. Stocks not listed on the FTSE/JSE Responsible Top 30 Index

The discussion shall begin with the results of panel A1 of Table 13. This included stocks that are not listed in the FTSE/JSE Responsible Top 30 Index.

There was an increase in market risk in RMB Holdings by 0.5350 with the launch of the responsible index as denoted by β_0 . Montauk Holdings also reacted with the launch of the responsible index, however, it was a decrease in its beta by 0.73251. This comes as a surprise since both stocks were not considered as having high ESG ratings but had differing responses to market risk. Furthermore, all other stocks remained unchanged during the event period, including Aspen Pharmaceuticals. Although Aspen Pharmaceuticals is not amongst the top 30 ESG rated firms, it is the only stock amongst the stocks in panel A1 that is listed in the general FTSE/JSE Responsible Index. Its

unchanged risk due to being listed on this index goes against the expectation that is expected of companies when listed on an index.

However, the overall reaction of Montauk Holdings and RMB Holdings should still be treated with prudence. Given, their reaction to the launch of the index, these reactions could remain to be isolate to the particular event since all other sample data remained unchanged in terms of their risk. In fact, since Montauk Holdings showed a decrease in its market risk, there could have been an event that occurred concurrently with the launch of the responsible index. Such is not strange for event studies as news occurs on a continuous basis and affects different stocks in different ways.

As for the control variables, the results show in Table 13, panel A1, that Consolidated Infrastructure Group's return is strongly positively related to the index returns of the JSE All Share index, as well as Aspen Pharmaceuticals, although slightly. With exception to Santova Limited, the 91-day bill rate does not influence stock returns. However, Jasco Electronics' returns are strongly affected by the foreign exchange market returns, represented by the lambda coefficient. Santova Limited was the exception that had a positive alpha, meaning investors who invested in this stock were able to get abnormal returns during the event period. This is possible since the stock is essentially of a medium to low capitalisation and could have got the advantage of small-cap firms that are sometimes overlooked due to scrutiny that is usually placed over large stock firms.

R^2 explains the fit of the model. It is on the last row of panel A1. It is worthy to note that Montauk Holdings, which showed a reduction in its market risk also has a very low R^2 of 2% compared to that of RMB Holdings which was 25%. This could further reiterate the fact that the decrease in its market risk must have been influenced by other factors or events that are not considered in this study, unlike RMB whose market risk increased for not being listed amongst the top 30 highly ESG rated firms.

Table 13: Results using OLS Regression

$$R_i = \alpha_i + \alpha'_i D' + \alpha_{oi} D_o + \beta_i R_m + \beta'_i D' R_m + \beta_{oi} D_o R_m + \sigma_i R_{rf} + \lambda_i R_{fx} + Y_i D + \varepsilon$$

R_i is the daily return on the stock; α is the index alpha; α' is the difference between alpha index before/after the FTSE and JSE partnership announcement; α_o is the difference between alpha index before/after the launch of the FTSE/JSE Responsibility Index; D' is the dummy variable representing before/after the FTSE/JSE partnership announcement where $D'=0$ before and $D'=1$ after; D_o is the dummy variable representing before/after the launch of the FTSE/JSE Responsibility Index; R_m is the market return; β_i is the index beta; β'_i is the change in index beta after the launch of the FTSE and JSE partnership announcement; β_o is the change in index beta after the launch of the FTSE/JSE Responsibility Index; σ is the risk-free rate coefficient; λ is the forex return coefficient; R_{fx} is the forex market return; R_{rf} is the risk-free rate of return; Y is the coefficient for cumulative abnormal returns; D is the dummy variable of the event periods; ε is the error term

Panel A1 : OLS Results for stocks not listed in the FTSE/JSE Responsibility Index Top 30											
p-values are reported below the coefficients *** - significant at 1%, ** - significant at 5%, * - significant at 10%											
	RMB Holdings	Bidvest Group	Massmart Holdings	Shoprite Holdings Ltd	Montauk Holdings	Jasco Electronics Holdings	Bowler Metc	Consolidated Infra	Santova Ltd	Aspen Pharmacare	
Event Effect Parameters											
1 α'	0.0012	0.0016	-0.00326	-0.00123	-0.00011	0.00391	-0.00205	0.00248	0.00207	-0.00032	
	0.7094	0.5349	0.38250	0.70988	0.99097	0.70970	0.67918	0.37368	0.64149	0.92046	
β'	-0.0052	0.1478	0.32921	0.28427	0.70487	0.74468	0.06245	-0.20473	0.03654	0.01207	
	0.9778	0.2968	0.11480	0.12503	0.17727	0.20509	0.82190	0.19029	0.88316	0.94564	
2 γ	-0.0069	-0.0016	-0.00002	-0.00610	0.02643	-0.01449	0.00016	0.00072	0.00930	0.00011	
	0.4421	0.8141	0.99842	0.49018	0.28929	0.60544	0.99057	0.92329	0.43361	0.98917	
3 α_0	-0.0026	-0.0015	-0.00082	-0.00111	-0.00893	-0.00291	0.00087	-0.00302	0.00427	0.00129	
	0.4151	0.5289	0.81447	0.72229	0.30943	0.76820	0.85248	0.25117	0.30824	0.66444	
β_0	0.5375	0.1765	0.25272	0.01593	-0.73251	0.32703	-0.22358	0.05479	0.30713	0.05473	
	***0.0006	0.1343	0.14521	0.91746	*0.09195	0.50283	0.33269	0.67289	0.13797	0.70993	
Control Variables and Intercept											
β	0.29842	0.08029	0.01783	0.06394	-0.16524	-0.64667	0.18773	0.34067	0.08872	0.21878	
	0.02961	0.43826	0.90687	0.63665	0.66513	0.13281	0.35540	***0.00306	0.62584	*0.09191	
σ	-0.00111	0.00032	0.00433	0.00443	0.00623	0.00508	-0.00081	-0.00216	-0.01034	0.00066	
	0.79141	0.91875	0.35400	0.28503	0.59402	0.69901	0.89626	0.53723	*0.06403	0.86679	
λ	0.33792	0.25762	0.54262	0.10326	-0.47614	3.93313	0.10099	0.07095	-0.16045	0.33812	
	0.40682	0.40390	0.23274	0.79789	0.67549	***0.00228	0.86739	0.83485	0.76722	0.38117	
α	0.00671	-0.00199	-0.02610	-0.02729	-0.03183	-0.03274	0.00537	0.01332	0.06480	-0.00539	
	0.79218	0.91775	0.35825	0.27945	0.65439	0.68231	0.88705	0.53149	*0.05656	0.82315	
R ²	25%	13%	14%	9%	2%	5%	1%	6%	6%	6%	

1- Change in risk when FTSE and JSE partnership was announced, 2- Abnormal returns throughout the event process focused on ESG reporting and import of ESG ratings for companies, 3- change in risk when the FTSE/JSE Index was launched

Table 13 (continued): Results using OLS Regression (Panel A2)

$$R_i = \alpha_i + \alpha'_i D' + \alpha_{oi} D_o + \beta_i R_m + \beta'_i D' R_m + \beta_{oi} D_o R_m + \sigma_i R_{rf} + \lambda_i R_{fx} + Y_i D + \varepsilon$$

R_i is the daily return on the stock; α is the index alpha; α' is the difference between alpha index before/after the FTSE and JSE partnership announcement; α_o is the difference between alpha index before/after the launch of the FTSE/JSE Responsible Index; D' is the dummy variable representing before/after the FTSE/JSE partnership announcement where $D'=0$ before and $D'=1$ after; D_o is the dummy variable representing before/after the launch of the FTSE/JSE Responsible Index; R_m is the market return; β_i is the index beta; β'_i is the change in index beta after the launch of the FTSE and JSE partnership announcement; β_o is the change in index beta after the launch of the FTSE/JSE Responsible Index; σ is the risk-free rate coefficient; λ is the forex return coefficient; R_{fx} is the forex market return; R_{rf} is the risk-free rate of return; Y is the coefficient for cumulative abnormal returns; D is the dummy variable of the event periods; ε is the error term

Panel A2 : OLS Results for stocks listed in the FTSE/JSE Responsibility Index Top 30											
p-values are reported below the coefficients *** - significant at 1%, ** - significant at 5%, * -significant at 10%											
	Netcare Limited	Tiger Brands Ltd	Kumba Iron Ore Ltd	British American Tobacco PLC	Mondi Ltd	Life Healthcare	Truworths International Ltd	Anglogold Ashanti	Barclays Group	African Rainbow Mineral Limited	
Event Effect Parameters											
1 α'	0.00063	0.00583	-0.00641	0.00265	0.00022	0.00252	0.00195	0.00417	0.00085	-0.00093	
	0.83462	*0.06307	0.45228	0.22186	0.94100	0.37703	0.64183	0.51895	0.79989	0.87935	
β'	0.03132	0.17913	0.66108	0.05492	0.19159	0.13130	0.07220	-0.12896	0.09079	0.34959	
	0.85161	0.30614	0.16634	0.64988	0.24263	0.41041	0.75756	0.72106	0.62734	0.30788	
2 γ	0.00538	-0.00346	0.01170	0.00069	-0.00703	-0.00020	-0.01290	-0.01494	-0.00341	-0.01393	
	0.50104	0.67883	0.60769	0.90435	0.36914	0.97874	0.24868	0.38672	0.70251	0.39494	
3 α_0	-0.00113	-0.00194	0.00237	0.00075	-0.00009	-0.00257	-0.00056	0.00443	-0.00217	0.00638	
	0.68810	0.51023	0.76768	0.71247	0.97477	0.33835	0.88698	0.46616	0.49122	0.26910	
β_0	0.03012	0.18301	0.40133	-0.05299	-0.07116	-0.10183	0.35900	-0.22574	0.40039	0.05375	
	0.82872	0.20871	0.31180	0.59832	0.60135	0.44250	*0.06556	0.45235	**0.01040	0.85030	
Control Variables and Intercept											
β	0.30273	0.09742	-0.05344	-0.00586	-0.04174	0.24016	0.00519	-0.01661	0.20774	-0.05215	
	**0.01395	0.44673	0.87828	0.94721	0.72765	**0.04019	0.97582	0.94990	0.12960	0.83520	
σ	-0.00005	-0.00193	0.00690	-0.00332	-0.00390	0.00168	-0.00191	-0.00611	-0.00096	-0.00100	
	0.98865	0.62219	0.51858	0.22141	0.28846	0.63858	0.71474	0.45016	0.81776	0.89609	
λ	0.26882	0.66667	1.26936	0.44991	0.86484	0.53349	0.57183	0.42903	0.56570	1.83793	
	0.46168	*0.08112	0.22266	*0.08877	**0.01593	0.12549	0.26252	0.58591	0.16583	**0.01432	
α	-0.00012	0.00907	-0.04527	0.02072	0.02692	-0.01219	0.01216	0.03802	0.00559	0.00455	
	0.99588	0.70363	0.48626	0.20953	0.22836	0.57492	0.70279	0.44009	0.82640	0.92234	
R ²	11%	13%	9%	1%	4%	10%	6%	2%	20%	5%	
1-Change in risk when FTSE and JSE partnership was announced, 2- Abnormal returns throughout the event process focused on ESG reporting and import of ESG ratings for companies, 3- change in risk when the FTSE/JSE Index was launched											

4.1.2. Stocks listed on the FTSE/JSE Responsible Index Top 30

The results of the stocks listed on the FTSE/JSE Responsible Top 30 Index shall be discussed as observed in Table 13 of panel A2.

Truworths International Limited and Barclays group stock returns were the only ones that reacted (positively) to the market beta with the launch of the new index. All other stocks' risks remained unchanged. Furthermore, Tiger brands was able to outperform the market as can be observed with its positive alpha returns with the launch of the partnership. This could be the market expectation that the company would benefit with this partnership.

In reference to the control variables, those that proved significant were the beta and lambda coefficients representing market risk and the forex market return respectively. Only Netcare Limited had its returns being affected by the overall market return. However, Barclays' return is also influenced by the foreign exchange market rate. In fact, the foreign exchange market rate has a great influence on three other stocks. Namely: Tiger Brands, Mondi Ltd, African Rainbow Mineral Limited. This could be because these companies have international market share or its investors are primarily foreign. The latter could be a possibility given that these stocks have high ESG ratings, set to the international standard of the FTSE. Investors, especially those in the Americas and Europe have had environmental performance as a priority as evidenced by the 2008 carbon credit leak (Beatty & Shimshack, 2010). Furthermore, the stocks listed in the FTSE/JSE Responsible Top 30 index also belong in the JSE Top 40 index, meaning they are also large capitalisations stocks which are attractive to foreign investors.

4.2. Results using M-estimator

Table 14, which is made up of panel B1 and B2 shows the coefficient results of the event and control parameters for the same sample data of stocks not listed and listed on the FTSE/JSE Responsible Top 30 Index respectively. The difference being that the method used is the robust regression method of M-estimator. The results are consistent with the different regression methods, for those stocks whose risks were found to be significant. However, there were a few changes that were observed when using the M-estimator such as the increase of beta with the launch of the index for

Table 14: Results using M-estimator

$$R_i = \alpha_i + \alpha'_i D' + \alpha_{oi} D_o + \beta_i R_m + \beta'_i D' R_m + \beta_{oi} D_o R_m + \sigma_i R_{rf} + \lambda_i R_{fx} + Y_i D + \varepsilon$$

R_i is the daily return on the stock; α is the index alpha; α' is the difference between alpha index before/after the FTSE and JSE partnership announcement; α_o is the difference between alpha index before/after the launch of the FTSE/JSE Responsible Index; D' is the dummy variable representing before/after the FTSE/JSE partnership announcement where $D'=0$ before and $D'=1$ after; D_o is the dummy variable representing before/after the launch of the FTSE/JSE Responsible Index; R_m is the market return; β_i is the index beta; β'_i is the change in index beta after the launch of the FTSE and JSE partnership announcement; β_o is the change in index beta after the launch of the FTSE/JSE Responsible Index; σ is the risk-free rate coefficient; λ is the forex return coefficient; R_{fx} is the forex market return; R_{rf} is the risk-free rate of return; Y is the coefficient for cumulative abnormal returns; D is the dummy variable of the event periods; ε is the error term

Panel B1 : M-Estimator Results for stocks not listed on the FTSE/JSE Responsibility Index Top 30										
p-values are reported below the coefficients *** - significant at 1%, ** - significant at 5%, * -significant at 10%										
	RMB Holdings	Bidvest Group	Massmart Holdings	Montauk Holdings	Jasco Electronics Hold	Bowler Metcalfe Ltd	Consolidated/ Shoprite Holdings	Santova Ltd	Aspen Pharmacare	
Event Effect Parameters										
1 α'	0.00098		-0.01078	-0.01078	-0.00211	-0.00034	0.00534	-0.00025		0.00109
	0.74750		*0.05410	*0.05410	0.68070	0.73870	**0.0218	0.93870		0.72170
β'	-0.03815		0.65100	0.65100	0.22651	0.01653	0.00092	0.24670		0.05072
	0.82250		**0.03750	**0.03750	0.43000	0.76880	0.99440	0.17650		0.76750
2 γ	-0.00675		0.00873	0.00873	0.01206	-0.00050	0.00214	-0.00612		0.00004
	0.40560		0.55940	0.55940	0.37930	0.85340	0.73120	0.48280		0.99610
3 α_0	-0.00236		0.00354	0.00354	-0.00353	-0.00098	-0.00476	0.00002		0.00104
	0.40860		0.50180	0.50180	0.46540	0.30110	**0.0298	0.99520		0.71810
β_0	0.24312		-0.64902	-0.64902	-0.26266	0.04033	0.13231	0.06743		0.07131
	*0.0854		**0.01260	**0.01260	0.27100	0.38820	0.22160	0.65680		0.61700
Control Variables and Intercept										
β	0.29396		-0.10355	-0.10355	-0.04442	-0.03001	0.03907	0.07296		0.19419
	**0.0181		0.65110	0.65110	0.83250	0.46580	0.68170	0.58490		0.12180
σ	-0.00092		0.00323	0.00323	0.01333	0.00162	-0.00068	0.00234		-0.00196
	0.81000		0.64520	0.64520	**0.03820	0.19810	0.81570	0.56720		0.61080
λ	0.34806		-0.14133	-0.14133	-0.78412	-0.17364	-0.05888	0.10126		0.42980
	0.34770		0.83590	0.83590	0.21020	0.15660	0.83570	0.79910		0.25040
α	0.00560		-0.01183	-0.01183	-0.08400	-0.00951	0.00157	-0.01455		0.01067
	0.80890		0.78140	0.78140	0.03180	0.21480	0.92930	0.55860		0.64810
1- Change in risk when FTSE and JSE partnership was announced, 2- Abnormal returns throughout the event process focused on ESG reporting and import of ESG ratings for companies, 3- change in risk when the FTSE/JSE Index was launched										

Table 14(continued): Results using M-Estimator

$$R_i = \alpha_i + \alpha'_i D' + \alpha_{oi} D_o + \beta_i R_m + \beta'_i D' R_m + \beta_{oi} D_o R_m + \sigma_i R_{rf} + \lambda_i R_{fx} + Y_i D + \varepsilon$$

R_i is the daily return on the stock; α is the index alpha; α' is the difference between alpha index before/after the FTSE and JSE partnership announcement; α_o is the difference between alpha index before/after the launch of the FTSE/JSE Responsible Index; D' is the dummy variable representing before/after the FTSE/JSE partnership announcement where $D'=0$ before and $D'=1$ after; D_o is the dummy variable representing before/after the launch of the FTSE/JSE Responsible Index; R_m is the market return; β_i is the index beta; β'_i is the change in index beta after the launch of the FTSE and JSE partnership announcement; β_o is the change in index beta after the launch of the FTSE/JSE Responsible Index; σ is the risk-free rate coefficient; λ is the forex return coefficient; R_{fx} is the forex market return; R_{rf} is the risk-free rate of return; Y is the coefficient for cumulative abnormal returns; D is the dummy variable of the event periods; ε is the error term

Panel B2 : M-Estimator Results for stocks listed on the FTSE/JSE Responsibility Index Top 30										
p-values are reported below the coefficients *** - significant at 1%, ** - significant at 5%, * -significant at 10%										
	Netcare Limited	Tiger Brands Ltd	Kumba Iron Ore Ltd	British American Tobacco Pl	Mondi Ltd	Life Healthcare	Truworths Int	Anglogold Ashan	Barclays Group	African Rainbow Mineral Limited
Event Effect Parameters										
1 α'	0.00119	0.00492	-0.00308	0.00232	0.00221	0.00208	0.00076	0.00545	0.00155	0.00222
	0.68690	*0.099	0.69390	0.26770	0.43450	0.47230	0.84640	0.37940	0.61680	0.69910
β'	0.04301	0.11351	0.56067	-0.01701	0.07125	0.13931	0.15299	0.24065	0.08466	0.16630
	0.79460	0.49570	0.20010	0.88440	0.65280	0.38980	0.48800	0.48730	0.62400	0.60380
2 γ	0.00562	-0.00344	0.01206	0.00019	-0.00742	-0.00047	-0.01203	-0.01466	-0.00356	-0.01416
	0.47630	0.66590	0.56380	0.97260	0.32660	0.95130	0.25360	0.37560	0.66640	0.35510
3 α_o	-0.00119	-0.00226	-0.00039	0.00110	0.00051	-0.00153	0.00031	0.00464	-0.00126	0.00399
	0.66750	0.41950	0.95780	0.57790	0.84920	0.57580	0.93380	0.42650	0.66390	0.45940
β_o	-0.00554	0.25710	0.47188	0.05879	-0.04078	-0.09587	0.15683	-0.49042	0.24352	0.17363
	0.96780	*0.0634	0.19450	0.54540	0.75680	0.47660	0.39250	*0.0886	*0.0899	0.51460
Control Variables and Intercept										
β	0.26261	0.12750	-0.03078	0.06272	0.04310	0.22102	0.02958	-0.04291	0.20901	-0.04900
	**0.02980	0.29560	0.92340	0.46370	0.71000	*0.0622	0.85460	0.86560	*0.0982	0.83450
σ	-0.00071	-0.00217	0.00537	-0.00325	-0.00500	0.00068	0.00019	-0.01032	-0.00184	-0.00517
	0.84880	0.56110	0.58350	0.21510	0.15860	0.85130	0.96890	0.18330	0.63480	0.47110
λ	0.30211	0.67516	1.14132	0.40430	0.74676	0.53102	0.61136	0.59181	0.77428	1.75497
	0.40150	*0.063	0.23150	0.11280	**0.0306	0.13270	0.20360	0.43320	**0.03980	**0.012
α	0.00357	0.01131	-0.03697	0.02059	0.03310	-0.00568	-0.00153	0.06302	0.01074	0.02864
	0.87400	0.61850	0.53520	0.19650	0.12520	0.79690	0.95950	0.18190	0.64820	0.51200
1- Change in risk when FTSE and JSE partnership was announced, 2- Abnormal returns throughout the event process focused on ESG reporting and import of ESG ratings for companies, 3- change in risk when the FTSE/JSE Index was launched										

Tiger Brands. To show this comparison, Table 15 shows the statistically significant event correlated coefficients using OLS regression and M-estimator.

Table 15: Summary of Results using OLS and M-estimator

Summary of the results using OLS and M-estimator										
	OLS					M-Estimator				
	α'	β'	γ	α_0	β_0	α'	β'	γ	α_0	β_0
RMB Holdings					0.5375 ***0.0006					0.24312 *0.0854
Bidvest Group										
Massmart Holdings						-0.01078 *0.05410	0.65100 **0.03750			-0.64902 **0.01260
Netcare Limited										
Montauk Holdings					-0.73251 *0.09195	-0.01078 *0.05410				-0.64902 **0.01260
Jasco Electronics Holdings										
Bowler Metcalfe Ltd										
Consolidated Infrastructure Group						0.00534 **0.0218			-0.00476 **0.0298	
Santova Ltd										
Tiger Brands Ltd	0.00583 *0.06307					0.00492 *0.099				0.25710 *0.0634
Kumba Iron Ore Ltd										
Shoprite Holdings Ltd										
British American Tobacco PLC										
Mondi Ltd										
Life Healthcare										
Aspen Pharmacare										
Truworths International Ltd					0.35900 *0.06556					
Anglogold Ashanti										-0.49042 *0.0886
Barclays Group					0.40039 **0.01040					0.24352 *0.0899
African Rainbow Mineral Limited										

Using M-estimator, it can be observed that there were other stocks that were affected with the partnership announcement between JSE and FTSE, as well as the launch of the responsible top 30 index that arose as part of this partnership. Massmart Holdings was affected by both the partnership announcement and the launch of the index. OLS regression failed to capture this. With the partnership announcement, Massmart Holdings achieved negative returns as can be observed with the negative alpha, meaning the market was able to outperform the individual stock. Perhaps investors had anticipated the FTSE and JSE partnership would reduce Massmart Holdings' profitability in the retail industry. Retailers often face a lot of hazardous environmental problems. From food and chemical waste to packaging, light bulbs, plastic bags and

so much more. Therefore, the market reaction to the announcement could have served as a signalling to the company. This could have been relayed since there were no abnormal returns made during the launch of the index.

Similarly, using the M-estimator, it is seen that there were negative abnormal returns with the announcement of the FTSE and JSE partnership for Montauk Holdings. Montauk Holdings is a renewable energy production company. Therefore, it is unclear why the stock would observe a negative alpha given the nature of its operations. Like previously mentioned, there could be an overriding news or information that could have led to the results as summarised in Table 15 since none of the control variables affect its stock returns.

Consolidate Infrastructure Limited was able to beat the market at the date of the partnership announcement but the inverse happened during the launch of the partnership. This could be that the market expected the company to improve as a result of the partnership, but was later punished due to its lack of inclusion with the launch of the index.

With the summary of results, the gamma coefficient which represented abnormal returns throughout the event period and the beta prime which represents market risk changes due to the partnership announcement remain to be insignificant for the stocks listed in the responsible top 30 index. This can be seen with the p-values of each coefficient as seen in Table 14. Additionally, no significant changes to risk are noted with the launch of the index, with exception to the companies mentioned above (Anglogold Ashanti, Tiger Brands and Barclays). Truworths International even loses its significance with β_0 when M-estimation is used. This leads us to reject the first and second hypothesis since the stocks listed remain to be largely indifferent with inclusion into the index and the partnership announcement since no abnormal returns, with the exceptional stocks mentioned above, are made. This is based on the p-values on Table 14 and summarised on Table 15.

Given the values of the coefficients are different when using both regression methods, this leads us to reject the third null hypothesis since the significant coefficients have differing figures. This gives reason for the researcher reason to believe that there exist outliers in the sample data.

4.3. Summary of Major Results and Findings

The major findings of this study show that the majority of stocks remain indifferent with the partnership announcement and the subsequent launch of the FTSE/JSE Responsible Index. This can be observed when using both the OLS and M-estimator to determine the values of the event and control variable coefficients. Both methods yield different results, with the latter improving the results of the former since the latter is consistent with the results of the former and additionally identifies significance in some coefficients such as that of Massmart Holdings (refer to Table 15). This indicates the presence of outliers in the sample data. These findings demonstrate that there should be a cautionary approach to the use of OLS in estimating the coefficients of stock returns' independent variables. Therefore, we reject all the three hypotheses as stated in the methodology chapter and conclude that environmental performance does not drive stock returns in the South African market.

5. Discussions, Conclusion and Recommendations

5.1. Introduction

The final chapter draws a conclusion to the study based on the results achieved and the previous literature on the same area of study. The rest of this chapter is structured to give a summary, discussion, scope and limitation of study, conclusion and recommendations for further research.

5.2. Summary

This study conducts an event study of the reaction of stock markets to the partnership announcement between FTSE and JSE that subsequently leads to the launch of the FTSE/JSE Responsible Index. The objective of this study is to demonstrate that environmental performance as indicated by their ESG ratings affects their stock returns which reflects their financial performance. This will be reflected by abnormal returns faced by companies listed in the top 30 index of the FTSE/JSE Responsible Index. OLS regression is then employed to estimate the value of the coefficients. The M-estimator, a robust estimator, is also used to check on the accuracy of the OLS regression method.

The results using these estimators show that stocks listed on the responsible top 30 index are mostly indifferent with their listing. This is because there are insignificant cumulative abnormal returns and no changes in market risk with the partnership announcement and the launch of the responsible index, with exception to three out of the ten sample stocks. With regards, to the stocks not listed, only four out of ten show significant reactions, though no cumulative abnormal returns. Two out of the four however are noted to be punished by the FTSE and JSE partnership announcement.

Finally, the results using OLS and the M-estimator are different, indicating the presence of outliers in the sample data. These findings demonstrate that there should be a cautionary approach to the use of OLS in estimating the coefficients of stock returns' independent variables.

With that, all the three null hypotheses are rejected.

5.3. Discussion

As mentioned previously, all event studies show that the markets respond to news, regardless of good or bad. This can be seen with the significant changes in market risk

for RMB Holdings, Massmart Holdings, Montauk Holdings, Barclays Group, Tiger Brands and African Rainbow Minerals Limited with the launch of the FTSE/JSE Responsible Index.

If the theory of firm choice holds true, the reduced risks observed by AngloGold Ashanti with the launch of the responsible index can be explained by the first path of the theory which suggests that positive benefits will be greater than the costs of the environmentally friendly behavior which could be as a result of increased demand due to a better public image (Konar and Cohen, 2001). However, the increase in beta for the other two stocks listed on the responsible index would be the fact that the market is efficient (Fama, 1970) to capture the environmental risks associated with stocks. This risk is also captured by RMB Holdings.

However, the overall results were not sufficient to state that environmental performance statistically affected the stock returns of the sample data. Since only 30% of the sample stocks that were listed yielded some change in its risk. In comparison to previous studies, these results follow the camp of Luther Matatko and Corner (1992), Hamilton, Jo and Statman (1993), Diltz et al. (1995), Guerard (1997), Sauer (1997), Gregory, Matatko and Luther (1997) and Kreander et al (2002). These studies found no statistical significance between the performance of SRI funds and conventional ones. Therefore, rejecting the first and second hypotheses.

The results using the OLS regression and M-estimator are similar to that of Sorokina et al. (2013). The results show the inferences of OLS could be distorted by the presence of outliers, for which M-estimation is used, hence rejecting the third null hypothesis. M-estimation improves the results of the coefficients estimated using OLS. This is possible since rarely do returns follow a normal distribution, for which OLS assumes. Therefore, robust estimators are necessary to get more accurate results when carrying out event studies.

5.4. Scope and Limitation of the Study

The focus of this study was to identify the effects of environmental performance on the stock returns of companies' stocks listed publicly through an event study. The findings using the OLS and M-estimator find that there is no statistical significance between the two for a majority of the stocks.

However, there were some limitations to the study. These were:

- i. The model consisted of several dummy variables. While these were necessary in order to capture the changes in risk with the different layers of timing that were consistent with the different event occurrences and the cumulative abnormal return, it made it difficult to use MM-estimator. This is because the values are equal for some levels after the event window but then are different before, resulting in a singular matrix. While MM-estimation is preferred to capture abnormal returns since it identifies both outliers and leverage points in data, this is not possible for the existing sample. This can also be noted by the blank values for Santova Limited and Bidvest Group as Eviews could not determine the coefficient estimators using M-estimation as the matrix was deemed singular.
- ii. The existing historical foreign exchange market rate contains monthly data, and this data had to be manipulated to a higher frequency to fit the model which to record of daily stock returns. This requires interpolating data from Eviews. This limits the data since the daily figures are mathematically computed and are not an exact representation of the actual foreign exchange daily rate. Thus, there is a possibility of errors using this proxy.
- iii. The process of selecting stocks did not go as planned since the stocks listed in the JSE All Share Index are mainly in the mining and construction industries, and as such representativeness amongst the twenty-sample data was difficult to achieve as some stocks belonged in the same industry, even though stratified random sampling was followed.
- iv. There could be concurrent events not captured in the model that could have affected the results of the coefficients as well. All stocks react to news, whether good or bad.

5.5. Conclusions

This research concludes that environmental performance has no statistical significance for a majority of stocks listed in South Africa. This is founded on the results of the lack of abnormal returns and no changes in risk with the announcement of the FTSE/JSE partnership and the subsequent FTSE/JSE Responsible Index for seven of the ten stocks used for the sample data. Furthermore, no abnormal negative returns for

the stocks not listed on the responsible index, with the exception to three stocks as well. This is because only two companies reported negative abnormal returns at the partnership announcement, with another one company being punished at the launch of the responsible index after reporting negative abnormal returns. Therefore, the results were not sufficient to be representative of the JSE All Share Index and environmental performance can be concluded not to have a significant impact on stock returns for the South Africa stock market.

5.6. Recommendations

The following are the recommendations for the study that may give further areas of research:

- i. The use of other sample data from other African countries can prove for areas of further research. This can serve as a means to create a sustainability index for the African market for investors that prefer to invest in companies with ESG ratings.
- ii. The use of a modified model that improves the one used in this study. This can then be used to apply MM-estimation as the preferred robust estimator since it captures the presence of both leverage and outliers in the data.
- iii. Economic performance versus environmental performance could also be considered. Since this paper focused on the stock returns and concluded that there was no statistical significance between companies with high ESG ratings versus those that do not, perhaps ESG ratings affect the economic importance of the company and of its location.

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7. Appendix

Table 16 A Summary of Definitions and Key Characteristics of Impact Investment

Source	Definition	Key Characteristics
OECD	Social investment is the provision of finance to organisations with the explicit expectation of a social, as well as financial, return	<ul style="list-style-type: none"> • Involves private investment that contributes to the public benefit; • Explicit social dimension; • Hybrid funding involving private investment that contributes to the public benefit; • Financial goals can range from capital preservation to a market rate of return.
Global Impact Investing Network	Impact investments are investments made into companies, organisations, and funds with the intention to generate social and environmental impact alongside a financial return. Impact investments can be made in both emerging and developed markets, and target a range of returns from below market to market rate, depending upon the circumstances.	<ul style="list-style-type: none"> • Intentionality – The intent of the investor to generate social and/or environmental impact through investments is an essential component of Impact investing; • Investment with return expectations – Impact investments are expected to generate a financial return on capital and, at a minimum, a return of capital;

		<ul style="list-style-type: none"> • Range of return expectations and asset classes – Impact investments generate returns that range from below market to risk-adjusted market rate. Impact investments can be made across asset classes, including but not limited to cash equivalents, fixed income, venture capital and private equity; • Impact measurement – A hallmark of Impact investing is the commitment of the investor to measure and report the social and environmental performance and progress of underlying investments.
World Economic Forum (WIF)	<ul style="list-style-type: none"> • Impact investing is an investment approach that intentionally seeks to create both financial return and positive social or environmental impact that is actively measured; 	<ul style="list-style-type: none"> • An investment approach and not an asset class (a criterion by which investments are made across asset classes); • Intentionality matters. Investments that are motivated by the intention

	<ul style="list-style-type: none"> • It does intentionally and explicitly set out to deliver the dual objective of social/ environmental outcomes and financial returns (which may be below market, at market or above market). 	<p>to create a social or environmental good are Impact investments.</p> <ul style="list-style-type: none"> • Outcomes, including both the financial return and the social and environmental impact, are actively measured; • Impact investing is unique in that the investor may be willing to accept a lower financial return in exchange for achievement of a social outcome; • Covers all investments that intentionally seek to create measurable social or environmental value, regardless of the stage of maturity of the enterprise.
European Commission	<p>European Social Enterprise Funds (EuSEF) are funds (undertakings) investing at least 70% of raised capital in social businesses.</p>	<ul style="list-style-type: none"> • Social businesses are businesses whose primary objective is the achievement of measurable, positive social impacts (art. 3(d)ii); • Procedures to measure the social impact investee businesses have committed to must be in place together with

		<p>specific indicators (art. 10);</p> <ul style="list-style-type: none"> • Investors must be informed about targeted and actual social impacts and the measurement methodologies used (art. 14d).
IESE Research Project	Any profit-seeking investment activity that intentionally generates measurable benefits for society.	<ul style="list-style-type: none"> • Correlation between impact and financial return: the financial return drivers of the funded business model cannot be dissociated from impact objectives; • Social impact must be intentional; • Social impact must be measurable; • It needs to generate positive benefits for society.

Table 17 List of Events surrounding the launch of the index

Date	News
3rd June 2015	FTSE Russel and Johannesburg Stock Exchange announce ESG partnership
12th October 2015	JSE launches new FTSE/JSE Responsible Investment Index Series

Table 18 Stocks Listed on the FTSE/JSE Responsible Investment Top 30 Index

FTSE/JSE Responsible Investment Top 30 Index				
Constituents as at 30 September 2016				
(in alphabetical order)				
Index Code	Statistic Date	Alpha	ISIN	Instrument
J110	30/09/2016	AGL	GB00B1XZS820	Anglo American
J110	30/09/2016	AMS	ZAE000013181	Anglo American Platinum
J110	30/09/2016	ANG	ZAE000043485	Anglogold Ashanti
J110	30/09/2016	ARI	ZAE000054045	African Rainbow Minerals Ltd
J110	30/09/2016	BAW	ZAE000026639	Barloworld
J110	30/09/2016	BGA	ZAE000174124	Barclays Africa Group Ltd
J110	30/09/2016	BIL	GB0000566504	BHP Billiton
J110	30/09/2016	BTI	GB0002875804	British American Tobacco PLC
J110	30/09/2016	CFR	CH0045159024	Compagnie Financiere Richemont AG
J110	30/09/2016	EXX	ZAE000084992	Exxaro Resources
J110	30/09/2016	FSR	ZAE000066304	Firststrand Limited
J110	30/09/2016	GFI	ZAE000018123	Gold Fields
J110	30/09/2016	GND	ZAE000072328	Grindrod
J110	30/09/2016	IMP	ZAE000083648	Impala Platinum Hlds
J110	30/09/2016	INL	ZAE000081949	Investec Ltd
J110	30/09/2016	INP	GB00B17BBQ50	Investec PLC
J110	30/09/2016	ITU	GB0006834344	Intu Properties Plc
J110	30/09/2016	KIO	ZAE000085346	Kumba Iron Ore
J110	30/09/2016	LHC	ZAE000145892	Life Healthcare Group Holdings
J110	30/09/2016	MND	ZAE000156550	Mondi Ltd
J110	30/09/2016	MNP	GB00B1CRLC47	Mondi Plc
J110	30/09/2016	NED	ZAE000004875	Nedbank Group
J110	30/09/2016	NTC	ZAE000011953	Netcare
J110	30/09/2016	OML	GB00B77J0862	Old Mutual
J110	30/09/2016	SBK	ZAE000109815	Standard Bank Group
J110	30/09/2016	SGL	ZAE000173951	Sibanye Gold
J110	30/09/2016	SLM	ZAE000070660	Sanlam
J110	30/09/2016	SOL	ZAE000006896	Sasol
J110	30/09/2016	TBS	ZAE000071080	Tiger Brands
J110	30/09/2016	TRU	ZAE000028296	Truworths International
J110	30/09/2016	VOD	ZAE000132577	Vodacom Group
J110	30/09/2016	WHL	ZAE000063863	Woolworths Holdings

Table 19 List of Companies in the JSE All Share Index

Company	Sector
AB InBev	Beverages
ABSA Bank Limited	Banks
Accelerate Property Fund Limited	Real Estate Investment Trusts
Accentuate Limited	Chemicals
Accion Limited	Real Estate Investment & Services
Adapt It Holdings Limited	Software & Computer Services
Adcock Ingram Holdings Limited	Pharmaceuticals & Biotechnology
Adcorp Holdings Limited	Support Services
Adrenna Property Group Limited	Real Estate Investment & Services
Advanced Health Limited	Health Care Equipment & Services
Advtech Limited	General Retailers
AECI Limited	Chemicals
African And Overseas Enterprises Limited	General Retailers
African Bank Investments Limited	Financial Services
African Dawn Capital Limited	Financial Services
African Eagle Resources Plc	Industrial Metals & Mining
African Equity Empowerment Investments Limited	Financial Services
African Media Entertainment Limited	Media
African Oxygen Limited	Chemicals
African Rainbow Minerals Limited	Industrial Metals & Mining
Afrimat Limited	Construction & Materials
Afrocentric Investment Corp Limited	Financial Services
AH-Vest Limited	Food Producers
Alaris Holdings Limited	Aerospace & Defense
Alert Steel Holdings Limited	General Retailers
Alexander Forbes Group Holdings Limited	Financial Services
Allied Electronics Corporation Limited	Software & Computer Services
Amalgamated Electronic Corp Limited	Electronic & Electrical Equipment
Anchor Group Limited	Financial Services
Andulela Investment Holdings Limited	Industrial Metals & Mining
Anglo American Platinum Limited	Mining
Anglo American Plc	Mining
Anglogold Ashanti Limited	Mining
Ansys Limited	Industrial Transportation
ARB Holdings Limited	Support Services
Arcelormittal South Africa Limited	Industrial Metals & Mining
Argent Industrial Limited	Support Services
Arrowhead Properties Limited	Real Estate Investment Trusts
Ascendis Health Limited	Pharmaceuticals & Biotechnology
Ascension Properties Limited	Real Estate Investment Trusts
Aspen Pharmacare Holdings Limited	Pharmaceuticals & Biotechnology

Assore Limited	Industrial Metals & Mining
Astoria Investments Limited	Financial Services
Astral Foods Limited	Food Producers
Astrapak Limited	General Industrials
Atlantic Leaf Properties Limited	Real Estate Investment Trusts
Atlatsa Resources Corporation	Mining
Attacq Limited	Real Estate Investment & Services
Aveng Limited	Construction & Materials
AVI Limited	Food Producers
Awethu Breweries Limited	Food Producers
Balwin Properties Pty Limited	Real Estate Investment & Services
Barclays Africa Group Limited	Banks
Barloworld Limited	Support Services
Basil Read Holdings Limited	Construction & Materials
Bauba Platinum Limited	Mining
Beige Holdings Limited	Personal Goods
Bell Equipment Limited	Industrial Engineering
BHP Billiton Plc	Industrial Metals & Mining
Bid Corp Limited	Health Care Equipment & Services
BK One Limited	Financial Services
Blue Financial Services Limited	Financial Services
Blue Label Telecoms Limited	Support Services
Bonatla Property Holdings Limited	Real Estate Investment & Services
Bowler Metcalf Limited	Chemicals
Brait SE	Financial Services
Brikor Limited	Construction & Materials
Brimstone Investment Corporation Ld	Financial Services
British American Tobacco Plc	Tobacco
BSI Steel Limited	Industrial Metals & Mining
Buffalo Coal Corp	Mining
Buildmax Limited	Oil Equipment, Services & Distribution
CAFCA Limited	Electronic & Electrical Equipment
Calgro M3 Holdings Limited	Real Estate Investment & Services
Capevin Holdings Limited	Beverages
Capital & Counties Properties Plc	Real Estate Investment & Services
Capital & Regional Plc	Real Estate Investment Trusts
Capital Appreciation Limited	Financial Services
Capitec Bank Holdings Limited	Banks
Cargo Carriers Limited	Industrial Transportation
Cartrack Holdings Limited	Technology Hardware & Equipment
Cashbuild Limited	General Retailers
Caxton CTP Publishers & Printers Ltd	Media
Central Rand Gold Limited	Mining
Chemical Specialities Limited	Chemicals

Choppies Enterprises Limited	General Retailers
Chrometco Limited	Industrial Metals & Mining
City Lodge Hotels Limited	Travel & Leisure
Clicks Group Limited	Food & Drug Retailers
Cientele Limited	Life Insurance
Clover Industries Limited	Food Producers
Coal of Africa Limited	Oil & Gas Producers
Cognition Holdings Limited	Fixed Line Telecommunications
Comair Limited	Travel & Leisure
Combined Motor Holdings Limited	General Retailers
Command Holdings Limited	General Retailers
Compagnie Financiere Richemont SA	Personal Goods
Conduit Capital Limited	Nonlife Insurance
Consolidated Infrastructure Group Ltd	Construction & Materials
Coronation Fund Managers Limited	Financial Services
Crookes Brothers Limited	Food Producers
CSG Holdings Limited	Support Services
Cullinan Holdings Limited	Travel & Leisure
Curro Holdings Limited	General Retailers
Datacentrix Holdings Limited	Software & Computer Services
Datatec Limited	Technology Hardware & Equipment
Delrand Resources Limited	Industrial Metals & Mining
Delta EMD Limited	Electronic & Electrical Equipment
Delta Property Fund Limited	Real Estate Investment Trusts
Deneb Investments Limited	Financial Services
Diamondcorp Plc	Industrial Metals & Mining
Dipula Income Fund Limited	Real Estate Investment Trusts
Dis-Chem Pharmacies	Food & Drug Retailers
Discovery Limited	Life Insurance
Distell Group Limited	Beverages
Distribution and Warehousing Network Ld	Support Services
DRDGOLD Limited	Mining
E Media Holdings Limited	Personal Goods
Eastern Platinum Limited	Industrial Metals & Mining
Ecsponent Limited	Financial Services
Efficient Group Limited	Financial Services
ELB Group Limited	Support Services
Ellies Holdings Limited	Technology Hardware & Equipment
Emira Property Fund Limited	Real Estate Investment Trusts
enX Group Limited	Support Services
EOH Holdings Limited	Software & Computer Services
EPE Capital Partners Limited (Ethos Capital)	Financial Services
Eqstra Holdings Limited	Support Services
Equites Property Fund Limited	Real Estate Investment Trusts

Erin Energy Corporation	Oil & Gas Producers
Esor Limited	Construction & Materials
Evrz Highveld Steel & Vanadium Ltd	Industrial Metals & Mining
Exxaro Resources Limited	Oil & Gas Producers
Fairvest Property Holdings Limited	Real Estate Investment & Services
Famous Brands Limited	Travel & Leisure
Ferrum Crescent Limited	Industrial Metals & Mining
Finbond Group Limited	Financial Services
Firestone Energy Limited	Mining
Firststrand Limited	Financial Services
Fortress Income Fund Limited	Real Estate Investment Trusts
Freedom Property Fund Ltd	Real Estate Investment & Services
GAIA Infrastructure Capital Limited	Financial Services
Giyani Gold Corporation	Industrial Metals & Mining
Glencore Plc	Mining
Global Asset Management Limited	Financial Services
Globe Trade Centre SA	Real Estate Investment & Services
Go Life International Pcc	Health Care Equipment & Services
Gold Brands Investments Limited	Travel & Leisure
Gold Fields Limited	Mining
Gooderson Leisure Corporation Ltd	Travel & Leisure
Grand Parade Investments Limited	Travel & Leisure
Great Basin Gold Limited	Mining
Greenbay Properties Limited	Financial Services
Grindrod Limited	Industrial Transportation
Group Five Limited	Construction & Materials
Growthpoint Properties Limited	Real Estate Investment Trusts
Harmony Gold Mining Company Limited	Mining
Holdsport Limited	General Retailers
Homechoice International Plc	General Retailers
Hosken Consolidated Investments Ltd	General Industrials
Hospitality Property Fund Limited	Real Estate Investment Trusts
Howden Africa Holdings Limited	Industrial Engineering
Hudaco Industries Limited	Support Services
Huge Group Limited	Fixed Line Telecommunications
Hulamin Limited	Industrial Metals & Mining
Hulisani Limited	#N/A
Hwange Colliery Company Limited	#N/A
Hyprop Investments Limited	Real Estate Investment Trusts
Imbalie Beauty Limited	Personal Goods
Impala Platinum Holdings Limited	Mining
Imperial Holdings Limited	General Retailers
Indequity Group Limited	Nonlife Insurance
Indluplace Properties Limited	Real Estate Investment Trusts

Ingenuity Property Investments Ltd	Real Estate Investment & Services
Insimbi Refractory and Alloy Supplies Limited	Support Services
International Hotel Group Limited	Real Estate Investment & Services
Interwaste Holdings Limited	Support Services
Intu Properties Plc	Real Estate Investment Trusts
Investec Australia Property Fund	Real Estate Investment Trusts
Investec Limited	Financial Services
Investec Plc	Financial Services
Investec Property Fund Limited	Real Estate Investment Trusts
Invicta Holdings Limited	Support Services
IPSA Group Plc	Construction & Materials
ISA Holdings Limited	Software & Computer Services
Italtile Limited	General Retailers
Jasco Electronics Holdings Limited	Electronic & Electrical Equipment
JSE Limited	Financial Services
Jubilee Platinum Plc	Industrial Metals & Mining
KAP Industrial Holdings Limited	General Industrials
Kaydav Group Limited	Support Services
Keaton Energy Holdings Limited	Oil & Gas Producers
Kibo Mining Plc	Mining
Kumba Iron Ore Limited	Industrial Metals & Mining
Labat Africa Limited	Technology Hardware & Equipment
Lewis Group Limited	General Retailers
Liberty Holdings Limited	Life Insurance
Life Healthcare Group Holdings Ltd	Health Care Equipment & Services
Lodestone REIT Limited	Real Estate Investment Trusts
London Finance & Investment Group Plc	Financial Services
Lonmin Plc	Industrial Metals & Mining
M-FiTEC International Limited	Software & Computer Services
Mara Delta Property Holdings	Real Estate Investment Trusts
Marshall Monteagle Plc	Support Services
MAS Real Estate Inc	Real Estate Investment & Services
Masonite (Africa) Limited	Forestry & Paper
Massmart Holdings Limited	Food & Drug Retailers
Master Drilling Group Ltd	Industrial Metals & Mining
Mazor Group Limited	Construction & Materials
Mediclinic International Limited	Health Care Equipment & Services
Merafe Resources Limited	Industrial Metals & Mining
Metair Investments Limited	Automobiles & Parts
Metrofile Holdings Limited	Software & Computer Services
MICROmega Holdings Limited	Financial Services
Middle East Diamond Resources Limited	Industrial Metals & Mining
Mine Restoration Investments Ltd	Support Services
Miranda Mineral Holdings Limited	Industrial Metals & Mining

Mix Telematics Limited	Support Services
MMI Holdings Limited	Life Insurance
Mondi Limited	Forestry & Paper
Mondi Plc	General Industrials
Moneyweb Holdings Limited	Software & Computer Services
Montauk Holdings Limited	Electricity
Mpact Limited	General Industrials
Mr Price Group Limited	General Retailers
MTN Group Limited	Mobile Telecommunications
Murray & Roberts Holdings Limited	Construction & Materials
Mustek Limited	Technology Hardware & Equipment
Nampak Limited	General Industrials
Naspers Limited	Media
Nedbank Group Limited	Banks
Net 1 UEPS Technologies Inc	Technology Hardware & Equipment
Netcare Limited	Health Care Equipment & Services
New Europe Property Investments Plc	Real Estate Investment & Services
New Frontier Properties Limited	Real Estate Investment & Services
Newpark REIT Limited	Real Estate Investment Trusts
Nictus Beperk	Financial Services
Niveus Investments Ltd	Financial Services
Northam Platinum Limited	Mining
Novus Holdings Limited	Support Services
Nu-World Holdings Limited	Household Goods & Home Construction
Nutritional Holdings Limited	Food Producers
NVest Financial Holdings Limited	Financial Services
Oakbay Resources and Energy Limited	Mining
Oando Plc	Oil & Gas Producers
Oasis Crescent Property Fund	Financial Services
Oceana Group Limited	Food Producers
Octodec Investments Limited	Real Estate Investment Trusts
Old Mutual Plc	Life Insurance
Omnia Holdings Limited	Chemicals
Onelogix Group Limited	Industrial Transportation
Orion Real Estate Limited	Real Estate Investment Trusts
Pallinghurst Resources Limited	Financial Services
Pan African Resources Plc	Industrial Metals & Mining
Peregrine Holdings Limited	Financial Services
Petmin Limited	Industrial Metals & Mining
Phumelela Gaming & Leisure Limited	Travel & Leisure
Pick N Pay Holdings Limited	Food & Drug Retailers
Pick N Pay Stores Limited	Food & Drug Retailers
Pinnacle Holdings Ltd	Technology Hardware & Equipment
Pioneer Food Group Limited	Food Producers

Platfields Limited	Mining
PPC Limited	Construction & Materials
Prescient Limited	Financial Services
Primeserv Group Limited	Support Services
Protech Khuthele Holdings Limited	Construction & Materials
PSG Group Limited	Financial Services
PSG Konsult Limited	Financial Services
PSV Holdings Limited	Industrial Engineering
Purple Group Limited	Financial Services
Putprop Limited	Real Estate Investment & Services
Quantum Food Holdings Limited	Food Producers
Quantum Property Group Limited	Real Estate Investment & Services
Rand Merchant Investment Holdings Limited	Life Insurance
Randgold & Exploration Company Ltd	Mining
Rare Holdings Limited	Support Services
Raubex Group Limited	Construction & Materials
RBA Holdings Limited	Real Estate Investment & Services
RCL Foods Limited	Food Producers
Rebosis Property Fund Limited	Real Estate Investment Trusts
RECM And Calibre Limited	Financial Services
Redefine International Plc	Real Estate Investment Trusts
Redefine Properties Limited	Real Estate Investment Trusts
Reinet Investments SCA	Financial Services
Remgro Limited	Financial Services
Renergen Limited	Financial Services
Resilient REIT Limited	Real Estate Investment Trusts
Resource Generation Limited	#N/A
Reunert Limited	General Industrials
Rex Trueform Clothing Company Ltd	General Retailers
Rhodes Food Group Holdings Limited	Food Producers
RMB Holdings Limited	Financial Services
Rockcastle Global Real Estate Company Limited	Real Estate Investment & Services
Rockwell Diamonds Incorporated	Industrial Metals & Mining
Rolfes Holdings Limited	Chemicals
Royal Bafokeng Platinum Limited	Mining
SA Corporate Real Estate Limited	Real Estate Investment Trusts
Sabvest Limited	Financial Services
Sacoil Holdings Limited	Oil & Gas Producers
Sacoven Plc	Financial Services
Safari Investments RSA Limited	Real Estate Investment Trusts
Sanlam Limited	Life Insurance
Santam Limited	Nonlife Insurance
Santova Limited	Industrial Transportation

Sappi Limited	Forestry & Paper
Sasfin Holdings Limited	Banks
Sasol Limited	Oil & Gas Producers
Schroder European Real Estate Investment Trust plc	Real Estate Investment Trusts
Sentula Mining Limited	Oil & Gas Producers
Sephaku Holdings Limited	Construction & Materials
Shoprite Holdings Limited	Food & Drug Retailers
Sibanye Gold Limited	Mining
Silverbridge Holdings Limited	Software & Computer Services
Sirius Real Estate Limited	Real Estate Investment & Services
South African Coal Mining Holdings Ltd	Oil & Gas Producers
South Ocean Holdings Limited	Electronic & Electrical Equipment
South32 Limited	Industrial Metals & Mining
Sovereign Food Investments Limited	Food Producers
Spanjaard Limited	Chemicals
Spur Corporation Limited	Travel & Leisure
Standard Bank Group Limited	Banks
Stefanutti Stocks Holdings Ltd	Construction & Materials
Steinhoff International Holdings Limited	Personal Goods
Steinhoff International Holdings NV	Personal Goods
Stellar Capital Partners Limited	Software & Computer Services
Stenprop Limited	Real Estate Investment & Services
Stor-Age Property REIT Limited	Real Estate Investment Trusts
StratCorp Limited	Financial Services
Sun International Limited	Travel & Leisure
Super Group Limited	General Retailers
Sygnia Limited	Financial Services
Synergy Income Fund Limited	Real Estate Investment Trusts
Taste Holdings Limited	Travel & Leisure
Tawana Resources NL	Industrial Metals & Mining
Telemasters Holdings Limited	Fixed Line Telecommunications
Telkom SA SOC Limited	Fixed Line Telecommunications
Texton Property Fund Limited	Real Estate Investment Trusts
Tharisa Plc	Mining
The Bidvest Group Limited	General Industrials
The Foschini Group Limited	General Retailers
The Pivotal Fund Limited	Real Estate Investment Trusts
The SPAR Group Limited	Food & Drug Retailers
The Waterberg Coal Company Limited	Mining
Tiger Brands Limited	Food Producers
Tiso Blackstar Group SE	Financial Services
Tongaat Hulett Limited	Food Producers
Torre Industries Limited	Support Services
Total Client Services Limited	Software & Computer Services

Tower Property Fund Limited	Real Estate Investment Trusts
Tradehold Limited	Real Estate Investment & Services
Trans Hex Group Limited	Mining
Transaction Capital Limited	Financial Services
Transpaco Limited	General Industrials
Trellidor Holdings Limited	Construction & Materials
Trematon Capital Investments Ltd	Financial Services
Trencor Limited	Industrial Transportation
Trustco Group Holdings Limited	Financial Services
Truworthe International Limited	General Retailers
Tsogo Sun Holdings Limited	Travel & Leisure
Universal Partners Limited	Financial Services
Value Group Limited	Travel & Leisure
Verimark Holdings Limited	General Retailers
VestIN Holdings Limited	Financial Services
Visual International Holdings Limited	Real Estate Investment & Services
Vodacom Group Limited	Mobile Telecommunications
Vukile Property Fund Limited	Real Estate Investment Trusts
Vunani Limited	Financial Services
W G Wearne Limited	Construction & Materials
Wescoal Holdings Limited	Support Services
Wesizwe Platinum Limited	Mining
Wilderness Holdings Limited	Travel & Leisure
William Tell Holdings Limited	Forestry & Paper
Wilson Bayly Holmes-Ovcon Limited	Construction & Materials
Winhold Limited	General Industrials
Woolworths Holdings Limited	General Retailers
Workforce Holdings Limited	Support Services
York Timber Holdings Limited	Forestry & Paper
ZCI Limited	Industrial Metals & Mining
Zeder Investments Limited	Financial Services