Performance Appraisal of Sustainable Responsible & Conventional Indices

Dr. Subrata Roy

Assistant Professor Department of Commerce, Rabindra Mahavidyalaya (Affiliated to the University of Burdwan), Champadanga, Hooghly, West Bengal, India

Abstract

Purpose: The study examines and compares the performance characteristics and performance differences of selected SRI (Sustainable Responsible Index) and conventional indices.

Method: The study uses risk-adjusted performance measures of Sharpe and Treynor. Jensen measure is also used to examine the relative risk-adjusted performance. The market-timing performance is measured by applying the Treynor & Mazuy model. The study also used single factor as well as seemingly unrelated regression equations. Spanning test is applied to test the joint hypothesis.

Findings: The risk-adjusted performances of majority of the indices are satisfactory as compared to the benchmark indices. The markettiming performances of the SRI indices are insignificant. The alpha performances of the SRI indices are same like the benchmark indices. But the risk exposures of the SRI indices are higher than their counterparts. Although, the performances between the SRI and the benchmark indices are same based on spanning test. According to the multi-factor measure, the performances of the SRI indices are different in some extent. Similarly, when world index is used as benchmark then the performance of the group of indices differs significantly within the index families.

Originality: It is observed that the performances of the SRI indices are almost same in terms of risks and returns. When multi-factor measure is used then the performance differences is observed in some cases. But in reality, the concept of SRI is not clear to the investors in developing countries and also the market of SRI is not developed and in some cases in infant stage. The return from the SRI investment is less attractive than the conventional indices. These are the issues for future research.

JELCODE: G11, G14, M14

Key Words: SRI, Equity Index, Conventional Index, Single-factor Measure, Spanning Test

Introduction

Sustainable investment was a much studied topic in finance at present. It was a process of integrating economic (E), social (S) and governance (G) factors into investment decision making process. The evolution of SRI was started in the year of 1960. In 1972, Moskowitz was the first who empirically examined the performance of SRI funds. Some of the earlier studies reported that the SRI Funds achieved superior financial performance (see Moskowitz 1972, Luck & Pilotle 1993, Derwall et al 2005, Edmans 2011). On the other hand, several studies observed that the SRI funds failed to achieve superior financial performances (see Brammer et al 2006, Ronneboog et al 2008, Alam & Rajjaque 2010, Hong & Kacperczyk 2009, Gilbarto et al 2010, Manescu 2011 etc). Similarly, a bulk of studies observed insignificant performance variations between the SRI funds and the conventional funds (see Hamilton et al 1993, Kurtz & Dibartolomeo 1996, Guerard 1997, Bauer et al 2005, Schroder 2007, Statman & Glushkov 2008, Gil-Bazo et al 2010, Climent & Soriano 2011, Humphery & Lee 2011 etc). The earlier studies concentrated basically on SRI funds and compared their performances with the conventional funds. But, this study exclusively examined the performance characteristics of the selected SRI equity indices and compared their performances with the conventional indices.

The remainder of the paper designed as follows. Section 2 literature review was analysed. The objective was described in section 3. Section 4 dealt with the data and the study period. Methodology was adopted in section 5. The analysis and interpretation of results were given in section 6 and finally, conclusion and recommendation were described in section 7.

Review of Literature:

Theoretically, 2 opposite arguments were competing to explain the impact of incorporating social screens into investment performance. The important argument was based on the sustainability of portfolio theory that meant construction of portfolios from a restricted universe of stocks that could reduce the benefits of diversification (Rudd 1981). Furthermore, an extra cost was incurred to maintain social activities that ultimately reduced return as compared to their conventional counterparts. Although, the proponents of SRI argued that social screens acted like a filter that helped to identify firms with a superior management skill relative to their conventional funds that could help to improve performance of the portfolios composed of socially responsible stocks in the long run (see Hill et al 2007, Kempf & Osthoff 2007).

The earliest one is Milton Friedman, who said that social responsibility could help to increase organisations' profits. But the organisation generally tried to avoid social initiatives which lead to decrease shareholder value (Cited in: Humphrey et al 2012). The more recent (in between 1980s and 1990) theories like instrumental stakeholders' theory (IST) and the slack resource theory (SRT) expected a positive relationship between corporate social

responsibility (CSR) and financial performance. IST assumed that organisation tries to satisfy various stakeholders that could help to develop a friendly relationship between the stakeholders and the management that assisted to monitor and imposed various mechanisms for the betterment of financial performance (Freeman & Evan 1990, Hill & Jones 1992, Jones 1995 and Clarkson 1995). The SRT assumed that satisfactory financial performance allowed corporate to became more socially responsible (Ullmann, Mcguire et al 1988 and Waddock & Graves 1997).

Several arguments were highlighted that SRI stocks might lead to poorer financial performance as compared to conventional funds (see Brammer et al 2006, Renneboog et al 2008, Hong & Kacperzyk 2009, Manescu 2011).

In 1975, Vance examined the performance of SRI stocks in US and observed negative relationship between CSR and stock prices. Later on, Margolise & Walsh (2003) and Orlitzky et al., (2003) reviewed a large number of studies (see Vance 1975, Abbottt & Monsen 1979, Shane & Spicer 1983, Patten 1990, Blackburn et al 1994, Rudd 1981, Guerard 1997 and others) on SRI stocks and portfolios. Kempf & Osthoff (2007) observed that remarkably a high additional return could be achieved by applying a simple long-short strategy. They also reported that best-in-class screening policy was significantly profitable. Hill et al., (2007) examined the SRI performance across three regions of the world and observed that the European portfolios outperformed the conventional benchmark in the short term. Similarly, US and European portfolios outperformed in the long run. Lot of studies had examined and compared SRI performance with the conventional funds and with the benchmarks and observed neutral performance (see Hamilton et al 1993, Luther & Matatko 1994, Gregory et al 1997, Kreandar et al 2000, Bauer et al 2005, Geczy et al 2005, Kreander et al 2005, Bauer et al 2007, Gregory & Whittaker 2007, Stenstrom & Therell 2007, Galema et al 2008, Cortez et al 2009, and many others). But few UK studies reported weak evidence on positive performance (see Luther et al., 1992, Mallin et al., 1995 and others).

Goldreyer & Diltz (1999) examined the performance of SRI funds with the conventional funds in USA and observed that conventional funds outperformed the SRI funds. Cummings (2000) observed insignificant performance differences as compared to the conventional market indices. (see Bauer et al., 2007, Asmundson & Foerster 2001, Statman 2000 etc). Scholtens (2005) in Netherlands also observed insignificant differences in riskadjusted returns between the SRI and the conventional funds. Bello (2005) found that the performance of SRI and the conventional funds were identical. Most of the earlier studies used Jensen's alpha (see Luther et al., 1992, Hamilton & Statman 1993 and White 1995) to evaluate SRI performance. Luther & Matatko (1994) were the first who considered broad market index along with the small cap stock index to evaluate performance and reported indifference performance.

Some recent studies applied multi factor models to evaluate investment performance. Bauer et al., (2005) evaluated the performance of Germany, UK and US SRI funds and observed that SRI funds of Germany and US underperformed both of their relevant indices and conventional fund whereas, UK funds out-performed slightly but the differences were insignificant. They also observed performance differences between the SRI and conventional funds after controlling the investment style (see Luther & Matatko 1994). Mill (2006) observed that the risk-adjusted performance of the UK conventional funds remains unchanged as compared to the similar funds when they applied SRI principles. In 2006, Bauer et al. examined the performance of Australian SRI Funds with the conventional funds by using the four-factor and single factor conditional measures and reported, both type of funds produced insignificant alpha. (see Cortez et al 2009). Gregory & Whittaker (2007) observed significant underperformance between the SRI and conventional funds in UK based on risk-adjusted measure. They reported evidence in favour of differences in performance persistence between the SRI and conventional funds. Jones et al., (2008) observed that SRI funds underperformed than the conventional funds in Australia in terms of alpha based on single as well as multi-factor measures. Similarly, Ronneboog et al., (2008) examined the performance of SRI funds in 17 countries and observed that the SRI funds underperformed than the conventional benchmarks. Although, the risk-adjusted returns of the SRI and the conventional funds were not statistically different except France, Japan and Sweden. Cortez et al., (2009) analysed the performance of SRI funds in 7 European countries by using both conditional and unconditional measures and reported insignificant performance differences between the SRI and conventional funds. Gil-Bazo et al., (2010) observed that SRI funds obtained higher risk-adjusted performances as compared to the conventional funds when management fees were excluded. They also observed that the performance of both type of funds didn't differ significantly if they managed by the same company. Humphrey & Lee (2011) observed insignificant performance difference in returns between the SRI and conventional funds (see Stenstrom & Thorell 2007). Climent & Soriano (2011) examined the performance of environmental funds with the conventional funds in USA and reported that environmental funds provided lower

performance during the period from 1987 to 2009 but in the next sub period they didn't see any performance differences (see also Naturvardsverket et al., 2000 & 2001).

Recently, matching approach was popular to evaluate and compare SRI funds performance with the conventional funds. The objective of this approach was to consider correctly the management and transaction costs for the SRI and conventional funds which served as benchmark (see Mallinet et al., 1995, Gregory et al., 1997, Statman 2000, Kreander et al., 2002, Stone et al., 2001, Naturvardsverket 2001, Bauer et al., 2005, Kreander et al., 2005 and Gregory & Whittaker 2007). Those studies reported that the performance of the SRI and the non-SRI Funds were quite same.

Some of the studies also examined and compared the performances of SRI equity indices with the benchmark indices. Sauer (1997) examined the performance of Domini Social Index (DSI) with the S & P 500 and CRSP value-weighted indices and reported that the performances of DSI were lower than the performances of both the indices based on risk-adjusted measure. But when he combined the earlier result with the DSI's live performance then the aggregate risk-adjusted returns had gone above the returns of the conventional indices. However, Statman (2000) observed that the performance of DSI (Domini Social Index) was similar to the performances of the S & P 500 index (see Kurtz & DiBartolomeo 1996, 1999, Garz, Volk & Gilles 2002). However, DiBartolomeo & Kurtz (1999) reported tiny insignificant out-performance by the Domini 400 Index. Similarly, Garz et al., (2002) observed a little significant out-performance as compared to the DJSI STOXX 600 Index. In 2007, Sauder examined that the performances of 29 SRI indices and observed that the performances of SRI indices were similar to the performances of the conventional indices. Consolandi et al., (2008) examined the performance of Dow Jones Sustainability STOXX Index (DJSSI) and exhibited that the performance of DJSSI slightly out-performed than the benchmark index. In 2012, Managi et al. examined the performance of SRI index with the conventional stock indices in UK, US and Japan based on Markov switching regression measure and reported that both type of indices offered indifference performances.

Objective of the study:

The study was designed to achieve the following objectives:

1.To examine the risk-adjusted performance based on screening policies

2. To examine the relative risk-adjusted performance

3. To inspect the market-timing performance

4.To check the risk and return performance of the SRI and conventional indices

5.To observe whether the SRI equity indices might be used as a benchmark

6.To examine the risk and return performance of specific group of indices.

Data & Study Period:

The selected SRI indices were constructed and published by 5 different suppliers worldwide. Here, the well-known sample indices were the DJSI, KLD and FTSE Good. The detailed information about the name of the supplier companies, benchmark indices, SRI selection criteria as well as the available length of the indices time series were given in table 1. The time series data of the SRI and benchmark indices were obtained from the suppliers of indices themselves. The DJSI group had 6 indices (World, Stoxx & Euro Stoxx and the remaining 3 were Ex AGTF that didn't produce alcohol, gambling, tobacco and firearms). Similarly, the FTSE Good index family consisted of 8 indices among them 4 were tradable indices (Europe 50, Global 100, US 100 & UK 50) and the remaining 4 were broader indices from which the 4 tradable indices were derived (FTSE4Good Europe, FTSE4Global, FTSE4Good US & FTSE4Good UK). Finally, three SRI indices (KLD Domini 400 Social index, KLD BMSI and KLD LCSI with their corresponding benchmark indices were S&P 500, Russell 3000 and Russell 1000 respectively) were taken from the KLD Research & Analytics. These indices covered a wide range of international markets and investment areas. In most cases, i.e. 16 out of 17 SRI indices, the benchmark indices were

the official benchmarks chosen by the suppliers of the SRI indices. In case of KLD Domini 400 social index, the benchmark index was chosen in such a way that the investment universe of the SRI indices was well reflected and closely approximated. The study also considered 4 additional world-wide style indices to check the robustness of the results derived from the single index measure (Domini 500 Social Index, S&P 600 Small Cap Index, S&P 500 Growth & Value Index, MSCI World Index, MSCI Small Cap Index, MSCI Growth Value Index). All the indices prices were converted into US dollars. The study period ranged between January 2005 and December 2015.

Methodology:

Generally, small cap bias means high investment weights with a low market capitalisation. It had a minor impact in this study because the sample equity indices dealt with such stocks that had a large market capitalisation. Therefore, the composition of the SRI indices were rarely adjusted and they didn't follow specific investment styles and hence, multi-factor models such as Fama-French (1993) three factor model and Carhart four factor model (1997) model didn't need to use. Thus, single factor measure with a close approximation of the benchmark index was sufficient. But, to check the robustness of the results, additional regression was conducted by taking into consideration the additional indices like small cap index, the growth value index of MSCI (Morgan Stanley Capital Market) and S&P (500 & 600).

The logarithm returns of the SRI indices and the benchmark indices were computed by taking into consideration the first differences of the monthly time series data as under.



Where, RSRI,t was the annualised average logarithm return of the SRI index at time t and Rmktindex,t was the return of the benchmark index at time t.

The risk-adjusted performances of the SRI indices and

benchmark indices were computed based on Sharpe and Treynor measures. The Sharpe ratio quantified the riskadjusted excess return per unit of total risk.

$$S_{SRI} = \frac{R_{SRI} - R_f}{\delta_{SRI}}$$
(3)

Where, S_{SRI} was the Sharpe ratio and δ_{SRI} was the standard deviation.

Similarly, the Treynor ratio measured the risk-adjusted excess return per unit of systematic risk.

$$T_{SRI} = \frac{R_{SRI} - R_f}{\beta_{SRI}}$$
(4)

Where, T_{SRI} was <u>Treynor</u> ratio and β_{SRI} was the systematic risk. R_f was the US 1 month interbank offer rate that acted as risk free rate of return.

Here, single index benchmark was used to measure the relative performance that acted as a surrogate of the SRI equity indices. The study also used additional indices like World index, World small cap index and World growth & value index to check the robustness of the single index measure. Here, performances of the SRI indices were compared with the benchmark indices in terms of risks and returns. Spanning test was applied for individual SRI indices and sometimes multi-equation test was applied for the group of indices.

Jensen measure (1968) was used to (single index measure) examine the relative performance of the SRI equity indices that can be written as:

$R_{SRI,t} = \alpha_{SRI,t} + \beta_{SRI} R_{mktindex,t} + e_{SRI,t}$ (5)

The performances of the SRI indices were estimated through the Jensen measure (α SRI). It was an extra return that was not explained by the risk exposure. β SRI,t was the coefficient of systematic risk at time t which was used to compare the relative risk of the SRI index and eSRI,t was the error term with zero mean and constant standard deviation. Spanning test was used (joint hypothesis H0: (α SRI = 0 and β SRI = 1)) between the SRI and the conventional indices with a view to observe whether the SRI equity indices could be replicated by the benchmark indices. If the null hypothesis of the spanning was accepted then the performance of both type of indices would be same (Benchmark & SRI equity index) in terms of risk and return (RSRI,t=Rmktindex,t+eSRI,t). The study also examined the market-timing performance of the SRI equity indices to avoid estimation biasness of Jensen alpha. Although, it was a difficult task because the SRI indices generally didn't follow active portfolio management. Moreover, it was difficult to identify the benchmark index that followed the investment style of the SRI funds. Practically, the existence of SRI in the total investment universe (Capital market) was very tiny. Therefore, the single index measure was more appropriate to examine the SRI performance. The market-timing performance was examined by using the Treynor & Mazuy measure (1968).

$$R_{SRI,t} = \alpha_{SRI} + \beta_{SRI} R_{mktindex,t} + \lambda_{SRI} R_{mktindex}^2 + e_{SRI,t}$$
(6)

Here, the coefficient λ_{SRI} (market-timing performance) was estimated through the quadratic regression equation. The variance and co-variance matrices of the residuals (equation 5 & 6) were corrected for autocorrelation and heteroscedasticity by using the Newey-West approach.

The study also examined the performance of the Domini 400 index. It consisted of more than half of the companies which were not part of the S&P 500 index and therefore, had a lower market capitalisation than the companies registered in the S&P 500 index. Hence, additional

indices like S&P 600 Small Cap index and S&P 500 Growth & Value index were used to examine the performance. Therefore, an extended regression equation was conducted for the Domini 400 social index by considering two additional factors like returns of the S&P 600 Small cap Index ($\frac{SmallCap}{R_{microadext}}$) and the returns differential between the S&P 500 Growth & Value indices ($\frac{GrowthFalue}{R_{microadext}}$). Similarly, an extended regression equation had also been carried out to measure the performance characteristics of the MSCI World equity index that acted as a market surrogate for the SRI indices.

$$\mathbf{R}_{\text{SRL}t} = \alpha_{\text{SRI}} + \beta_{1,\text{SRI}} R_{\text{mktindex},t} + \beta_{2,\text{SRI}} R_{\text{mktindex},t}^{\text{S\&P600 SmallCap}} + \beta_{3,\text{SRI}} R_{\text{mktindex},t}^{\text{S\&P500 GrowthValue}} + e_{\text{SRI},t}$$
(7)

Here, it was observed that the return of the S&P 600 Small Cap index was highly correlated with the returns of the benchmark index. Here, the return of the S&P 600 Small Cap index was <u>orthogonalised</u> with the return of the benchmark index (Domini 400 index) that could be written

$$R_{mktindex,t}^{S\&P 600 \ SmallCap} = \nu_t^{S\&P 600 \ SmallCap} + \beta_t^{S\&P 600 \ SmallCap} R_{mktindex,t} + e_t^{S\&P 600 \ SmallCap}$$
(8)

Here, equation 7 was estimated by taking into consideration the residuals of the equation 8 which represented the part of S&P 600 Small Cap index return that couldn't be explained by the benchmark (Domini 400 index) return.

On the other hand, the growth-value factor was computed by taking into consideration the returns' differences between the S&P 500 Growth and Value indices that could be shown as under.

$$R_{mktindex,t}^{GrowthValue} = R_{mktindex,t}^{Growth} - R_{mktindex,t}^{Value}$$
(9)

Generally, growth portfolio consisted of equities with a low book-to-market value whereas the value portfolio contained stocks with high book-to-market value. Hence, equation 7 consisted of a market factor as well as 2 style factors namely size and book-to-market value (See Fama & French 1993 & 1996).

Here, joint coefficient test was conducted for the index families by using a single benchmark index. It was done by estimating a system of equations with the information collected from the cross-section of the SRI index series. The study considered 3 index groups under which 17 SRI equity indices belong. The groups were FTSE Good where 8 SRI indices were included, DJSI where 6 SRI indices were incorporated and KLD where 3 SRI indices were present. Finally, it was assumed that "n" equation test could improve the performance of the parameter tests that could be estimated as under:

$$R_{SRI,1,t} = \alpha_1 + \beta_1 R_{mktindex,1,t} + e_{1,t} \dots R_{SRI,n,t} = \alpha_n + \beta_n R_{mktindex,n,t} + e_{n,t}$$
(10)

The coefficient (Equation 10) was estimated through the seemingly unrelated regression (SUR) procedure. This type of regression approach was more realistic for the estimation of the coefficients because the independent variable $\mathbb{R}_{mktindex,t}$ was completely different across the equation. Here, the time series data was free from the survivorship bias because they were collected from a particular date (01.01.2005) and ended with a fixed date (31.12.2014).

The study used chi-square test statistic for the joint tests of the alpha and beta coefficients (H₀: $(\alpha_{SRI} = 0, \square_{SRI}: SRI = 1, ..., n)$ and H₀: $(\beta_{SRI} = 1, \square_{SRI}: SRI = 1, ..., n)$) respectively. Similarly, spanning test was also used for the joint hypothesis with the assumption that the indices of a particular index group followed the benchmark index (H₀: $(\alpha_{SRI} = 0 \text{ and } \beta_{SRI} = 1, \square_{SRI}: SRI = 1, ..., n)$) that means they followed benchmark indices in a same way. Newey-West (1987) corrected standard error was used for all the tests.

Now, the question relating to under or over performance that played a crucial role for the assessment of SRI was tested through an additional test and checked the robustness of the results by considering the MSCI World Equity index as the market surrogate. Here, 2 additional factors were considered in the system of "n" equation test - a small cap factor and a growth-value factor that had been created by using the World Small Cap index and the World Growth and Value indices. The following seemingly unrelated regression equation (SUR) was formulated and estimated.

$$R_{1,t}^{SRI} = \alpha_1 + \beta_{1,1}R_{mktindex,t} + \beta_{2,1}R_t^{MSCI World SmallCap} + \beta_{3,1}R_t^{MSCI World GrowthValue} + e_{1t} \dots R_{n,t}^{SRI} = \alpha_n + \beta_{1n}R_{mktindex,t} + \beta_{2n}R_t^{MSCI World SmallCap} + \beta_{3n}R_t^{MSCI World GrowthValue} + e_{n,t}$$
(11)

Here, the small cap factor was <u>orthogonalised</u> with the World index that could be written as under:

$$R_{t}^{MSCI \text{ World SmallCap}} = v^{MSCI \text{ World SmallCap}} + \varphi^{MSCI \text{ World SmallCap}} R_{mktindex,t} + e_{t}^{MSCI \text{ World SmallCap}}$$
(12)

on the contrary, the growth-value factor was computed by taking the returns' differential between the world growth and the value indices of MSCI which could be shown as under:

$$R_{t}^{MSCI \text{ World GrowthValue}} = R_{t}^{MSCI \text{ World Growth}} - R_{t}^{MSCI \text{ World Value}}$$
(13)

...........

The coefficients (Equation 11) were estimated through the seemingly unrelated regression (SUR) procedure. In addition, chi-square (χ) test was applied for the joint test of alpha and beta coefficients. Finally, spanning test was used for the joint hypothesis test with a null hypothesis that all the SRI equity indices would be followed the benchmark index (MSCI World Index).

Result & Interpretation:

It was found (Table 1) that the returns of the 11 SRI indices were higher than the conventional indices. The risk exposures of the 16 SRI indices were also higher than the conventional indices that means SRI indices were riskier than the benchmark indices and they failed to diversify the risks. Not only that but also the beta coefficients of the SRI indices were also higher. Here, the SRI indices experienced higher business risk. The Sharpe ratios of 3 SRI indices were found to be negative and another 3 indices were lower than their benchmark indices but the Sharpe ratios of the remaining 11 SRI indices were higher than their conventional indices. Similarly, the Treynor ratios of 3 SRI indices were lower than their benchmark indices and another 3 indices were lower than their conventional indices. Similarly, the Treynor ratios of 3 SRI indices were lower than their benchmark indices and the remaining 11 indices were higher than their conventional counterparts. Thus, it might be said that most of the SRI indices had the potential to compete with their conventional benchmarks.

SRI Index	Benchmark	R _{SRI}	R _{mindx}	δ _{sri}	δ_{mindx}	β _{sri}	S _{SRI}	S _{mindx}	T _{SRI}	T _{mindx}
DJSI World	DJ World	0.1341	0.0142	0.7542	0.6123	0.7581	0.1778	0.0232	0.1769	0.0187
DJSI World ex AGTF	DJ World	0.1632	0.0142	0.6941	0.6123	0.9321	0.2351	0.0232	0.1751	0.0152
DJSI STOXX	DJ STOXX	0.1025	0.0897	0.6642	0.6345	1.0124	0.1543	0.1414	0.1012	0.0886
DJSI STOXX ex AGTF	DJ STOXX	0.0354	0.0897	0.7874	0.6345	0.8745	0.0450	0.1414	0.0405	0.1026
DJSI EUROSTOXX	DJ Eurostoxx	-0.1024	-0.0741	0.7891	0.7139	0.7654	-0.1298	-0.1038	-0.1338	-0.0968
DJSI EUROSTOXX ex AGTF	DJ Eurostoxx	-0.0241	-0.0741	0.8015	0.7139	1.0235	-0.0301	-0.1038	-0.0235	-0.0724
FTSE4Good Europe 50	FTSE AW Europe	0.0845	0.0612	0.6719	0.6012	0.9941	0.1258	0.1018	0.0850	0.0616
FTSE4Good Europe	FTSE AW Europe	0.1024	0.0612	0.7125	0.6012	1.0421	0.1437	0.1018	0.0983	0.0587
FTSE4Good Global 100	FTSE Developed World	0.0941	0.0784	0.7355	0.7352	1.0874	0.1280	0.1066	0.0865	0.0721
FTSE4Good Global	FTSE Developed World	0.2012	0.0784	0.7419	0.7352	1.0562	0.2881	0.1066	0.1905	0.0742
FTSE4Good UK 50	FTSE All Share	0.0642	0.0579	0.6512	0.5945	1.0145	0.0986	0.0974	0.0633	0.0571
FTSE4Good UK	FTSE All Share	0.0321	0.0579	0.5974	0.5945	1.0321	0.0537	0.0974	0.0311	0.0561
FTSE4Good US 100	FTSE Local USA	0.0746	0.0612	0.6020	0.5781	1.0733	0.1239	0.1059	0.0695	0.0570
FTSE4Good US	FTSE Local USA	0.0521	0.0612	0.5612	0.5781	1.0856	0.0928	0.1059	0.0480	0.0564
KLD Domini 400 Social Index	S&P 500	0.1021	0.0732	0.5874	0.5523	1.0984	0.1738	0.1325	0.0930	0.0666
KLD BMSI	Russell 3000	-0.042	-0.0211	0.7625	0.6784	1.1021	-0.0551	-0.0311	-0.0381	-0.0191
KLD LCSI	Russell 1000	0.0120	-0.0032	0.6973	0.6098	1.2145	0.0172	-0.0052	0.0099	-0.0026

It was observed (Table 2) that the alpha values of the 15 SRI indices were positive. The alpha values were tested with the null hypothesis (H0 α SRI = 0) and observed that they were insignificant that meant acceptance of null hypothesis (performance of the SRI equity indices didn't deviate significantly from their benchmark indices). It was found that the estimated beta (β) of 12 SRI indices was higher than 1 and almost in all cases the SRI indices produced significant β values (except DJSI Eurostoxx). The beta values were tested with the null hypothesis (H0: β SRI = 1) and found that they were significantly different from 1 except for DJSI Eurostoxx index. Therefore, it might be argued that the risk exposures of SRI indices were higher than their benchmark indices that means rejection of null

hypothesis (the investment in SRI indices was riskier than their conventional counterparts). It was observed that the market-timing (γ SRI,t) performances of the SRI indices were positively insignificant. Here, the SRI indices failed to predict the behaviour of market movement of their benchmark indices. Here, the gamma values were tested with the null hypothesis (H0: γ SRI,t = 1) and found that they were not significantly different from 1 that meant the market-timing performance of both type of indices was same. Finally, it was observed from the spanning test (H0: (α SRI,t = 0 & β SRI,t = 1)) that the spanning for 7 SRI indices were accepted and the spanning of the remaining indices were rejected. Therefore, it might be opined that the investors who were willing to invest in SRI indices could Table 2: Performance of SRI Indices (Estimation of Jensen's Alpha & Market-Timing

equally made investment in the benchmark indices with the same risks and returns except those who's spanning were

rejected. Similarly, the higher adjusted R2 indicated that

	P	erformance)				
SRI Index	Time Period	Adjusted R ²	Alpha H_0 : $\alpha_{SRI,t} = 0$	Beta H_0 : $\beta_{SRI,t} = 1$	Gama H_0 : $\lambda_{SRI,t} = 1$	Spanning Test H ₀ : (α
						$= 0 \& \beta_t = 1)$
DJSI World	01.01.05 - 31.12.15	0.9745	0.0213	0.7581***	0.0431	Significant**
DJSI World ex AGTF	01.01.05 - 31.12.15	0.9612	0.0102	0.9321**	0.0015	Insignificant
DJSI STOXX	01.01.05 - 31.12.15	0.9847	0.0053	1.0124**	0.2345	Insignificant
DJSI STOXX ex AGTF	01.01.05 - 31.12.15	0.9912	0.0000	0.8745**	0.1598	Insignificant
DJSI EUROSTOXX	01.01.05 - 31.12.15	0.9321	0.0046	0.7654	0.5348	Insignificant
DJSI EUROSTOXX ex AGTF	01.01.05 - 31.12.15	0.9565	-0.0001	1.0235^{***}	0.4435	Insignificant
FTSE4Good Europe 50	01.01.05 - 31.12.15	0.9512	0.0145	0.9941***	0.3715	significant**
FTSE4Good Europe	01.01.05 - 31.12.15	0.9454	0.0031	1.0421**	0.2633	Significant**
FTSE4Good Global 100	01.01.05 - 31.12.15	0.9219	0.0345	1.0874**	0.2914	Insignificant
FTSE4Good Global	01.01.05 - 31.12.15	0.9074	0.0487	1.0562**	0.5324	Insignificant
FTSE4Good UK 50	01.01.05 - 31.12.15	0.8974	0.0002	1.0145**	0.4971	Insignificant
FTSE4Good UK	01.01.05 - 31.12.15	0.9018	0.0083	1.0321**	0.1059	Significant**
FTSE4Good US 100	01.01.05 - 31.12.15	0.9133	0.0009	1.0733**	0.2743	Insignificant
FTSE4Good US	01.01.05 - 31.12.15	0.9361	0.0035	1.0856^{**}	0.1923	Insignificant
KLD Domini 400 Social Index	01.01.05 - 31.12.15	0.9471	0.0079	1.0984^{**}	0.3789	Significant**
KLD BMSI	01.01.05 - 31.12.15	0.9005	0.0000	1.1021^{***}	0.4264	Significant**
KLD LCSI	01.01.05 - 31.12.15	0.9688	-0.0032	1.2145**	0.4907	Significant**
** Significant at 5% equation 5 & marke	level & *** significa t-timing through equ	ant at 10% lev 1ation 6.	el. Estimation is don	e through		

the SRI equity indices could be largely replicated by their benchmark indices.

The performance of the Domini 400 Social index was examined through single factor as well as multi-factor measures. It was observed that the alpha value was slightly improved when additional factors were included in equation 7. But the statistical test (H0: α SRI = 0) indicated that insignificant differences existed between the single factor and the multi-factor measures. But the beta value that was derived from the single factor measure was found to be higher and significantly different from 1 that indicated the return performance of Domini 400 Social Index was riskier than the multi-factor measure. It was also observed that

Domini 400 Social Index was little bias towards the growth factor although the estimated values of both the style factors were not statistically significant. The difference was occurred due to the risk exposure. The adjusted R2 value was improved due to the inclusion of 2 style factors in the multi-factor measure and might be argued that single factor measure could be replicated by the multi-factor measure. But the spanning test indicated rejection of the null hypothesis. Hence, it might be concluded that the SRI equity indices in KLD index group were different in terms of their risks and returns based on both the measures.

 Table 3: Performance of Domini 400 Social Index after inclusion of additional factors

Description	Domini 400 Social Index		
	Single Factor	Multi Factor	
Sample Period	01.01.2005	01.01.2005	
Alpha, (H ₀ : $\alpha = 0$)	0.0079	0.0578	
Benchmark β_1 (H ₀ : $\beta_1 = 1$)	1.0984**	1.0321	
S&P 600 Small Cap Index β_2 (H ₀ : $\beta_2 = 0$)		0.0052	
S&P 500 Growth – Value Index β_3 (H ₀ : $\beta_3 = 0$)		0.3291	
Adjusted R ²	0.9471	0.9622	
Spanning Test H ₀ : $\alpha = 0$ & ($\beta_1 + \beta_2 + \beta_3 = 1$)	Significant**	Significant**	

****** Significant at 5% level.

The performance of MSCI World Equity Index presented in Table 4. It was found that the alpha was reduced when 2 style factors were added in the multi-factor measure. Although, it was found that the alpha was not significantly different from 0 and the difference was occurred due to the risk exposure. The MSCI World Equity Index was experienced higher risk as compared to the Multi-factor measure and the risk performance was significantly different from 1. Here, the null hypothesis (H0: β 1 = 1) was rejected that signified the World Index (single factor measure) was riskier as compared to the multi-factor measure. Here, the performance of the growth style factor was found satisfactory than the small cap style factor. But the estimated coefficients of both the style factors were statistically insignificant that means acceptance of the null hypothesis and the difference was occurred due to the risk exposure. Although, the adjusted R2 of the World Index based on multi-factor measure was slightly higher than the single factor measure, which means, single factor measure could be represented by the multi-factor measure. Finally, the spanning test indicated rejection of the null hypothesis (H0: $\alpha = 0 \& \beta 1 + \beta 2 + \beta 3 = 1$) that meant risks and returns performances of the MSCI World Equity Index based on both the measures were significantly different.

	index (inclusion of additional factors)			
Description	MSCI World Equity Index			
	Single Factor	Multi Factor		
Sample Period	01.01.2005	01.01.2005		
Alpha, (H ₀ : $\alpha = 0$)	0.0759	0.0471		
Benchmark β_1 (H ₀ : $\beta_1 = 1$)	1.5246**	1.3128		
MCSI Small Cap Index β_2 (H ₀ : $\beta_2 = 0$)		-0.0037		
MCSI Growth – Value Index β_3 (H ₀ : $\beta_3 = 0$)		0.4173		
Adjusted R ²	0.9257	0.9822		
Spanning Test H ₀ : $\alpha = 0$ & ($\beta_1 + \beta_2 + \beta_3 = 1$)	Significant**	Significant**		

Table 4: Performance of MSCI World Equity Index (Inclusion of	f additional factors)
---	-----------------------

** Significant at 5% level.

The joint coefficient test for the index families based on single benchmark measure was presented in table 5. Here, 3 index families were constructed namely DJSI, FTSE 4 Good and KLD. In each index family consisted of different child SRI indices. Here, the child indices strongly operated under the supervision of index family. Therefore, they were homogeneous in nature and their SRI screening system and the time intervals were equal. Only their investment universe was different. It was observed that the alpha of the SRI indices of 3 index families were not significantly different from 0 that means the null hypothesis H0: all α SRI = 0 was accepted. Hence, it might be argued that the SRI screening strategy failed to draw significant impact on the

performance of the SRI indices in the index families or the alpha performances of the SRI Child indices followed the performances of their family indices. The risk exposures of the SRI indices of their own families were significantly different from their family indices based on SRI screening policy. Here, the null hypothesis H0: all β SRI = 1 was rejected that means the child indices didn't follow their family indices in terms of risk. Finally, the spanning test prompted us to reject the null hypothesis (H0: all α SRI = 0 and H0: all β SRI = 1) in all cases. Therefore, it might be argued that the SRI indices couldn't perform properly like their own index families based on the SRI screening criteria.

Index	Child Indices	H ₀ : All $\alpha_{sri} = 0$	$H_0: All \beta_{sri} = 1$	Spanning H ₀ : all
Family				$\alpha_{sri}=0$ & all $\beta_{sri}=1$
	DJSI World, DJSI World ex			
DJSI	AGTF, DJSI Stoxx, DJSI Stoxx ex	3.1251	85.3647*	90.1254*
	AGTF, DJSI Eurost oxx, DJSI	(0.7321)	(0.0000)	(0.0000)
	Eurostoxx ex AGTF (6)			
	FTSE4Good Europe 50,			
FTSE4Good	FTSE4Good Europe, FTSE4Good	6.5549	67.8833*	75.9475*
	Global 100, FTSE4Good Global,	(0.0032)	(0.0000)	(0.0000)
	FTSE4Good UK 50, FTSE4Good			
	UK, FTSE4Good US 100,			
	FTSE4Good US (8)			
	KLD Domini 400 Social Index,	3.1254	95.5926*	97.1326*
KLD	KLD BMSI, KLD LCSI (3)	(0.7129)	(0.0000)	(0.0000)

Table 5: Joint Coefficient test for Index Families based on Single Benchmark Model

* Significant at 1% level. ρ values are given in bracket.

The joint coefficient test for the index families based on the World Index (MSCI) presented in table 6. Here, MSCI world index and its 2 style factors were considered as benchmark. It was found that the alpha coefficients of the SRI indices in 3 index families were statistically insignificant based on the single factor measure when world index acted as benchmark and therefore, the null hypothesis was accepted (SRI indices in the index families acted like the benchmark index). But, the risk performances of the SRI indices in the index families were statistically significant and therefore the null hypothesis was rejected that meant the risk performances of the SRI equity indices in the index families were higher as compared to the world benchmark based on the single factor measure. It was also observed from the spanning test that the risks and returns performances of the SRI indices in the index families were statistically significant and therefore the null hypotheses were rejected in all cases. Hence, it might be argued that the SRI indices in the index families didn't follow the world index in terms of risks and returns based on single index measure. On the contrary, it was observed that the alpha values were slightly decreased when 2 additional style factors were included in the multifactor measure. Here, the null hypothesis was accepted in case of alpha performances. But, the risk performances of the SRI indices in the index families were statistically different from 1 that meant the SRI indices allowed higher risk as compared to the world index when additional factors were considered. Finally, the spanning test prompted us to reject the null hypotheses for the SRI indices in 3 index families that meant the risk and return performances of the SRI indices in the 3 index families were different as compared to the world index when 2 style factors were used in the multi-factor measure.

Mother	Child Indices	Single	Single World	Spanning	Three World	Three	Spanning H ₀ :
Index		World Index	Index H ₀ : All	H_0 : all α_{SRI}	Index H ₀ :	World	all $\alpha_{SRI} = 0$ &
		H_0 : All α_{SRI}	$\beta_{SRI} = 1$	= 0 & all	All $\alpha_{SRI} = 0$	Index H ₀ :	all $\beta_{SRI} = 1$
		= 0		$\beta_{SRI} = 1$		All $\beta_{SRI} = 1$	
DJSI	Same as Table 5 (6)	4.1575	63.1245*	65.7469*	3.6974	85.3647*	107.2331*
		(0.8745)	(0.0001)	(0.0000)	(0.1205)	(0.0000)	(0.0000)
FTSE4Good	Same as Table 5 (8)	7.8471	77.1475*	91.7324*	5.4518	67.8833*	98.5347*
		(0.2189)	(0.0045)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
KLD	Same as Table 5 (3)	5.1278	69.3359*	75.4135*	3.4567	91.4758*	104.7754*
		(0.1452)	(0.0000)	(0.0004)	(0.0001)	(0.0035)	(0.0000)

* Significant at 1% level. ρ values were given in brackets ().

Conclusion:

It might be concluded that the SRI indices were higher risk exposures as compared to their conventional counterparts but the risk-adjusted performances of the SRI indices in most cases were higher. But the spanning test showed that the risks and returns performances of the SRI and conventional indices were same in most cases. The alpha performances based on both measures of the SRI indices in KLD groups (single factor & multi-factor measure) were equal but the risk performance was higher in single factor measure as compared to the multi-factor. But the spanning test showed to reject the null hypothesis. Similarly, in case of MSCI world equity index the alpha value reduced after inclusion of 2 style factors but they were insignificant. The single factor measure experienced higher risk than the multi-factor measure. But, the risks and returns performances of the MSCI world index based on spanning test was found different based on both the measures. But the risk performances of the SRI indices were different from their index groups. But the spanning test prompted to reject the null hypothesis. However, the alpha performance of the SRI indices was same like the MSCI world equity index based on single factor measure. But the risk performance was significantly different in the same measure. After all, the SRI equity indices didn't follow the world equity index in terms of risks and returns based on single index measure and the result was same when 2 style factors were added in multi-factor measure in the index families. Finally, it might be concluded that the performances of the SRI indices in some cases were same like the benchmark indices and sometimes different when additional factors were used. At the end, it might be recommended that further research was needed in developing economics where SRI markets was at infant stage. Even if, the concept of SRI was not clear to the investors and sometimes the return from SRI was not

attractive as compared to the conventional indices. This issue might be taken into consideration for further research.

References:

- Abbott, W. and J. Monsen. 1979. "On the Measure of Corporate Social Responsibility: Self-Reported Disclosure as a Method of Measuring Corporate Social Involvement." Academy of Management Journal, 22(3), 501-515.
- Alam, N. and M.S. Rajjaque. 2010. "Shariah-Compliant equities: Empirical evaluation of performance in the European Market During credit crunch." Journal of Financial Services Marketing, 15(3), 228-240.
- Bauer, R., K. Koedijk and R. Otten. 2005. "International Evidence on Ethical Mutual Fund Performance and Investment Style." Journal of Banking and Finance, 29, 1751-1767.
- Brammer, S., C. Brooks and S. Pavelin. 2006. "Corporate social performance and stock returns: UK evidence from disaggregate measures." Financial Management, 35(3), 97-116.
- Blackburn, V., M. Doran and C. Shrader. 1994. "Investigating the Dimensions of Social Responsibility and the Consequences for Corporate Financial Performance." Journal of Managerial Issues, 6(2), 195-212.
- Consolandi, C., Jaiswal-Dale, A., Poggiani, E., & Vercelli, A. (2008). Global Standards and Ethical Stock Indexes: The Case of the Dow Jones Sustainability Stoxx Index. Journal of Business Ethics, 87(1), 185-197.
- Climent, F., & Soriano, P. (2011). Green and Good? The Investment Performance of US Environmental Mutual Funds. Journal of Business Ethics, 103(2), 275-287.
- Cortez, M.C., Silva, F., & Areal, N. (2009). The Performance of European Socially Responsible Funds. Journal of Business Ethics, 87(4), 573-588.
- Clarkson, M. (1995). A Stakeholder Framework for Analyzing and Evaluating Corporate Social Performance. Academy of Management Review, 20(1), 92-117.
- Derwall, J., N. Guenster, R. Bauer, and K. Koedijk. 2005. "The eco-efficiency premium puzzle." Financial Analysts Journal 61:2, 51-63.
- Edmans, A. (2011). Does the Stock Market Fully Value

Intangibles? Employee Satisfaction and Equity Prices. Journal of Financial Economics, 101(3), 621-640.

- 12. Freeman, E. & Evan, E. (1990). Corporate Governance: A Stakeholder Interpretation. Journal of Behavioural Economics, 19(4), 337-359.
- Friedman, M. (1970). The social responsible of business is to increase its profits. New York Times Magazine, 13, 32-33.
- 14. Garz, H., Volk, C., & Gilles, M. (2002). More gain than pain – SRI: Sustainability pays off. WestLB P a n m u r e , h t t p : / / w w w . Westlbpanmure.com/sri/pdf/sri nov2002.pdf.
- Gregory, A., Matatko, J., & Luther, R. (1997). Ethical unit trust financial performance: Small company effects and fund size effects. Journal of Business Finance & Accounting, 24, 705-725.
- Gil-Bazo, J., Ruiz-Verdu, P. & Santos, A.A.P. (2010). The Performance of Socially Responsible Mutual Funds: The Role of Fees and Management Companies. Journal of Business Ethics, 94(2), 243-263.
- Guerard, J. (1997). Is There a Cost to Being Socially Responsible in Investing? Journal of Investing, 6(2), 11-19.
- Galema, R., Plantinga, A., & Scholtens, L.J.R. (2008). The stocks at stake: Return and risk in socially responsible investment. Journal of Banking and Finance, 32(12), 2646-2654.
- Hamilton, S., Jo, H., & Statman, M. (1993). Doing well while doing good? The investment performance of socially responsible mutual funds. Financial Analysts Journal, November/December 1993, 62-66.
- Hong, H. & Kacperczyk, M. (2009). The price of sin: The effect of social norms on markets. Journal of Financial Economics, 93(1), 15-36.
- Hill C., & Jones, T. (1992). Stakeholder-agency Theory. Journal of Management Studies, 29(2), 131-154.
- 22. Humphrey, J.E., & Lee, D.D. (2011). Australian Socially Responsible Funds: Performance, Risk and Screening Intensity. Journal of Business Ethics, 102(4), 519-535.
- 23. Jones, T. (1995). Instrumental Stakeholder Theory: A synthesis of Ethics and Economics. Academy of

Management Review, 20(2), 404-437.

- Jones, S., van der Laan, S., Frost, S., & Loftus, J. (2008). The Investment Performance of Socially Responsible Investment Funds in Australia. Journal of Business Ethics, 80(2), 181-203.
- Kurtz, L. & DiBartolomeo, D. (1996). Socially screened portfolios: An attribution analysis of relative performance. Journal of Investing, Fall 1996, 35-41.
- Luther, R. & Matatko, J. (1994). The performance of ethical unit trusts: Choosing an appropriate benchmark. British Accounting Review, 26, 77-89.
- Luther, R., Matatko, J. & Corner, D. (1992). The investment performance of UK Ethical unit trusts. Accounting auditing & accountability Journal, 5, 57-70.
- Luck, C., & Pilotte, N. (1993). Domini Social Index Performance. Journal of Investing, 2(3), 60-62.
- Mallin, C., Saadouni, B., & Briston, R. (1995). The financial performance of ethical investment trusts. Journal of Business Finance & Accounting, 22, 483-496.
- Managi, S., Okimoto, T. & Matsuda, A. (2012). Do Socially Responsible Investment Indexes Outperform Conventional Indexes? Applied Financial Economics, 22(18), 1511-1527
- Mill, G. (2006). The Financial Performance of a Socially Responsible Investment over Time and a Possible Link with Corporate Social Responsibility. Journal of Business Ethics, 63(2), 131-148.
- Moskowitz, M. (1972). Choosing socially responsible stocks. Journal of Business & Society, Spring 1, 71-75.
- Orlitzky, M., Schmidt, F. & Rynes, S. (2003). Corporate Social and Financial Performance: A Meta-Analysis. Organization Studies, 24(3), 403-441.
- Renneboog, L., Horst, J.T., & Zhang, C. (2008). The Price of Ethics and Stakeholder Governance: The Performance of Socially Responsible Mutual Funds. Journal of Corporate Finance, 14(3), 302-322.
- Sauer, D. (1997). The impact of social-responsibility screens on investment performance: evidence from the Domini 400 social index and Domini equity fund. Review of Financial Economics, 6,

23-35.

- Schroeder, M. (2004). The performance of socially responsible investments: investment funds and indexes. Journal of Financial Markets and Portfolio Management, 18, 122-142.
- Statman, M. (2000). Socially responsible mutual funds. Financial Analysts Journal, May/June 2000, 30-39.
- Stenstrom, H., & Thorell, J. J. (2007). Evaluating the performance of socially responsible investment funds: A holding data analysis. Stockholm School of Economics, Master Thesis, 1-49.
- Sharpe, W. (1966). Mutual Fund Performance. Journal of Business, 39(1), 119-138.
- Treynor, J., & Mazuy, F. (1966). Can mutual fund predict the markets? Harvard Business Review, 45, 131-136.
- Ullmann, A. (1985). Data in Search of a Theory: A Critical Examination of the Relationship among Social Performance, Social Disclosure and Economic Performance of U.S. Firms. Academy of Management Review, 10(1-2), 540-557.
- White, M. (1995). The performance of environmental mutual funds in the United States and Germany: Is there economic hope for Green investors? Research in Corporate Social Performance and Policy, Supplement 1, 323-344.
- Waddock, S., & Graves, S. (1997). The Corporate Social Performance-Financial Performance Link. Strategic Management Journal, 18(4), 303-319