Exploration of the Cross-Sectional Return Distributions of Socially Responsible Investment Funds

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Abstract

We compare the cross-sectional performance (total returns, risk-adjusted returns, and risk exposures) of socially responsible (SRI) and conventional (non-SRI) mutual funds. We establish that there exist economically and statistically significant and persistent differences in the cross-sectional performance between the SRI and non-SRI funds when comparisons are made at the quantiles of the return distribution away from the median. These differences increase dramatically moving away from the median and toward the tails of these distributions. We find that both the cross-sectional total return and risk-adjusted return distributions are narrower for SRI funds than non-SRI funds. These differences are much more pronounced during bear markets than bull markets, providing a potential explanation for some recently published research. To determine potential sources of these performance differences we evaluate the respective universes of stock holdings of SRI and non-SRI funds. We find compelling evidence that these universes are substantially different, with the SRI holdings universe being less dispersed than the non-SRI holdings universe along the dimensions of total and risk-adjusted returns, as well as risk exposures.

Keywords: SRI, ESG, social responsibility, socially responsible investing
JEL Classification: G11, G12, G20, M14

1. Introduction

The genesis of what is now referred to as sustainable, responsible, impact investing (SRI) strategies (also commonly referred to as socially responsible investing) can be traced back thousands of years. Jews of the biblical era were to abide by standards of ethical dealings in financial matters, and since then, other religious groups have also invested according to some form of environmental, social or governance (ESG) policies. In recent decades, institutional and individual investors have increasingly considered social consciousness as part of their overall investment program, as concerns over such issues as nuclear power, environmental crises, fossil fuel extraction and climate change have become part of the investment consideration.[4] As a result, SRI strategies have experienced significant growth

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over the past twenty years. According to industry group The Forum for Sustainable and Responsible Investment (USSIF), the amount of SRI assets under management in the U.S. has grown from $639 billion in 1995 to more than $3.7 trillion in 2012 (the latest data available), a gain of 486 percent. Over the same period, according to USSIF overall assets under management grew 376 percent. USSIF estimates that SRI now accounts for approximately 11% of assets under management in the U.S.[5]

Understandably, the growth in SRI strategies and assets has been accompanied by an increase in the volume of research analyzing the impact social investment policies have on portfolio performance. If it turns out that SRI strategies underperform, one would expect the category to be limited to niche investors who value social policies more highly than investment performance, and continued growth would be constrained. However, the category could be expected to continue to expand if it could be demonstrated that SRI strategies at least "do no harm" to investment performance. A significant number of studies on this topic (e.g., Cortez et al., 2009; Galema et al., 2009; Statman and Glushkov, 2009, besides others) reach a conclusion that by selecting an SRI funds, an investor would not be sacrificing performance, on average, while being able to ascertain that their social policy investment constraints are being met. In other words, the average performance of SRI funds is indistinguishable from that of non-SRI funds, according to this body of research.

In this paper we investigate the differences in the SRI and non-SRI fund performance not only in terms of average performance, but also by comparing the return distributions of SRI and non-SRI funds at quantiles away from the median. Our research uncovers economically and statistically significant differences in the cross-sectional performance between SRI and non-SRI funds when comparisons are made at the quantiles away from the median. These differences generally increase further away from the median.

The purpose of characterizing various percentiles of the SRI and the non-SRI cross-sectional distributions is that in addition to comparing the average performance differences, we can answer the question of what the performance of a randomly selected fund would be at various selected percentiles through time. Researching this is worthwhile for reaching an informed investment decision, since a randomly selected fund a posteriori can turn out to be (and most likely will be) better or worse than the average fund, and hence knowing only the average properties of the cross-sectional return distribution of SRI relative to non-SRI funds is not sufficient.

The following are our main findings: first, we demonstrate that the cross-sectional total return distribution of SRI funds is much concentrated around its median when compared to the non-SRI funds. Second, in parallel to the result for the total returns, we establish that the cross-sectional distribution of risk-adjusted returns also has much thinner tails for SRI funds when compared to non-SRI funds. These differences are much more pronounced during bear markets than bull markets, which provides an explanation for recently published research identifying these bull/bear market differences at the mean of the distribution Nofsinger and Varma (2014).

Finally, we investigate the potential sources of the total return and risk-adjusted return differences between SRI and non-SRI funds by evaluating the respective universes of stocks in which they invest. We find strong suggestive evidence that the total and risk-adjusted return distributions of the SRI and non-SRI fund holdings are different, with the SRI stock holdings having distributions that are closer to the median, compared to the distribution of the non-SRI holdings. In addition, the distributions of the Fama-French risk factor exposures are much less dispersed for the SRI holdings universe, which

[5] USSIF Foundation - The Forum for Sustainable and Responsible Investment. Report on Sustainable and Responsible Investing Trends in the United States 2012. Retrieved from `http://www.ussif.org/files/publications/12_trends_exec_summary.pdf`.

means that the SRI holdings universe is more homogeneous not only from the point of view of total and risk-adjusted returns, but also from the point of view of its risk exposures.

2. Literature Review

Because of the growth in the number, and assets under management, of SRI strategies, a significant body of academic research has been conducted on evaluating the investment performance of ESG factors and SRI strategies generally. From this research, three general views have emerged surrounding SRI performance. First, critics of SRI argue that social investors concentrate on a sub-set of investment assets in considering ESG factors, and this will inevitably result in lower investment returns because the pool of investment opportunities and diversification is reduced. This is the "doing good but not well" hypothesis (Statman and Glushkov, 2009). Girard et al. (2007) find that SRI mutual fund managers demonstrate poor selectivity, diversification and market timing as compared to active benchmarks. Adler and Kritzman (2008) use Monte Carlo analysis in order to quantify the cost of SRI investing, finding that performance is adversely impacted by 17 to 240 basis points annually through limiting the investable universe of securities. Geczy et al. (2005) find that for mutual fund investors, the cost of limiting ones fund universe only to SRI funds can be as high as 1000 basis points per month. Renneboog et al. (2008) find that in the U.S. and internationally investors pay a price for ethics, likely as a result of stocks of firms following SRI policies being overpriced.

A second view, espoused by advocates of SRI, holds that SRI outperforms non-SRI, primarily as a result of fund managers underestimating the benefits of social responsibility or overestimating its costs. Statman and Glushkov (2009) refer to this as the "doing well while doing good" hypothesis. Edmans (2011) analyzes intangibles such as employee satisfaction, and finds that positive SRI screens designed to identify firms concerned with employee welfare may have a positive impact on performance of SRI funds. Kempf and Osthoff (2007) find that stocks of companies having high ratings on various measures of social responsibility fare better than stocks having low ratings. More recently, Nofsinger and Varma (2014) find that SRI mutual funds outperform conventional funds in periods of market crisis. Pointing to Prospect Theory, the authors posit that the growth of the SRI industry is in part driven by investor preference for such asymmetric performance characteristics.

A third view is that under normal circumstances there should be no meaningful difference between long-term performance of SRI and traditional investments. In other words, the market does not put a price on incorporating socially responsible factors in investment decisions. Statman and Glushkov (2009) refer to this as as the "no effect" hypothesis. While Benson et al. (2006) find a difference in industry composition as between SRI and non-SRI funds, they conclude there is no difference in the stock-picking abilities of managers in the respective categories. Also falling under this third view are studies by Galema et al. (2009) and Schröder (2006), which conclude that there is no performance differential for SRI strategies that are prohibited from selling short relative to non-SRI strategies. Internationally, Cortez et al. (2009) find that European SRI funds generate neutral performance relative to conventional benchmarks. In a study of the characteristic and diversification effects of performance of SRI and non-SRI funds, Bello (2005) finds no difference between the two groups.

The general results of our analysis tend to support prior studies in the "no effect" camp, concluding that in terms of the cross-sectional average performance of SRI and non-SRI funds there do not exist economically or statistically significant differences. However, the story changes rather dramatically when the study is extended beyond cross-sectional averages of total and risk-adjusted return distributions to include other quantiles. We demonstrate that the SRI funds tend to have cross-sectional return distributions that are much less dispersed than those of non-SRI funds, and that differences between the SRI and non-SRI total and risk-adjusted cross-sectional return distributions are economically and statistically significant.

3. Data

We use the Morningstar Direct Open End Funds database to obtain performance data for mutual funds. To identify SRI funds in the database, we utilize Morningstar's "Socially Conscious" flag, which is defined as follows: "This data point indicates if the fund selectively invests based on certain non-economic principles. Such funds may make investments based on such issues as environmental responsibility, human rights, or religious views. A socially conscious fund may take a pro-active stance by selectively investing in, for example, environmentally-friendly companies, or firms with good employee relations. This group also includes funds that avoid investing in companies involved in promoting alcohol, tobacco, or gambling, or in the defense industry." While this dimension does not allow us to identify various SRI strategy sub-types, it does give us a general classification of funds into SRI and non-SRI groups.

It is essential to include obsolete funds in the fund performance analysis in order to reduce the survivorship bias – the bias in the measurement of active asset management performance arising from the fact that funds that become obsolete are usually the poor-performing funds. Therefore, excluding the obsolete funds from the analysis will tend to overestimate the overall performance of active managers as a group (see Elton et al. (1996); Carhart et al. (2002)). To obtain a comprehensive overview of active risk-adjusted performance, we analyzed all the available "alive" (i.e., those funds still in existence) and obsolete funds in the Morningstar Direct database.

Morningstar advertises its Direct database as "survivorship bias" free database and notes that "with Morningstar Direct, professors and other researchers can easily access historical data on a full range of securities and investment managers. When available, investment holdings and fund flow data is included, and information for merged and liquidated investments allows for comparisons and rankings that are free of survivorship bias."[6] In further private conversations with Morningstar, they noted that the funds get marked as being discontinued in the database due to either liquidations or mergers. In addition, Morningstar provided the annual total count (1990 to present) of liquidations and mergers that are included in the Direct database. Since 1990 the overall number of liquidations included in the database is 10,233 (number of share classes), while the overall number of mergers is 15,205 (number of share classes).

Table 1 presents the number of SRI/non-SRI funds across time (1980-2013) for domestic equity (the nine domestic equity Morningstar categories), international equity (Diversified Emerging Markets, Foreign Large Blend, Foreign Large Growth, Foreign Large Value, Foreign Small/Mid Blend, Foreign Small/Mid Growth, Foreign Small/Mid Value, World Stock Morningstar categories), domestic fixed income (Intermediate Government, Intermediate-Term Bond, Long Government, Long-Term Bond, Short Government, Short-Term Bond Morningstar categories), and allocation (Aggressive Allocation, Conservative Allocation, Moderate Allocation Morningstar categories) investment groups. Table 1 also gives the total number of funds and SRI funds across time. As of June 30 2013, there were a total (dead and alive) of 9,840 mutual funds and 231 SRI mutual funds in our databases. These counts represent unique fund strategies (i.e., unique Morningstar fund IDs), and for each one of these strategies we have performance history on potentially multiple share classes.

Table 1 gives more detail for the number and breakdown of SRI funds across various investment universes. The important takeaways from Table 1 are as follows:

[6] `http://goo.gl/tD1QdM`

1. The incidence of SRI funds across time is about 1-2 percent of the total fund universe.
2. The absolute number of SRI mutual funds ranges between 89 in 1999 and 178 in 2013.
3. Domestic equity SRI funds account for about 50 percent of all the SRI mutual funds, with most of the SRI funds being concentrated in the Large Cap Core and Large Cap Growth Morningstar categories.

Given that domestic equity is the most populous investment group in terms of the number of SRI funds, we largely single out domestic equity in our research. Also, focusing on the domestic equity SRI funds allows us to isolate investment strategies that are exposed to similar risk factors, thereby providing more precision to our research results. In addition, we chose 1999 as the starting date for most of our analyses, because there is a substantial drop-off in the number of SRI funds prior to this year (see Table 1).

Mutual fund strategies tend to be represented by multiple share classes. Each share class will usually invest in the same investment portfolio of securities and will have the same investment objectives, policies, and strategies. The main differences across the share classes lie in fee structures and distribution channels. Since the main focus of this research are the performance differences that arise from the investment skills of the manager rather than the distribution channels or fee structures, viewing each share class as a unique strategy will assign too much weight to a particular fund in a peer group. At the same time, we want to make sure to reflect the fee structure of the funds in our performance analysis. Finally, different share classes will typically have different performance history lengths, and we want to make sure that our analysis incorporates all the available data history. The ideal solution that represents the fee structure of the fund across various asset classes while resulting only in a single representative performance history that incorporates all the available data is to calculate asset-weighted average performance. Because Morningstar's database does not contain the historical market capitalization of the various share classes in a particular fund, we do the next best thing and base our analysis of a particular fund on the equal-weighted average of the return streams across the various available share classes.

4. SRI/non-SRI Performance Differences at the Mean

To identify potential differences in the SRI and non-SRI funds, we will first explore their *average* cross-sectional behavior. This is the approach most commonly undertaken in the SRI fund performance analysis literature.

4.1. Methodology

To carry out the comparison of performance differences at the mean, we follow two approaches. First, we undertake the most common approach in the SRI methodology, which is the comparison of means of various performance dimensions across SRI and non-SRI samples. The time period of analysis is 1999/01 to 2013/06. For the hypothesis test of equality of two sample means we carry out Welch's t-test for two samples with possible unequal variances and unequal number of observations. In addition, we implement Wilcoxon's signed rank test. We implement both of these tests with asymptotic as well as bootstrap distributional methods.

In the second approach we form monthly return series by averaging across all the available funds in a particular month. We form separate monthly return series for large cap and domestic equity mutual fund funds and do this for SRI as well as non-SRI funds. We then apply Fama-French four-factor[7] analysis to these monthly return series to explore any alpha or exposure differences. We run separate analyses for various time subperiods: 1980/01 to present, 1990/01 to present, and 2000/01 to present. In addition, we analyze the SRI/non-SRI differences using Returns-Based Style Analysis (Sharpe, 1992), which is an alternative factor-based fund performance evaluation model that is commonly used in the financial industry.

4.2. Results

In this section we discuss the results for the tests of the equality of SRI and non-SRI performance *at the mean*. We largely replicate the results obtained in previous studies, which show that on average the performance of SRI and non-SRI funds is both economically and statistically indistinguishable.

Table 2 presents the non-performance dimension (i.e., expense ratio, fund size, fund age, and percentage of the portfolio in top 10 holdings) comparisons across SRI and non-SRI mutual funds. We carry out Welch and Wilcoxon hypothesis tests to compare the sample means of SRI and non-SRI funds. The time period presented is 1980/01 to 2013/06, and we use averages across live and dead funds, where the data for dead funds is given at the last month during which they were in operation.

As the results illustrate, the SRI and non-SRI funds are largely identical, with the only uniformly present difference, which is both economically and statistically significant, being the fund size. It turns out that SRI funds tend to be smaller in size than non-SRI funds, usually by a wide margin. For example, the average size of a large cap non-SRI mutual fund is about $1.6 billion, while that of an SRI fund is less than one-third the size at $507 million. This size difference holds for the whole domestic equity investment group as well for the large cap sub-group.

Also, the expense ratios tend to be slightly lower for SRI funds, on average, and these differences are statistically significant. The expense ratios given in Table 2 are obtained by constructing a weighted average of the expense ratios of individual mutual funds in a particular category, where the weight used is the market cap of the fund.

Table 3 presents the comparison across SRI and non-SRI funds for various performance dimensions. The time period analyzed is 1980/01 to 2013/06, and we evaluate both alive and dead funds. The performance measures given are calculated at the individual fund level and then averaged across funds. Returns-Based Style Analysis (RBSA) analysis is done with respect to a list of domestic and international equity benchmarks.[8]

As the results in Table 3 indicate, the performance measures (e.g., total return, active return, information ratio, Fama-French four-factor alpha, etc.) are economically and statistically similar across SRI and non-SRI funds. The only significant difference between the SRI and non-SRI performance can be noticed at the risk dimensions. For example, standard deviations and tracking errors for SRI funds are economically and statistically lower than those for non-SRI funds. In the next section we will see that the source of these differences is the way that SRI and non-SRI funds perform in the tails of the cross-sectional (i.e., across funds) return distribution.

[7] The three risk factors in the Fama and French (1993) factor model capture (1) the risk of the overall market, (2) the risk associated with the market capitalization of an investment and (3) the risk associated with the value-growth orientation of the investment. In a well-known paper, Carhart (1997) added a fourth factor to the widely used Fama and French (1993) three-factor model, where the added factor captures the effect of one-year momentum anomaly (Jegadeesh and Titman, 1993).

[8] We use the total return of the following list of indexes as factors in our RBSA analysis: Russell 1000 Value, Russell 1000 Growth, Russell 2000 Value, Russell 2000 Growth, MSCI EM NR, MSCI EAFE Growth NR, MSCI EAFE Value NR, Citi Treasury Bill 3 Month.

As a next test for differences in SRI and non-SRI performance, we construct monthly return series separately for SRI and non-SRI funds. As we note in the methodology section, the monthly return series are constructed as equal-weighted averages across total returns of the available SRI and non-SRI funds for the particular month. We do this for the domestic equity as well as large cap funds. The time periods of analysis are 1990/01 to 2013/06 and 2000/01 to 2013/06. We then carry out Fama-French four-factor and RBSA analysis on these return streams. The results are presented in Table 4. Again, the results are largely identical for SRI and non-SRI funds and across both of the subperiods. For example, the Fama-French monthly alpha estimate for domestic equity SRI funds is equal to -0.06 percent for the 2000/01 to 2013/06 period, while it is equal to -0.05 percent for non-SRI funds. Not surprisingly, the p-value for the symmetric two-sided hypothesis test of the null of equality of the intercepts is 0.43. This general result holds also for large cap funds and across time periods. The only consistent difference between the SRI and non-SRI funds at the mean is the exposure to the momentum risk factor, which is lower for the SRI funds. These differences are statistically significant. While at the average these differences are very slight, we will see in later results that these differences get more pronounced at tail quantiles.

5. SRI/non-SRI Performance Differences at Other Percentiles

In this section we describe our unique contribution to the SRI literature – analysis of tail as well as median percentiles of the cross-sectional SRI and non-SRI return distribution, which, to our knowledge, has previously not been undertaken by other researchers in the field. We investigate the behavior (total return, risk-adjusted return, risk exposures, and their differences) of the cross-sectional SRI and non-SRI distributional quantiles through time.

By characterizing various percentiles of the SRI and the non-SRI cross-sectional distributions, we can answer the question of what the performance of a randomly selected fund would be at various selected percentiles through time. Researching this is worthwhile for reaching an informed investment decision, since a randomly selected fund *a posteriori* can turn out to be (and most likely will be) better or worse than the average fund, and hence knowing only the average properties of the cross-sectional return distribution of SRI relative to non-SRI funds is not sufficient.

To compare the distributions of SRI and non-SRI returns, we compare the respective quantiles in the two distributions rather than the moments or functions of moments (i.e., mean, standard deviation, skewness, kurtosis, etc.) of the two distributions. The reason for taking this approach is that comparing the quantiles is a much more direct approach to comparing the distributions, as compared to moments, which are summaries of the distributional features. Also, analysis of quantiles allows for a much more focused comparison of the two distributions, since we can zero in on any particular part of the distribution. Finally, this approach is also supported by more theoretical considerations, which state that the equality of two distributions would not be guaranteed even if countably infinite number of moments of two distributions were the same (e.g., Gut, 2005, Theorems 5.9 and 6.2).[9]

5.1. Methodology

In this section we summarize the methodology we use in exploring the relationships between the cross-sectional return distribution quantiles and a set of risk factors. Knowing these relationships

[9] Equality in distributions and equality of countably infinite moments for the two distributions are equivalent under the condition of uniform integrability of the random variable in question.

would allow us to observe *how a particular quantile in the cross-sectional conditional return distribution responds to changes in the values of one or more of the conditioning factors.* Thus, unlike in the case with the conditional expectation function (i.e., exploration of how averages respond to changes in regressors - the approach that is usually undertaken in the literature and the one we discussed in the previous section), we can explore the whole distribution of conditional cross-sectional returns (conditional on factor exposures), which, in general, will be much more informative than just obtaining information about the conditional mean.

It is important to emphasize that we are not researching the return quantile responses to risk factors for individual funds, but rather for the whole cross-sectional (i.e., across all funds) return distribution. If we assume that the quantiles of the cross-sectional return distribution are linear in the risk factors, then the τth conditional quantile of the cross-sectional return distribution, $Q_\tau(r|X)$, is given by (see the Appendix for the derivation)

$$Q_\tau(r|X) \quad = \quad \alpha(\tau)_* + \beta(\tau)_*^{'}X, \tag{1}$$

where r refers to the cross-sectional total fund return, $\alpha(\tau)_*$ is the intercept of the τth return percentile of the cross-sectional return distribution, while the risk factor exposures, $\beta(\tau)_*$, give the risk factor exposures for τth return percentile of the cross-sectional return distribution. We use the three Fama-French risk factors (Fama and French, 1993) plus the momentum factor (Carhart, 1997) to represent the systematic risk, X, in the above model.

We estimate and compare the intercepts and risk factor exposures in Equation 1 for SRI and non-SRI funds in the overall domestic equity asset class as well as in large cap equity sub-group. We carry out bootstrap hypothesis tests for the intercept and slope coefficient equality in Equation 1 across SRI and non-SRI funds.

5.2. Results

In the previous section we compared the cross-sectional *average* performance of SRI and non-SRI funds across various dimensions and concluded that there do not exist economically and statistically significant differences, which confirms previous results from numerous existing studies. However, this differential changes drastically if we compare SRI and non-SRI funds at other cross-sectional quantiles. In the sections that follow we present results of SRI relative to non-SRI performance comparisons at various cross-section quantiles.

5.2.1. Cross-sectional SRI/non-SRI Differences in Total Returns

We start out by comparing the total net return of SRI and non-SRI funds. Figures 1 and 2 give values for cumulative log returns for SRI and non-SRI funds at various cross-sectional quantiles. Notice that the total return distribution of SRI and non-SRI funds are markedly different for domestic equity and large cap equity (Figures 1 and 2) – the SRI distribution of total returns is "shrunken" compared to the non-SRI distribution. That is, *the total cross-sectional return for quantiles above the median is lower for SRI compared to non-SRI, while the relationship reverses for quantiles below the median.* These differences are economically very significant and persistent through time. As far as we are aware, this is the first time that this effect has been documented in the literature.

We hypothesize that the source of these differences is the limited universe of stocks – and the characteristic homogeneity within that universe – that the SRI funds can invest in, compared to the universe of stocks available to the non-SRI funds. Thus, while there are stocks that are not available to SRI funds that provide larger upside performance to the non-SRI funds, SRI funds benefit from not having access to stocks that are responsible for large losses in non-SRI fund portfolios. In the following sections we add detail to this finding by analyzing differences in SRI and non-SRI fund risk-adjusted performance and risk exposures.

5.2.2. Cross-sectional SRI/non-SRI Differences in Alphas

As Figures 1 and 2 demonstrate, there is a sizeable and systematic difference in SRI and non-SRI total return tail quantiles. In this section we use Fama-French four-factor models in quantile regression framework to separate the value of a total return quantile into the part attributable to risk exposure (market, size, value, and momentum) and the remainder ("alpha"). We carry out the analysis separately for domestic equity and large cap funds. The results are given in Tables 5 and 6.

The following are the salient points of analysis. First, there are economically large and statistically significant difference in the sizes of the quantile regression factor model intercepts ("alpha") for domestic equity and large cap mutual funds (see Figures 3 and 4 and Tables 5 and 6). These differences mimic the results for the total returns in that the alphas for the lower deciles are higher for SRI than non-SRI funds, while the relationship reverses for the higher deciles. For example, as Table 6 and Figure 4 demonstrate, the monthly alpha for the lowest decile in the large cap mutual funds space is -2.02 percent for non-SRI funds, while it is equal to -1.6 percent for SRI funds across the time period 1999/01 to 2013/06. The 0.43 percent monthly (about 5.16 percent annualized) outperformance of the SRI over non-SRI funds is both economically and statistically significant. On the other hand, SRI funds tend to underperform non-SRI funds at the higher deciles. For example, as Table 5 shows, in the domestic equity category, SRI funds underperform non-SRI funds by about 0.42 percent per month (2.10 percent for SRI relative to 2.52 for non-SRI funds) at the 90th percentile, which equals about 5.04 percent per year. As our hypothesis test results in Tables 5 and 6 indicate, the differences in alphas are strongly statistically significant, except for the quantiles around the median. Insofar as the average performance is close to the median performance, this helps explain the existing results in the literature that identify no significant difference in the performance of the SRI and non-SRI funds *at the mean*, while failing to see the divergence of performance in the tails of the distribution that our research points out.

The results in Tables 5 and 6 represent quantile regression estimates for the time period of 1999/01 to 2013/06. We carried out identical analysis for the sub-periods of 1999/01 to 2013/06, each equal to two years in length, and Figures 1 and 2 present the results.[10] What the results demonstrate is that the *differences* between the SRI and non-SRI fund quantile regression factor model intercepts have been steadily decreasing through time, while remaining very sizeable and strongly statistically significant. This behavior again seems to lend confirmation to our earlier hypothesis that the source of these performance differences is the relatively smaller and perhaps more homogeneous SRI stock universe. As as Table 1 indicates, the universe of SRI type of stocks has grown sizeably from 1999 to 2013.

Second, there are sizeable differences in the quantile regression factor model intercepts across bull and bear markets.[11] The bull and bear market behavior of SRI relative to non-SRI funds is depicted in Figure 5 as well as in Table 7. The results illustrate that the quantile regression factor model intercept differences in the SRI and non-SRI funds are much more pronounced for the below-median quantiles during bear markets than bull markets. For example, Table 7 shows that the

[10] We also carried out the statistical significance tests across the time periods, and they are largely identical to the whole time period results.

[11] We used Russell 3000 high- and low-water marks to break the 1999/01-2013/06 period in the following broad bull and bear markets. Bull markets: 01/1999 – 08/2000 & 03/2003 – 10/2007 & 03/2009 – 06/2013; bear markets: 09/2000 – 02/2003 & 11/2007 – 02/2009.

difference between the SRI and non-SRI alpha for large cap mutual funds at the first quantile is a very economically and statistically significant 0.66 percent monthly (about 7.92 percent annualized) during bear markets, while it is substantially lower, but nevertheless still economically and statistically significant, 0.33 percent monthly (about 3.96 percent annualized) for bull markets.[12] In other words, for the deciles below the median, SRI alpha is much higher than non-SRI alpha, and this difference is much more pronounced during bear markets than during bull markets. Interestingly, while SRI funds do underperform non-SRI funds for above-the-median percentiles (see Figure 5 and Table 7) for both bull and bear markets, the differences in these underperformances are economically much less discernable across bull and bear markets.

Practically what this means is that SRI funds tend to outperform non-SRI funds for below-the-median outcomes, and this outperformance is especially strong during bear markets. The above result gives a lot more context to the result in Nofsinger and Varma (2014), where the authors look at the performance of SRI and non-SRI funds in bull and bear markets through the much more restrictive linear conditional expectation function (estimated via OLS) lens (i.e., comparisons of SRI and non-SRI performance at the conditional *mean*, rather than across various deciles).

Third, the results demonstrate differences not only in the cross-sectional quantiles of total returns and quantile regression factor model intercepts, but also in the risk exposures of the Fama-French four-factor models. Figure 6 demonstrates that there are persistent differences in the market exposures between SRI and non-SRI funds, with SRI funds having lower market exposure compared to non-SRI funds.[13] These differences are especially pronounced for domestic equity funds and for large cap equity funds at the lower quantiles. As Tables 5 and 6 show, these differences are also statistically significant, especially for the tail deciles. In addition, Figure 9 shows that there are statistically significant sustained differences in momentum risk factor exposure. We noted earlier that this result was noticeable also at the cross-sectional averages (see Table 4). Finally, Figures 7 through 9 give a graphical representation of differences in the value and size factors, and while there are certain differences, they are neither sustained nor statistically significant across the mutual funds that we study.

5.2.3. SRI/non-SRI Fund Holdings

In this section we analyze the universe of investments in which SRI and non-SRI funds invest. We established in earlier sections that the SRI fund cross-sectional distribution has thinner tails than the non-SRI distribution (both for total returns as well as risk-adjusted returns), and that this difference in distributions is more pronounced during bear markets, compared to bull markets. We hypothesized earlier that at least part of the reason for these differences is due to differences in the universes of investments accessible to the SRI and non-SRI funds. In this section we analyze the return distributions of SRI and non-SRI fund holding universes to test this hypothesis.

We analyze the holdings of the SRI and non-SRI funds observed on June 30th, 2013. There are a total of 7,935 unique tickers in the combined SRI and non-SRI holdings. There are 56 unique tickers in which only SRI funds invest; there are 4,770 unique tickers in which only non-SRI funds invest, and there are 3,084 tickers in which both SRI and non-SRI funds invest. We call the union of uniquely SRI tickers and tickers in which both SRI and non-SRI funds invest "SRI holdings universe". Our definition of "non-SRI holdings universe" is the union of tickers in which only non-SRI funds invest and the tickers in which both SRI and non-SRI funds invest.

[12] Note that this difference is 0.43 percent per month for the overall period, as given in Table 6.

[13] If SRI and non-SRI funds had the same exposures, we would expect to see the differences between them be depicted as a horizontal line at zero across all the deciles.

The universes of SRI and non-SRI holdings are traded on 58 exchanges in 46 countries. Of the total ticker count, 5,753 are traded in the United States (2,994 on NASDAQ, 2,004 on NYSE, 365 on Pink OTC Markets, 208 on AMEX, 167 on NYSE ARCA, and 15 on OTC Bulletin Board). There is also a relatively large number of tickers that are traded outside the United States: 406 on Tokyo Stock Exchange, 270 on Toronto Stock Exchange, 259 on London Stock Exchange, and 174 on Hong Kong Stock Exchange. The number of tickers traded on the NASDAQ, NYSE, and AMEX in the SRI holdings universe is 1,442, 1,465, and 56, respectively, which constitutes about 94 percent of all the tickers in which SRI funds invest. The number of tickers traded on the NASDAQ, NYSE, and AMEX in the non-SRI holdings universe is 2,960, 1,969, and 206, respectively, which constitutes a significantly lower 65 percent of the overall number of tickers in which non-SRI funds invest. In other words, the incidence of non-SRI funds investing in stocks that do not trade on the main three US exchanges, or even in the US-based exchanges, is much higher than for the SRI fund holdings.

Next we look at the distributional differences of the total returns of the stocks in the SRI and non-SRI holdings universe. Since our inquiry into the differences about SRI and non-SRI holdings universes should account not only for the performance differences, if any, in the stocks of the two universes, but also for the relative sizes of these two universes, we incorporate market capitalization of individual stocks into our analysis. Specifically, for every month in the period of 1999/01 to 2013/06, we construct a market cap-weighted total return for the holdings in the SRI and non-SRI universes. We repeat this analysis for the bull and bear subperiods of this time period. The results are given in Table 8 (panel "Total return") and Figures 10 through 12, which contain the non-parametric density plots.

Figure 10 presents the rather significant differences in the total return distributions in the SRI and non-SRI holdings universes, and panel "Total returns" of Table 8 gives various statistics that describe the distributions in Figures 10 through 12. In particular, the tails of the non-SRI total return distribution are heavier than those of the SRI distribution on either side, with a much longer tail on the positive side. In other words, the bad return outcomes in the non-SRI holding universe are worse than those in the SRI universe, and the good return outcomes in the non-SRI universe are significantly better than those in the SRI universe. We also carry out a two-sample quantile test for equality of various quantiles (Kosorok, 1999) in the total return distributions of SRI and non-SRI holdings universes (see Appendix for the details of this test). We reject the null of equality for the 10th, 70th, 80th, and 90th quantiles, indicating the difference of the two distributions in the tails. The differences between the SRI and non-SRI quantiles are also economically significant. For example, the 10th quantile for the total return distribution of SRI holdings universe is 180 basis points per month higher than that for non-SRI holdings universe. The total returns for SRI and non-SRI holdings universes is exactly equal at the median, but the difference reverses by the 60th quantile with non-SRI holdings universe having a 70 basis point monthly advantage. At the 90th quantile the total return distribution of the non-SRI holdings universe is 210 basis points per month higher than that for SRI universe.

Interestingly, as demonstrated by the results in Table 8 (panel "Total returns") and Figures 11 and 12, the differences in the distributions of total returns of SRI and non-SRI holdings universes are significantly larger during bull periods than bear periods (for bear periods all the quantiles are statistically indistinguishable). This is opposite of the result that we obtained for the SRI and non-SRI funds in Table 7 and Figure 5, where we demonstrated that the total return and risk-adjusted return differences are larger between SRI and non-SRI funds during bear markets than during bull markets, especially for below-the-median quantiles. The fact that at the level of fund holdings the return differences seem to be stronger during bull markets rather than bear markets seem to suggest that SRI fund managers have risk controls in place that are absent for non-SRI fund managers, although further inquiry into this statement is required to establish its empirical validity.

The much more pronounced dispersion of the total returns for the stocks in the non-SRI holdings universe as compared to the SRI universe provides credible explanation to the greater dispersion of the total returns of the non-SRI funds when compared to SRI funds that we established in earlier sections (see Figures 1 and 2).

We next attempt to establish that there is larger dispersion of the risk-adjusted returns (Fama-French four-factor intercept) in the non-SRI holdings universe when compared to SRI holdings universe, because that would help us explain the results we established in earlier sections (see Tables 5 through 7 and Figures 3 through 5). To accomplish this, we carry out Fama-French four-factor model analysis of the stocks in SRI and non-SRI holdings universe. In particular, every month we estimate the Fama-French four-factor model using the last 12 months of data for the stocks that have at least 12 months of data available. For every month we form a market capitalization weighted average across all the estimated Fama-French alphas and risk (market, size, value, and momentum) exposures. We construct this average across all the SRI and non-SRI domestic equity mutual fund holdings, and construct these monthly series across time (1999/01-2013/06). Panels "FF4 alpha" through "FF4 MOM" in Table 8 give the results. We carry out the analysis for the overall time period (1999/01-2013/06) and its bull and bear subperiods.

In parallel to the SRI/non-SRI fund results and the results from the total return analysis of the respective SRI/non-SRI stock holdings universes, the distributions of risk-adjusted returns (Fama-French four-factor alphas) for the non-SRI holdings universe are more dispersed when compared to the SRI holdings universe. In other words, the SRI holdings universe alphas below the median are larger than those of non-SRI holdings universe alphas, with the result reversing for the above-the-median quantiles (see panel "FF4 alpha" in Table 8). We carry out a two-sample quantile test for equality of various quantiles (Kosorok, 1999) in these distributions and find that for almost all quantiles that we test these differences are statistically significant. The only two quantiles at which the distributions are not different are 30th and 40th quantiles. In addition, these differences appear to be economically significant. For example, the 10th quantile for the monthly non-SRI holdings universe is 60 basis points (about 720 basis points annually) lower than the corresponding SRI holdings universe quantile. Conversely, the 90th quantile for the monthly SRI holdings universe is 210 basis points (about 2,520 basis point annually) lower than the corresponding SRI holdings universe quantile. The larger differences for the above-the-median quantiles points to the right-skewed distribution of the risk-adjusted alphas for the non-SRI holdings universe, which parallels the result that we noted for the distributions of total returns of the holdings universes. Similarly to the total return results, the differences between the SRI and non-SRI holdings universes are observable for the bull sub-periods, but disappear for the bear sub-periods, which is the reverse of the results that we observe at the fund level. Again, a possible explanation for this is that the SRI funds have some type of risk controls in place that are lacking in non-SRI funds.

Panels "FF4 MKT" through "FF4 MOM" in Table 8 give results of risk exposure analysis for the SRI and non-SRI holdings universes. The most salient result in these tables is the relative homogeneity of risk exposures for the SRI holdings universe when compared to the non-SRI holdings universe. The dispersion of the risk exposures for the non-SRI holdings universe are much more pronounced (with the differences being strongly statistically significant) for off-from-the-median quantiles, compared to the SRI holdings universe. For example, over the whole time period, the risk exposure to market (market beta) ranges from 0.850 to 1.142 for 10th and 90th percentiles, respectively, in the SRI holdings universe. The corresponding values in the non-SRI holdings universe are -1.040 and 1.335. The same pattern holds for the other Fama-French risk factor exposures. This result complements the result on risk-adjusted returns implying that the stocks in the non-SRI holdings universe are more heterogeneous not only in their risk-adjusted returns, but also in their exposures to Fama-French risk factors.

Overall, the much more pronounced dispersion of the risk-adjusted returns for the stocks in the non-SRI holdings universe as compared to the SRI universe provides a credible explanation to the greater dispersion of the risk-adjusted returns of the non-SRI funds when compared to SRI funds that we established in earlier sections (see Tables 5 through 7 and Figures 3 through 5).

6. Conclusions

In this paper we have compared the cross-sectional performance (total return, risk-adjusted return, risk exposures, and their differences) of SRI and non-SRI mutual funds. Our approach diverges significantly from the usual approach of performance analysis, which focuses on comparing the performance of these two groups of funds at the unconditional or conditional mean. Instead, we focus on comparing the performance of SRI and non-SRI funds at the performance deciles away from mean and the median. We establish that there exist economically and statistically significant and persistent differences in the cross-sectional performance between SRI and non-SRI funds when comparisons are made at the quantiles away from the median. These differences increase dramatically deeper in the tails of these distributions.

Among our findings: first, we demonstrate that the cross-sectional total return distribution of SRI funds is markedly less extreme than that for the non-SRI funds. That is, below-the-median quantiles of the SRI fund total return distribution tend to be higher than those for the non-SRI funds, with this relationship reversing for above-the-median quantiles. This relationship is persistent through time.

Second, similarly to the results for the total returns, we establish that the cross-sectional distribution of risk-adjusted returns for SRI funds also tend to be more "shrunken" towards the median when compared to non-SRI funds. These differences are economically as well as statistically significant and are much more pronounced during bear markets than bull markets, which provides a much richer context for recently published results identifying these bull/bear market differences of SRI/non-SRI risk-adjusted returns at the mean of the distribution (Nofsinger and Varma, 2014).

Finally, we investigate the potential sources of the total return and risk-adjusted return differences between SRI and non-SRI funds by focusing on the respective universes of stocks in which they invest. We find strong suggestive evidence, which is economically and statistically significant, that the total return and risk-adjusted return distributions of the SRI and non-SRI fund holdings are different, with the SRI stock holdings having a distribution with thinner tails, compared to the distribution of the non-SRI holdings. In addition, the distributions of the Fama-French risk factor exposures are much less dispersed for the SRI holdings universe, which means that the SRI holdings universe is more homogeneous not only from the point of view of total and risk-adjusted returns, but also from the point of view of its risk exposures.

7. Appendix

7.1. Quantile Regressions: Estimation and Hypothesis Tests

In this section we describe the methodology we use to explore the performance behavior of SRI relative to non-SRI funds at various cross-sectional percentiles. We start out by reviewing the quantile regression concept, which is the main tool used in this paper and then move on to the panel data and fixed effects model concepts. We then focus on the estimation of quantile regressions for panel data set-ups as well as the restrictions that we impose on this framework to adapt it for our purposes. Finally, we talk about the hypothesis tests that we carry out to test the differences between SRI and non-SRI quantile regression results.

7.1.1. Quantile Regressions

Quantile regressions[14] estimate linear conditional quantile functions and therefore can be viewed as an extension to the ordinary least squares (OLS) framework, where we estimate linear conditional expectation functions. A linear conditional quantile function gives a linear relationship between a particular conditional quantile of the dependent variable (here funds' returns) and the set of conditioning variables (here the risk factors).

Suppose that we are interested in estimating the linear conditional expectation function between fund's returns and a set of risk factors. Knowing this relationship would allow us to answer questions about *how a particular fund's conditional mean return responds to changes in the values of one or more of the conditioning factors.* Let's denote the conditional expectation function by $\mu(X, \alpha^*, \beta^*) \equiv E(r|X)$, where $E(\cdot)$ denotes the expectation operator. Then the linearity assumption for the conditional expectation function implies that

$$E(r|X) \quad = \quad \alpha^* + \beta^{*'} X,$$

where $r \in \Re$ and $X \in \Re^p$ represent the random variables whose sample values we observe, and α^* and $\beta^{*'}$ represent the population values of the intercept and slope, respectively. Suppose we observe a sample of returns $r_1, \ldots, r_T$, $r_t \in \Re$ and values for vectors of factors, $X_1, \ldots, X_T$, $X_t \in \Re^p$ as realizations for the random variables r and X. Then a statistically consistent estimate of the conditional expectation function $\mu(\cdot, \alpha^*, \beta^*)$ is given by the following estimator:

$$\hat{\mu}\left(x, \hat{\alpha}, \hat{\beta}\right) \quad = \quad \hat{\alpha} + \hat{\beta}' x,$$

where the values $\hat{\alpha}$ and $\hat{\beta}$ are obtained by solving the following minimization problem:[15]:

$$\{\hat{\alpha}, \hat{\beta}\} \quad = \quad \arg \min_{\alpha \in \Re, \beta \in \Re^p} \sum_{t=1}^{T} \left(r_t - \hat{\mu}(X_t, \alpha, \beta)\right)^2,$$

Thus, solving the above minimization function will produce an estimate of conditional mean function of r, conditional on the regressors X, under the assumption of linearity of conditional mean.

Now suppose that we are interested in estimating the linear conditional quantile function between fund's return and a set of risk factors. Knowing this relationship would allow us to observe *how a*

[14] See Koenker and Bassett (1978) and Koenker and Hallock F. (2000) for reviews of quantile regression methodology.
[15] This is the usual Ordinary Least Squares (OLS) framework

particular quantile of fund's conditional return responds to changes in the values of one or more of the conditioning factors. Thus, unlike in the case with the conditional expectation function, we can explore the whole distribution of fund's conditional return (conditional on factor exposures), which, in general, should be much more informative than just obtaining information about the conditional mean. Similarly to the conditional expectation case, let's denote the conditional quantile function by $\xi_\tau\left(X, \alpha_*(\tau), \beta_*(\tau)\right) \equiv Q_\tau(r|X)$, where $Q_\tau(\cdot)$ denotes the τth quantile operator. Then the linearity assumption for the conditional quantile function implies

$$Q_\tau(r|X) \quad = \quad \alpha(\tau)_* + \beta(\tau)_*^{'}X,$$

where $\alpha(\tau)_*$ and $\beta(\tau)_*^{'}$ represent the population values of the intercept and slope, respectively and the other values are defined above. Similarly to OLS framework, it turns out that a statistically consistent estimator of the conditional quantile function $\xi_\tau\left(\cdot, \alpha(\tau)_*, \beta(\tau)_*\right)$ is given by the estimator

$$\tilde{\xi}_\tau\left(x, \tilde{\alpha}(\tau), \tilde{\beta}(\tau)\right) \quad = \quad \tilde{\alpha}(\tau) + \tilde{\beta}(\tau)'x,$$

where the values $\tilde{\alpha}(\tau)$ and $\tilde{\beta}(\tau)$ are obtained by solving the following minimization problem (see Koenker and Bassett (1978)):

$$\{\tilde{\alpha}(\tau), \tilde{\beta}(\tau)\} \quad = \quad \arg\min_{\alpha\in\Re, \beta\in\Re^p} \sum_{t=1}^{T} \rho_\tau\left(r_t - \tilde{\xi}_\tau(X_t, \alpha, \beta)\right), \tag{2}$$

where $\rho_\tau(u) \equiv u \cdot (\tau - I(u < 0))$ is the tilted absolute value function, and $I(\cdot)$ is an identity function. The most well-known case of the above minimization problem is the estimation of the conditional median function (i.e., $\tau = 0.5$), in which case $\rho(\tau)(\cdot)$ becomes an absolute value function.

7.1.2. Panel Data and Fixed Effects Models

Since we have observations on multiple funds (i.e., observations cross-sectionally) through time, we are working in "panel data" set-up. Usually the return data in panel data format will be denoted as r_{it}, where i refers to the ith fund, and t refers to the tth time period. An important model for panel data is the "fixed effects" model, which in the cross-sectional fund context is specified in the following way:

$$r_{it} \quad = \quad \alpha_i + \beta_i' X_t + u_{it} \tag{3}$$

where α_i is the time-invariant and fund-specific fixed effect for fund i (i.e., fund's "alpha"); u_{it} is the random zero-mean error term that is generally assumed to be uncorrelated across time and cross-sectionally; β_i represents the vector of risk exposures for fund i; $X_t \in \Re^p$ represents the vector of risk factor values for time period t, which is assumed to be identical across all funds.

7.1.3. Quantile Regressions for Fixed Effects Models

In our research we want to focus on exploring the *return distribution differences for a cross-section of funds*, rather than focusing on comparing distributions of individual funds. In other words, we would like to understand how the return distribution of one group of funds (e.g., SRI funds) as a whole compares to another group (e.g., non-SRI funds).

This means that we need to apply the quantile regression approach to panel data set-up. Kato et al. (2010) show that the estimation framework for the fixed effects quantile regressions is similar to the simple quantile regressions (Equation 2), but it accounts for the analysis across multiple funds. Let's denote the conditional quantile function for the ith fund by $\xi_{\tau,i}(X, \alpha_{*,i}, \beta_*) \equiv Q_{\tau,i}(r|X)$, where $Q_{\tau,i}(\cdot)$ denotes the quantile operator. Then the linearity assumption for the conditional quantile function implies

$$Q_{\tau,i}(r|X) \quad = \quad \alpha(\tau)_{*,i} + \beta(\tau)_*^{'} X,$$

where $\alpha(\tau)_{*,i}$ and $\beta(\tau)_*^{'}$ represent the population values of the intercept for the ith fund and slope, respectively and the other values are defined above. Kato et al. (2010) show that a statistically consistent estimator of the conditional quantile function $\xi_{\tau,i}(\cdot, \alpha(\tau)_{*,i}, \beta(\tau)_*)$ is given by the estimator

$$\tilde{\xi}_{\tau,i}\left(x, \tilde{\alpha}(\tau)_i, \tilde{\beta}(\tau)\right) \quad = \quad \tilde{\alpha}(\tau)_i + \tilde{\beta}(\tau)' x,$$

where the values $\tilde{\alpha}(\tau)_i$ and $\tilde{\beta}(\tau)$ are obtained by solving the following minimization problem:

$$\{\tilde{\alpha}(\tau)_1, \ldots, \tilde{\alpha}(\tau)_n, \tilde{\beta}(\tau)\} \quad = \quad \arg \min_{\alpha \in \Re^n, \beta \in \Re^p} \frac{1}{nT} \sum_{i=1}^{n} \sum_{t=1}^{T} \rho_\tau \left(r_{it} - \tilde{\xi}_{\tau,i}(X_t, \alpha_i, \beta) \right), \qquad (4)$$

where n refers to the number of funds in the cross-section, $\alpha \equiv \{\alpha_1, \ldots, \alpha_n\}$, and the rest of the notation is the same as above. Note that using Kato et al. (2010) framework amounts to assuming that the risk factor exposures, β, are identical across funds. This suits us well, because, again, we are attempting to understand the return distribution of the cross-section of funds, rather than the individual funds themselves.

However, we need to make one modification to Kato et al. (2010) framework to adapt to our cross-sectional distribution exploration purposes: we need assume that the intercept, $\alpha(\tau)_{*,i}$ is identical across all the funds, i.e., $\alpha(\tau)_{*,i} = \alpha(\tau)_*$ for all i. With this change, $\alpha(\tau)_*$ now estimates the quantile regression factor model intercepts across all funds at the τth return percentile, while the risk factor exposures, $\beta(\tau)_*$, give the quantile regression factor model risk factor exposures across all funds at the τth return percentile.

Thus, the final model that we use to investigate the differences in the cross-sectional distributions of returns for SRI and non-SRI funds is specified as follows:

$$Q_\tau(r|X) \quad = \quad \alpha(\tau)_* + \beta(\tau)_*^{'} X, \qquad (5)$$

where r refers to the cross-sectional return across all funds, $\alpha(\tau)_*$ estimates the quantile regression factor model intercept across all funds at the τth return percentile, while the risk factor exposures, $\beta(\tau)_*$, give the quantile regression factor model risk factor exposures across all funds at the τth return percentile. Note that we have assumed that the conditional quantiles of these distributions are linear in the risk factors. We obtain estimates of the intercept and risk exposure values in equation 5 separately for SRI and non-SRI funds and then carry out hypothesis tests on their equality.

Up to now we have made no assumption about the true distribution of the data. In order to ensure the existence of asymptotic distribution of estimated coefficients, three more assumptions are necessary.

(A1) r_{it} is independent identical distributed (i.i.d.) cross-sectional given X_t.

Note that in our research equation 3 can be written as $u_{it} = r_{it} - \alpha - \beta^{'} X_t$, condition (A1) implies that u_{it} is i.i.d. across i given X_t.

(A2) Let F denote the CDF of u_{it}. F is continuous and has a strictly positive derivative f at $F^{-1}(\tau)$, for every quantile τ that we investigate in equation 5.

(A3) $\lim_{T \to \infty} X^{'} X = D$ exists and is a positive definite matrix.

7.1.4. Goodness-of-fit

We use a goodness-of-fit measure that is specific to quantile regressions (Koenker and Machado, 1999). This measure is derived from the familiar R-squared of classical OLS model. Notice that R-squared of OLS is given by

$$R^2 = 1 - \frac{SS_{ret}}{SS_{tot}}$$

where $SS_{ret} = \sum_i (y_i - \hat{y}_i)^2$ is the residual sum of squares, and $SS_{tot} = \sum_i (y_i - \bar{y}_i)^2$ is the total sum of squares. Under quantile regression setup, the analog to SS_{ret} and SS_{tot} are

$$\hat{V}(\tau) = \min_{\beta} \sum \rho_\tau (y_i - \beta' x_i)$$

and

$$\tilde{V}(\tau) = \min_{\alpha} \sum \rho_\tau (y_i - \alpha)$$

respectively. Thus, the goodness-of-fit measure is defined as

$$R^1(\tau) = 1 - \frac{\hat{V}(\tau)}{\tilde{V}(\tau)}.$$

Koenker and Machado (1999) point out that unlike R^2, which is regarded as a global measure of goodness-of-fit, $R^1(\tau)$ is a local measure of goodness-of-fit focusing on a particular quantile. On the other hand, R^2 measures the relative fitness of OLS model in terms of sum of residual squared, while $R^1(\tau)$ measures the relative success of the corresponding quantile regression model in terms of weighted sum of absolute residuals. Thus, $R^1(\tau)$ is usually less in scale than R^2, even if they are estimated from the same population and the results are about the same. In addition to the above two measures of goodness-of-fit, we employed the coefficient of multiple correlations, which is defined as the square of the Pearson correlation coefficient between the predicted and the actual values of the dependent variable.

7.1.5. Hypothesis Tests

To carry out the hypothesis tests for the equality of parameters $\tilde{\alpha}(\tau)$ and $\tilde{\beta}(\tau)$ for SRI and non-SRI funds, we introduce two sets of additional variables in the above quantile regression. First, we create a 0/1 indicator variable for the SRI funds that we add to the quantile regression. Second, we create interaction variables between the SRI indicator variable and all the risk factors, which we also add to the estimated quantile regression. Finally, with the above two sets of indicator variables added to the quantile regression (Equation 5), we pool the observations across all the funds (SRI and non-SRI) to carry out the estimation.

The coefficients on the SRI indicator variable and the interaction variables then will estimate the differences in the intercept and the risk exposures, respectively, across SRI and non-SRI funds. In addition, this framework allows us to carry out statistical hypothesis tests on the equality of the intercepts and the risk exposures across SRI and non-SRI funds by simply testing whether the coefficients on these variables are statistically equal to zero.

We carry out two types of these hypothesis tests: asymptotic and bootstrap. Koenker and Bassett (1978) show that under assumptions (A1) - (A3), the coefficients estimated by quantile regression converge in distribution to a Gaussian random vector with mean 0 and some covariance matrix vD^{-1}, i.e.

$$\sqrt{N}\left(\tilde{\beta}(\tau) - \beta_* - F^{-1}(\tau)\mathbf{e_1}\right) \xrightarrow{\mathcal{L}} N(0, vD^{-1}), \tag{6}$$

where $v = \frac{\tau(1-\tau)}{f^2(F^{-1}(\tau))}$, $\mathbf{e_1} = (1, 0, 0, \ldots, 0)$, $N = nT$, and F and D are defined in (A1) - (A3).

Equation 6 allow us to tell whether the coefficients are statistically equal to zero by a two-side test. However, we notice that condition (A1) implies the true β being a constant instead of a function of τ, and the distribution F is not directly obtained from data but estimated from OLS regression. To release these issues, we employ bootstrap as an alternative way to test the hypothesis. First, we resample fund returns along with risk factors, i.e. pair (y_{it}, X_{it}), with replacement. Second, we calculate the quantile regression coefficients with bootstrap sample. Finally, we repeat the process many times and calculate the bootstrap distribution of coefficients. To test the hypothesis that a particular coefficient is not statistically different from zero, we obtain its p-value from bootstrap distribution and compare it to the significance level.

7.1.6. Application of Cramér-Wold Theorem

In Table 7 we also compare the behavior of SRI vs non-SRI during bull and bear markets. As introduced above, we can estimate the coefficient difference between SRI and non-SRI funds during a single period, like bear or bull market, by adding an indicator variable and test the hypothesis through bootstrap distribution. However, there doesn't exist a simple regression equation allowing us to test the bear vs bull difference of SRI/non-SRI spread. Here we apply the Cramér-Wold theorem to accomplish this task.

Let $\tilde{\beta}_{N1}$ and $\tilde{\beta}_{N2}$ denote the SRI/non-SRI spread during bear and bull market respectively. Equation 6 shows they converge to the true coefficient, say β_{*1} and β_{*2}, as $N \to \infty$, where $N = nT$ represents the total number of data. The Cramér-Wold Theorem tells us that every fixed linear combination of $\tilde{\beta}_{N1}$ and $\tilde{\beta}_{N2}$ converges in distribution to the correspondent linear combination of β_{*1} and β_{*2}. In other words, we have

$$\sqrt{N}h^T(\tilde{\beta}(\tau) - \beta_*(\tau)) \xrightarrow{\mathcal{L}} N(0, h^T\Omega h) \tag{7}$$

where $h = (1, -1)^T$, $\tilde{\beta}(\tau) = (\tilde{\beta}_{N1}(\tau), \tilde{\beta}_{N2}(\tau))^T$ and $\beta_*(\tau) = (\beta_{*1}(\tau), \beta_{*2}(\tau))^T$. The variance matrix Ω can be written as

$$\Omega = \begin{pmatrix} \Omega_{11} & \Omega_{12} \\ \Omega_{21} & \Omega_{22} \end{pmatrix} \tag{8}$$

where Ω_{11} andΩ_{22} are determined by Equation 6. Ω_{12} andΩ_{21} represent the covariance matrix of the SRI/non-SRI spread during bear and bull market. To simplify the problem, one can assume there is no correlation between bear and bull period and replace the covariance with zeros. The p-values in Table 7 are obtained from bootstrap distribution, where we calculate $\tilde{\beta}_{N1}(\tau) - \tilde{\beta}_{N2}(\tau)$ from resampled data and repeat the process for many times.Since there is no overlap between bear and bull period, the bootstrap process automatically imposes the zero-covariance assumption.

7.1.7. Two-sample Quantile Tests

To statistically compare the quantiles of the total return distribution of SRI and non-SRI holdings, we use the approach by Kosorok (1999). We use this methodology to test the statistical equality of quantiles from two independent distributions.

Let y_{1t} and y_{2t} denote the observations from SRI and non-SRI distributions (e.g., total returns, risk-adjusted returns, or Fama-French risk exposures). To simplify the problem, we assume y_{1t} and y_{2t} are IID draws from distributions with cumulative distributions functions (CDF) G_1 and G_2, respectively. Kosorok (1999) shows that under certain conditions the difference between the τ^{th} empirical quantile of G_1 and G_2 is asymptotically a zero-mean Gaussian process. In other words, we have that

$$\sqrt{n}\left(\hat{G}_1^{-1}(\tau) - \hat{G}_2^{-1}(\tau)\right) \longrightarrow N\left(0, \frac{\hat{\phi}}{\hat{g}_1^2} + \frac{\hat{\gamma}}{\hat{g}_2^2}\right), \tag{9}$$

where n represents the sample size, and $\hat{g}_1$ and $\hat{g}_2$ are non-parametric kernel density estimators of probability density functions (PDFs) of G_1 and G_2. Under the assumption of no autocorrelation of y_{1t} and y_{2t}, one can prove that $\hat{\phi} = \hat{\gamma} = \tau(1-\tau)$. To carry out hypothesis tests, p-values are calculated based on the asymptotic distribution results.

7.2. Results: Tables & Graphs

Table 1: Number of mutual funds (SRI funds and total) (1980/01-2013/06) in Morningstar Direct database. The overall count includes dead and alive funds. Morningstar categories covered are Large Cap Core (LCC), Large Cap Growth (LCG), Large Cap Value (LCV), MidCap Core (MCC), MidCap Growth (MCG), MidCap Value (MCV), Small Cap Core (SCC), Small Cap Growth (SCG), Small Cap Value (SCV). Domestic equity (D.Eq.) consists of LCC, LCG, LCV, MCC, MCG, MCV, SCC, SCG, SCV Morningstar categories. International equity (Int'l eq.) consists of Diversified Emerging Markets, Foreign Large Blend, Foreign Large Growth, Foreign Large Value, Foreign Small/Mid Blend, Foreign Small/Mid Growth, Foreign Small/Mid Value, World Stock Morningstar categories. Domestic fixed income (Dom.fixed) consists of Intermediate Government, Intermediate-Term Bond, Long Government, Long-Term Bond, Short Government, Short-Term Bond Morningstar categories. Allocation (Alloc.) consists of Aggressive Allocation, Conservative Allocation, Moderate Allocation Morningstar categories.

	Total funds	# of SRIs	'80	'85	'90	'95	'99	'00	'05	'10	'11	'12	'13
D.Eq. (1)	3630	114	2	4	9	28	49	64	80	85	83	81	78
LCC	862	38	1	1	3	8	19	22	24	23	23	23	22
LCG	757	23	0	2	3	8	13	17	21	19	19	18	18
LCV	533	9	0	0	0	0	2	4	6	6	6	6	6
MCC	205	12	0	0	2	6	6	7	8	9	8	8	8
MCG	359	9	0	0	0	1	2	5	7	8	8	8	8
MCV	151	5	0	0	0	1	0	0	1	4	4	4	3
SCC	267	10	1	1	1	3	4	5	8	9	9	9	9
SCG	356	8	0	0	0	1	3	4	5	7	6	5	4
SCV	140	0	0	0	0	0	0	0	0	0	0	0	0
Int'l eq.	1045	33	0	1	2	5	9	10	12	30	30	29	26
Dom. fixed	1144	25	1	2	4	9	15	17	23	22	21	21	21
Alloc.	700	31	1	2	3	4	9	11	24	29	29	29	29
Total (SRIs) (2)		231	5	11	22	53	89	110	149	191	188	185	178
Total (all) (3)	9840		392	803	1848	3776	5214	5593	6219	6554	6275	5933	5645
(1)/(2)		0.49	0.40	0.36	0.41	0.53	0.55	0.58	0.54	0.45	0.44	0.44	0.44
(2)/(3)		0.02	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03	0.03	0.03	0.03

Table 2: Comparison of average non-performance dimensions for SRI and non-SRI mutual funds in Morningstar Direct database (1980/01-2013/06). Domestic equity consists of LCC, LCG, LCV, MCC, MCG, MCV, SCC, SCG, SCV Morningstar categories. Large Cap consists of LCC, LCG, LCV Morningstar categories. # of funds refers to the total number of funds included in these averages for this time period. This number is slightly smaller than in Table 1 because we impose a minimum data requirement of 36 months. The dimensions listed are expense ratio (Exp. ratio (%)), fund size (Fund Size (mil. $)), fund age (Fund Age (yrs.)), percentage of the portfolio in top ten holdings (% in top 10 hold.). The averaging is carried out across all the funds, regardless of the time period of the performance. Welch Test denotes Welch's t-test for the equality of two sample means with possibly unequal variances and unequal number of observations. Welch and Wilcoxon tests are carried out using asymptotic (asym.) and bootstrap (boot.) methods.

	Average		Welch Test			Wilcoxon Rank Test		
				p-value			p-value	
	SRI	non-SRI	t-stat.	asym.	boot.	t-stat.	asym.	boot.
			Domestic Equity					
# of funds	100	3025						
Exp. ratio (%)	1.25	1.36	-2.28	0.02	0.03	-1.46	0.15	0.18
Fund size (mil.$)	506.9	1,648.3	-6.86	0.00	0.00	-1.90	0.06	0.03
Fund age (yrs.)	10.26	10.05	0.52	0.61	0.62	0.43	0.67	0.92
% in top 10 hold.	28.94	29.84	-0.67	0.51	0.51	0.13	0.90	0.90
			Large Cap					
# of funds	59	1750						
Exp. ratio (%)	1.15	1.26	-2.10	0.04	0.04	-1.65	0.10	0.11
Fund size (mil.$)	660.5	2,149.8	-5.25	0.00	0.00	-1.14	0.25	0.47
Fund age (yrs.)	10.23	9.94	0.54	0.59	0.58	0.50	0.62	0.93
% in top 10 hold.	29.42	33.93	-3.04	0.00	0.00	-1.93	0.05	0.07

Table 3: Comparison of performance dimensions for domestic equity SRI and non-SRI mutual funds in Morningstar Direct database (1980/01-2013/06). Domestic equity consists of LCC, LCG, LCV, MCC, MCG, MCV, SCC, SCG, SCV Morningstar categories. # of funds refers to the total number of funds included in these averages for this time period. This number is slightly smaller than in Table 1 because we impose a minimum data requirement of 36 months. The performance dimensions listed are active return (Active Ret.), Capital Asset Pricing Model alpha (CAPM alpha), Fama-French four-factor (FF4) model alpha (FF4 alpha), returns-based style analysis alpha (RBSA alpha), average total return (Avg. TR), standard deviation of total return (Std. TR), tracking error (TE), information ratio (IR), market exposure in the Capital Asset Pricing Model (CAPM beta), coefficient of determination in CAPM (R2 CAPM), drawdown of the total return (Drawdown), upside capture (Up capt.), downside capture (Down capt.), and the capture ratio (Capt. Ratio). AR, IR, and TE are calculated with respect to the Morningstar category benchmark. CAPM, up/down capture and capture ratio are calculated with respect to Russell 3000. The list of RBSA benchmarks is as follows Russell 1000 Value, Russell 1000 Growth, Russell 2000 Value, Russell 2000 Growth, MSCI EM NR, MSCI EAFE Growth NR, MSCI EAFE Value NR, Citi Treasury Bill 3 Month. All the statistics are given on monthly basis – the frequency of return observations used to carry out the calculations. The averaging is carried out across all the funds, regardless of the time period of the performance. Welch Test denotes Welch's t-test for the equality of two sample means with possibly unequal variances and unequal number of observations. Welch and Wilcoxon tests are carried out using asymptotic (asym.) and bootstrap (boot.) methods.

	Average		Welch Test	p-value		Wilcoxon Rank Test	p-value	
	SRI	non-SRI	t-stat.	asym.	boot.	t-stat.	asym.	boot.
# of funds	100	3025						
	(in percent)							
Active Ret.	-0.07	-0.04	-1.59	0.12	0.12	-1.82	0.07	0.05
CAPM alpha	-0.03	-0.02	-0.91	0.37	0.39	-1.39	0.17	0.14
FF4 alpha	-0.08	-0.07	-0.27	0.79	0.77	-1.24	0.21	0.43
RBSA alpha	-0.08	-0.11	1.26	0.21	0.21	1.05	0.29	0.26
Avg. TR	0.48	0.45	0.70	0.48	0.48	-0.14	0.89	0.88
Std. TR	5.19	5.43	-2.55	0.01	0.01	-1.10	0.27	0.18
TE	1.80	2.06	-2.62	0.01	0.01	-2.74	0.01	0.01
	(in decimals)							
IR	-0.06	-0.03	-1.94	0.05	0.06	-2.21	0.03	0.06
CAPM beta	0.92	0.93	-1.51	0.13	0.14	-1.32	0.19	0.17
CAPM R2	0.88	0.86	1.79	0.08	0.09	2.21	0.03	0.08
Drawdown	0.50	0.51	-0.98	0.33	0.33	-1.63	0.10	0.14
Up capt.	0.91	0.93	-1.95	0.05	0.05	-1.49	0.13	0.15
Down capt.	0.96	0.97	-0.67	0.50	0.51	-0.29	0.77	0.75
Capt. Ratio	0.96	0.99	-1.55	0.12	0.13	-1.68	0.09	0.14

Table 4: Analysis of monthly SRI and non-SRI return series for domestic equity and large cap mutual funds in Morningstar Direct database for 1990/01-2013/06 and 2000/01-2013/06 time periods. Domestic equity consists of LCC, LCG, LCV, MCC, MCG, MCV, SCC, SCG, SCV Morningstar categories. Large Cap consists of LCC, LCG, LCV Morningstar categories. The dependent variable is a monthly return series, which constructed as an equal-weighted average of total return of all the available SRI/non-SRI funds at a particular month. The performance dimensions listed are average total return (Avg. (TR)), standard deviation of total return (Std. (TR)), returns-based style analysis alpha (RBSA alpha), Fama-French four-factor (FF4) model alpha (FF4 alpha), FF4 model market factor exposure (FF4 mkt), FF4 model size factor exposure (FF4 SMB), FF4 model value factor exposure (FF4 HML), FF4 model momentum factor exposure (FF4 MOM), and Sharpe ratio (Sharpe). The p-values are given for the following hypothesis tests: symmetric two-sided tests of coefficient equality for SRI and non-SRI quantile regressions. All the statistics are given on monthly basis – the frequency of return observations used to carry out the calculations.

	SRI	non-SRI	diff.	p-value	SRI	non-SRI	diff.	p-value
	Domestic Equity				Large Cap			
	Time period: 1990/01-2013/06							
	(in percent)							
Avg. (TR)	0.74	0.80	-0.05	0.11	0.71	0.73	-0.02	0.58
Std. (TR)	4.48	4.53	-0.04		4.37	4.23	0.14	
RBSA alpha	-0.11	-0.10	-0.01		-0.12	-0.12	0.00	
FF4 alpha	-0.10	-0.08	-0.02	0.47	-0.10	-0.08	-0.02	0.69
	(in decimals)							
FF4 mkt	0.97	0.98	-0.01	0.30	0.97	0.96	0.01	0.38
FF4 SMB	0.11	0.18	-0.07	0.00	-0.01	-0.04	0.03	0.03
FF4 HML	0.05	0.07	-0.01	0.14	0.03	0.05	-0.02	0.14
FF4 MOM	-0.03	0.00	-0.02	0.00	-0.03	-0.02	-0.02	0.03
Sharpe	0.10	0.12	-0.01		0.10	0.11	-0.01	
	Time period: 2000/01-2013/06							
	(in percent)							
Avg. (TR)	0.38	0.43	-0.05	0.198	0.28	0.30	-0.02	0.41
Std. (TR)	4.76	4.89	-0.13		4.58	4.54	0.04	
RBSA alpha	-0.11	-0.10	-0.01		-0.12	-0.12	0.00	
FF4 alpha	-0.06	-0.05	-0.01	0.43	-0.08	-0.06	-0.02	0.38
	(in decimals)							
FF4 mkt	0.99	1.00	-0.02	0.03	0.98	0.98	0.00	0.57
FF4 SMB	0.07	0.15	-0.08	0.00	-0.07	-0.07	0.00	0.73
FF4 HML	0.09	0.08	0.01	0.39	0.05	0.05	0.00	0.77
FF4 MOM	-0.02	0.00	-0.03	0.00	-0.03	-0.01	-0.02	0.00
Sharpe	0.04	0.05	-0.01		0.02	0.03	0.00	

Table 5: Quantile Fama-French four-factor regressions for SRI/non-SRI domestic equity mutual fund funds in Morningstar database (1999/01-2013/06). Domestic equity consists of LCC, LCG, LCV, MCC, MCG, MCV, SCC, SCG, SCV Morningstar categories. Minimum 36-month contiguous data availability restriction is imposed. The performance dimensions listed are Fama-French four-factor model (FF4) intercept (alpha), FF4 model market factor exposure (MKT), FF4 model size factor exposure (SMB), FF4 model value factor exposure (HML), FF4 model momentum factor exposure (MOM), Koenker's goodness-of-fit measure for quantile regressions (R2 (Koenker)), and coefficient of determination (R2 (corr.)). The last panel contains the p-values of the following hypothesis tests: symmetric two-sided tests of coefficient equality for SRI and non-SRI quantile regressions, where * and ** denote rejection of the null at the 5 and 1 percent significance level, respectively. All the statistics are given on monthly basis – the frequency of return observations used to carry out the calculations.

deciles	10^{th}	20^{th}	30^{th}	40^{th}	50^{th}	60^{th}	70^{th}	80^{th}	90^{th}
					SRI				
alpha (%)	-2.18	-1.28	-0.76	-0.40	-0.09	0.22	0.58	1.11	2.10
MKT	1.03	1.01	0.99	0.99	0.98	0.97	0.96	0.94	0.93
SMB	0.05	0.04	0.02	0.02	0.03	0.04	0.07	0.11	0.15
HML	0.13	0.08	0.07	0.05	0.05	0.05	0.06	0.08	0.09
MOM	0.00	0.00	0.00	-0.01	-0.01	-0.01	-0.02	-0.03	-0.04
R2 (Koenker)	0.62	0.64	0.65	0.64	0.63	0.62	0.60	0.57	0.53
R2 (corr.)	0.81	0.82	0.81	0.81	0.82	0.82	0.82	0.82	0.81
					non-SRI				
alpha (%)	-2.60	-1.51	-0.90	-0.45	-0.08	0.30	0.76	1.39	2.52
MKT	1.07	1.03	1.01	1.00	0.99	0.97	0.96	0.94	0.93
SMB	0.09	0.09	0.07	0.07	0.08	0.11	0.15	0.20	0.24
HML	0.12	0.09	0.08	0.07	0.07	0.08	0.09	0.11	0.13
MOM	0.02	0.02	0.02	0.01	0.01	0.00	0.00	-0.01	-0.02
R2 (Koenker)	0.57	0.59	0.59	0.59	0.58	0.56	0.54	0.52	0.47
R2 (corr.)	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76	0.76
					Differences (SRI minus non-SRI)				
alpha (%)	0.41	0.23	0.14	0.05	-0.01	-0.08	-0.18	-0.28	-0.43
MKT	-0.04	-0.02	-0.02	-0.01	-0.01	0.00	0.00	0.00	0.01
SMB	-0.04	-0.04	-0.05	-0.05	-0.05	-0.07	-0.08	-0.09	-0.09
HML	0.01	-0.01	-0.01	-0.01	-0.01	-0.03	-0.03	-0.02	-0.04
MOM	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
					Hypothesis tests				
alpha	0.00**	0.00**	0.00**	0.00**	0.51	0.00**	0.00**	0.00**	0.00**
MKT	0.00**	0.00**	0.00**	0.01*	0.19	0.47	0.68	0.67	0.64
SMB	0.02*	0.00**	0.00**	0.00**	0.00**	0.00**	0.00**	0.00**	0.00**
HML	0.30	0.31	0.34	0.11	0.07	0.00**	0.00**	0.02*	0.00**
MOM	0.00**	0.00**	0.00**	0.00**	0.00**	0.00**	0.00**	0.01*	0.06

Table 6: Quantile Fama-French four-factor regressions for SRI/non-SRI domestic large cap mutual fund funds in Morningstar database (1999/01-2013/06). Large cap consists of LCC, LCG, LCV Morningstar categories. Minimum 36-month contiguous data availability restriction is imposed. The performance dimensions listed are Fama-French four-factor (FF4) model intercept (alpha), FF4 model market factor exposure (MKT), FF4 model size factor exposure (SMB), FF4 model value factor exposure (HML), FF4 model momentum factor exposure (MOM), Koenker's goodness-of-fit measure for quantile regressions (R2 (Koenker)), and coefficient of determination (R2 (corr.)). The last panel contains the p-values of the following hypothesis tests: symmetric two-sided tests of coefficient equality for SRI and non-SRI quantile regressions, where * and ** denote rejection of the null at the 5 and 1 percent significance level, respectively. All the statistics are given on monthly basis – the frequency of return observations used to carry out the calculations.

deciles	10^{th}	20^{th}	30^{th}	40^{th}	50^{th}	60^{th}	70^{th}	80^{th}	90^{th}
					SRI				
alpha (%)	-1.60	-0.94	-0.58	-0.31	-0.09	0.13	0.41	0.79	1.48
MKT	1.00	1.00	0.98	0.98	0.98	0.97	0.96	0.95	0.94
SMB	-0.08	-0.08	-0.08	-0.08	-0.08	-0.07	-0.06	-0.06	-0.05
HML	0.06	0.04	0.04	0.04	0.04	0.04	0.05	0.06	0.05
MOM	0.00	-0.01	-0.01	-0.02	-0.02	-0.02	-0.03	-0.03	-0.04
R2 (Koenker)	0.70	0.72	0.72	0.72	0.71	0.70	0.69	0.67	0.63
R2 (corr.)	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88	0.88
					non-SRI				
alpha (%)	-2.02	-1.16	-0.68	-0.35	-0.09	0.17	0.52	1.01	1.91
MKT	1.02	1.00	0.99	0.98	0.98	0.97	0.95	0.94	0.91
SMB	-0.10	-0.09	-0.09	-0.09	-0.09	-0.08	-0.06	-0.05	-0.03
HML	0.07	0.06	0.05	0.05	0.04	0.05	0.06	0.07	0.08
MOM	0.01	0.01	0.00	0.00	-0.01	-0.01	-0.01	-0.02	-0.03
R2 (Koenker)	0.62	0.65	0.65	0.65	0.64	0.63	0.61	0.58	0.53
R2 (corr.)	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.81
					Differences (SRI minus non-SRI)				
alpha (%)	0.43	0.22	0.10	0.04	0.00	-0.04	-0.11	-0.22	-0.43
MKT	-0.02	0.00	-0.01	0.00	0.00	0.01	0.01	0.01	0.03
SMB	0.02	0.01	0.01	0.01	0.01	0.01	0.00	-0.01	-0.02
HML	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.03
MOM	-0.01	-0.02	-0.02	-0.01	-0.01	-0.01	-0.02	-0.02	-0.01
					Hypothesis tests				
alpha	0.00**	0.00**	0.00**	0.01**	0.78	0.00**	0.00**	0.00**	0.00**
MKT	0.03*	0.63	0.17	0.64	0.38	0.22	0.02*	0.02*	0.01*
SMB	0.14	0.59	0.16	0.50	0.42	0.33	0.99	0.37	0.32
HML	0.45	0.04*	0.26	0.13	0.27	0.04*	0.11	0.26	0.07
MOM	0.13	0.00**	0.00**	0.00**	0.00**	0.00**	0.00**	0.00**	0.41

Table 7: Differences in SRI and non-SRI intercepts in bull and bear markets for quantile Fama-French four-factor regressions for domestic equity and large cap mutual funds in Morningstar database (1999/01-2013/06). Domestic equity consists of LCC, LCG, LCV, MCC, MCG, MCV, SCC, SCG, SCV Morningstar categories. Large cap consists of LCC, LCG, LCV Morningstar categories. Minimum 36-month contiguous data availability restriction is imposed. Bull markets: 01/1999 – 08/2000 & 03/2003 – 10/2007 & 03/2009 – 06/2013; bear markets: 09/2000 – 02/2003 & 11/2007 – 02/2009. The performance dimensions listed are the differences between SRI and non-SRI intercepts (SRI minus non-SRI) during bear (Diff. (bear)) and bull (Diff. (bull)) periods as well as the difference (Delta) between the Diff. (bear) and Diff. (bull), which captures the size of SRI/non-SRI alpha differences across bull/bear time periods. P-values are given for the following hypothesis tests: symmetric two-sided tests of coefficient equality for SRI and non-SRI quantile regressions, where * and ** denote rejection of the null at the 5 and 1 percent significance level, respectively. All the statistics are given on monthly basis – the frequency of return observations used to carry out the calculations. Units are percentage points, except for the p-values.

deciles	10^{th}	20^{th}	30^{th}	40^{th}	50^{th}	60^{th}	70^{th}	80^{th}	90^{th}
					Domestic Equity				
Diff. (bear)	0.63	0.43	0.30	0.13	0.05	-0.05	-0.17	-0.24	-0.46
p-values	0.00**	0.00**	0.00**	0.00**	0.24	0.17	0.00**	0.00**	0.00**
Diff. (bull)	0.28	0.17	0.10	0.03	-0.01	-0.08	-0.18	-0.27	-0.39
p-values	0.00**	0.00**	0.00**	0.04*	0.64	0.00**	0.00**	0.00**	0.00**
Delta	0.35	0.26	0.20	0.10	0.06	0.04	0.01	0.03	-0.07
p-values (Delta)	0.00**	0.00**	0.00**	0.02*	0.24	0.43	0.76	0.51	0.61
					Large Cap				
Diff. (bear)	0.66	0.46	0.26	0.16	0.09	0.03	-0.09	-0.29	-0.50
p-values	0.00**	0.00**	0.00**	0.00**	0.03*	0.48	0.05	0.00**	0.00**
Diff. (bull)	0.33	0.15	0.06	0.02	-0.02	-0.05	-0.10	-0.19	-0.36
p-values	0.00**	0.00**	0.00**	0.14	0.15	0.00**	0.00**	0.00**	0.00**
Delta	0.33	0.31	0.20	0.14	0.11	0.07	0.01	-0.10	-0.14
p-values (Delta)	0.00**	0.00**	0.00**	0.00**	0.01*	0.07	0.87	0.09	0.17

Table 8: Statistics on the SRI and non-SRI domestic equity mutual fund holdings (1999/01-2013/06), across bull/bear markets and the overall time period. Bull markets: 01/1999 – 08/2000 & 03/2003 – 10/2007 & 03/2009 – 06/2013; bear markets: 09/2000 – 02/2003 & 11/2007 – 02/2009. Domestic equity consists of LCC, LCG, LCV, MCC, MCG, MCV, SCC, SCG, SCV Morningstar categories. "Total retun" panel: for every month we construct a market capitalization weighted return across all SRI and non-SRI domestic equity mutual fund holdings, and construct this monthly return series across time (1999/01-2013/06). The statistics reflect the distribution of these monthly return series. "FF4 alpha", "FF4 MKT", "FF4 SMB", "FF4 HML", "FF4 MOM" panels: for every month we estimate Fama-French 4-factor regression using last 12 months of data. For every month we form a market capitalization weighted average across all the estimated Fama-French alphas ("FF4 alpha"), market risk exposures ("FF4 MKT"), size risk exposures ("FF4 SMB"), value risk exposures ("FF4 HML"), and momentum risk exposures ("FF4 MOM"). We construct this average across all SRI and non-SRI domestic equity mutual fund holdings, and construct these monthly series across time (1999/01-2013/06). The statistics reflect the distribution of these monthly series. P-values ("P-val.") are given for the Kosorok (1999) test of two-sample equality of quantiles, where * and ** denote rejection of the null at the 5 and 1 percent significance level, respectively. All the statistics are given on monthly basis – the frequency of return observations used to carry out the calculations. Statistics are given in decimal format.

	Overall				Bull periods				Bear periods			
	SRI	non-SRI	Diffs	P-val.	SRI	non-SRI	Diffs	P-val.	SRI	non-SRI	Diffs	P-val.
Total return												
Mean	0.014	0.021	-0.007		0.023	0.031	-0.009		-0.013	-0.012	-0.002	
Std.dev.	0.046	0.076	-0.030		0.039	0.078	-0.039		0.055	0.059	-0.004	
Skewness	-0.217	1.460	-1.677		0.152	1.621	-1.469		0.116	0.042	0.074	
Kurtosis	3.434	9.674	-6.240		3.437	10.062	-6.625		2.702	2.638	0.064	
Min	-0.149	-0.172	0.024		-0.083	-0.172	0.089		-0.149	-0.160	0.011	
Max	0.142	0.433	-0.291		0.142	0.433	-0.291		0.107	0.114	-0.007	
Drawdown	0.400	0.427	-0.027		0.164	0.187	-0.023		0.503	0.445	0.059	
Quantiles:												
10th	-0.048	-0.066	0.018	0.040*	-0.022	-0.041	0.019	0.009**	-0.076	-0.077	0.000	0.957
20th	-0.020	-0.024	0.004	0.436	-0.014	-0.014	0.001	0.831	-0.063	-0.068	0.005	0.667
30th	-0.008	-0.013	0.005	0.301	0.004	-0.003	0.007	0.190	-0.049	-0.046	-0.003	0.765
40th	0.005	-0.002	0.007	0.122	0.014	0.009	0.006	0.296	-0.031	-0.028	-0.003	0.815
50th	0.016	0.016	0.000	0.964	0.023	0.023	0.000	0.968	-0.009	-0.018	0.009	0.454
60th	0.026	0.033	-0.007	0.195	0.031	0.039	-0.008	0.113	-0.001	-0.006	0.005	0.728
70th	0.039	0.050	-0.011	0.030*	0.041	0.052	-0.011	0.055	0.008	0.019	-0.011	0.428
80th	0.050	0.067	-0.017	0.002**	0.053	0.069	-0.016	0.010*	0.029	0.051	-0.022	0.123
90th	0.069	0.090	-0.021	0.002*	0.071	0.110	-0.039	0.001**	0.067	0.070	-0.003	0.819

Table 8: (continued)

	Overall				Bull periods				Bear periods			
	SRI	non-SRI	Diffs	P-val.	SRI	non-SRI	Diffs	P-val.	SRI	non-SRI	Diffs	P-val.
FF4 alpha												
Quantiles:												
10th	0.001	-0.004	0.006	0.000**	0.001	-0.005	0.006	0.000**	0.007	0.001	0.005	0.000**
20th	0.002	0.000	0.002	0.001**	0.002	-0.002	0.004	0.000**	0.007	0.005	0.002	0.009**
30th	0.003	0.003	0.000	0.786	0.002	0.001	0.001	0.137	0.008	0.007	0.001	0.170
40th	0.004	0.004	-0.001	0.377	0.003	0.003	0.000	0.546	0.008	0.008	0.000	0.656
50th	0.004	0.007	-0.003	0.000**	0.003	0.005	-0.002	0.034*	0.008	0.009	-0.001	0.264
60th	0.006	0.009	-0.003	0.000**	0.004	0.008	-0.004	0.000**	0.009	0.011	-0.002	0.077
70th	0.007	0.011	-0.004	0.000**	0.004	0.011	-0.007	0.000**	0.010	0.012	-0.002	0.079
80th	0.008	0.015	-0.007	0.000**	0.006	0.017	-0.011	0.000**	0.012	0.013	-0.001	0.465
90th	0.012	0.033	-0.021	0.003**	0.008	0.052	-0.044	0.000**	0.018	0.018	0.000	0.988
FF4 MKT												
Quantiles:												
10th	0.850	-1.040	1.890	0.000**	0.924	-1.409	2.333	0.000**	0.728	0.689	0.039	0.344
20th	0.917	0.696	0.222	0.000**	0.961	0.653	0.308	0.000**	0.786	0.757	0.029	0.402
30th	0.944	0.828	0.115	0.000**	1.002	0.833	0.169	0.000**	0.831	0.822	0.010	0.742
40th	0.995	0.900	0.094	0.000**	1.028	0.986	0.042	0.213	0.880	0.867	0.013	0.627
50th	1.020	0.983	0.037	0.133	1.054	1.094	-0.039	0.130	0.906	0.886	0.019	0.471
60th	1.049	1.093	-0.044	0.050*	1.079	1.157	-0.078	0.001**	0.926	0.913	0.013	0.618
70th	1.080	1.160	-0.080	0.000**	1.091	1.189	-0.098	0.000**	0.957	0.938	0.019	0.465
80th	1.099	1.207	-0.108	0.000**	1.123	1.254	-0.130	0.000**	1.009	0.999	0.010	0.745
90th	1.142	1.335	-0.193	0.000**	1.168	1.391	-0.222	0.000**	1.024	1.107	-0.083	0.022*

Table 8: (continued)

	Overall				Bull periods				Bear periods			
	SRI	non-SRI	Diffs	P-val.	SRI	non-SRI	Diffs	P-val.	SRI	non-SRI	Diffs	P-val.
FF4 SMB												
Quantiles:												
10th	-0.292	-0.576	0.284	0.000**	-0.294	-0.647	0.353	0.000**	-0.246	-0.476	0.229	0.001**
20th	-0.202	-0.457	0.255	0.000**	-0.204	-0.476	0.272	0.000**	-0.186	-0.226	0.040	0.358
30th	-0.142	-0.355	0.213	0.000**	-0.159	-0.385	0.225	0.000**	-0.115	-0.148	0.032	0.282
40th	-0.094	-0.198	0.104	0.000**	-0.095	-0.245	0.150	0.000**	-0.085	-0.131	0.046	0.116
50th	-0.058	-0.109	0.051	0.057	-0.057	-0.123	0.066	0.116	-0.069	-0.104	0.036	0.205
60th	-0.025	-0.049	0.023	0.372	-0.024	-0.056	0.031	0.467	-0.027	-0.047	0.020	0.463
70th	0.010	0.045	-0.035	0.213	0.020	0.084	-0.064	0.204	0.005	-0.001	0.006	0.828
80th	0.042	0.155	-0.113	0.002**	0.048	0.470	-0.421	0.001**	0.012	0.044	-0.032	0.223
90th	0.085	0.948	-0.864	0.005**	0.105	2.011	-1.907	0.114	0.069	0.091	-0.021	0.444
FF4 HML												
Quantiles:												
10th	-0.225	-0.361	0.136	0.000**	-0.194	-0.325	0.130	0.000**	-0.365	-0.418	0.054	0.386
20th	-0.164	-0.270	0.106	0.000**	-0.146	-0.258	0.112	0.001**	-0.274	-0.324	0.050	0.393
30th	-0.108	-0.183	0.075	0.004**	-0.106	-0.182	0.077	0.024*	-0.156	-0.187	0.030	0.566
40th	-0.071	-0.103	0.032	0.242	-0.063	-0.056	-0.007	0.838	-0.090	-0.146	0.056	0.290
50th	-0.035	-0.020	-0.015	0.604	-0.031	0.026	-0.057	0.140	-0.070	-0.104	0.034	0.517
60th	0.019	0.103	-0.084	0.011*	0.019	0.153	-0.135	0.003**	0.054	-0.026	0.079	0.122
70th	0.082	0.197	-0.115	0.003**	0.074	0.335	-0.261	0.000**	0.107	0.016	0.091	0.071
80th	0.121	0.429	-0.308	0.000**	0.115	1.044	-0.929	0.003**	0.141	0.125	0.016	0.748
90th	0.187	1.839	-1.652	0.000**	0.185	2.307	-2.122	0.000**	0.188	0.222	-0.033	0.517

Table 8: (continued)

	Overall				Bull periods				Bear periods			
	SRI	non-SRI	Diffs	P-val.	SRI	non-SRI	Diffs	P-val.	SRI	non-SRI	Diffs	P-val.
FF4 MOM												
Quantiles:												
10th	-0.147	-1.259	1.113	0.000**	-0.162	-1.810	1.648	0.000**	-0.138	-0.171	0.033	0.290
20th	-0.102	-0.539	0.437	0.000**	-0.109	-0.703	0.595	0.000**	-0.100	-0.098	-0.002	0.952
30th	-0.076	-0.175	0.100	0.000**	-0.081	-0.275	0.194	0.000**	-0.062	-0.083	0.021	0.479
40th	-0.055	-0.133	0.078	0.000**	-0.060	-0.170	0.110	0.000**	-0.022	-0.035	0.013	0.653
50th	-0.021	-0.086	0.065	0.001**	-0.032	-0.127	0.095	0.001**	-0.001	0.014	-0.015	0.632
60th	-0.001	-0.020	0.019	0.360	-0.008	-0.067	0.058	0.035*	0.016	0.063	-0.047	0.127
70th	0.025	0.064	-0.039	0.108	0.021	0.001	0.020	0.503	0.027	0.141	-0.114	0.000**
80th	0.071	0.191	-0.119	0.001**	0.064	0.215	-0.150	0.025*	0.085	0.169	-0.084	0.008**
90th	0.187	0.494	-0.308	0.000**	0.188	0.660	-0.472	0.000**	0.180	0.241	-0.060	0.159

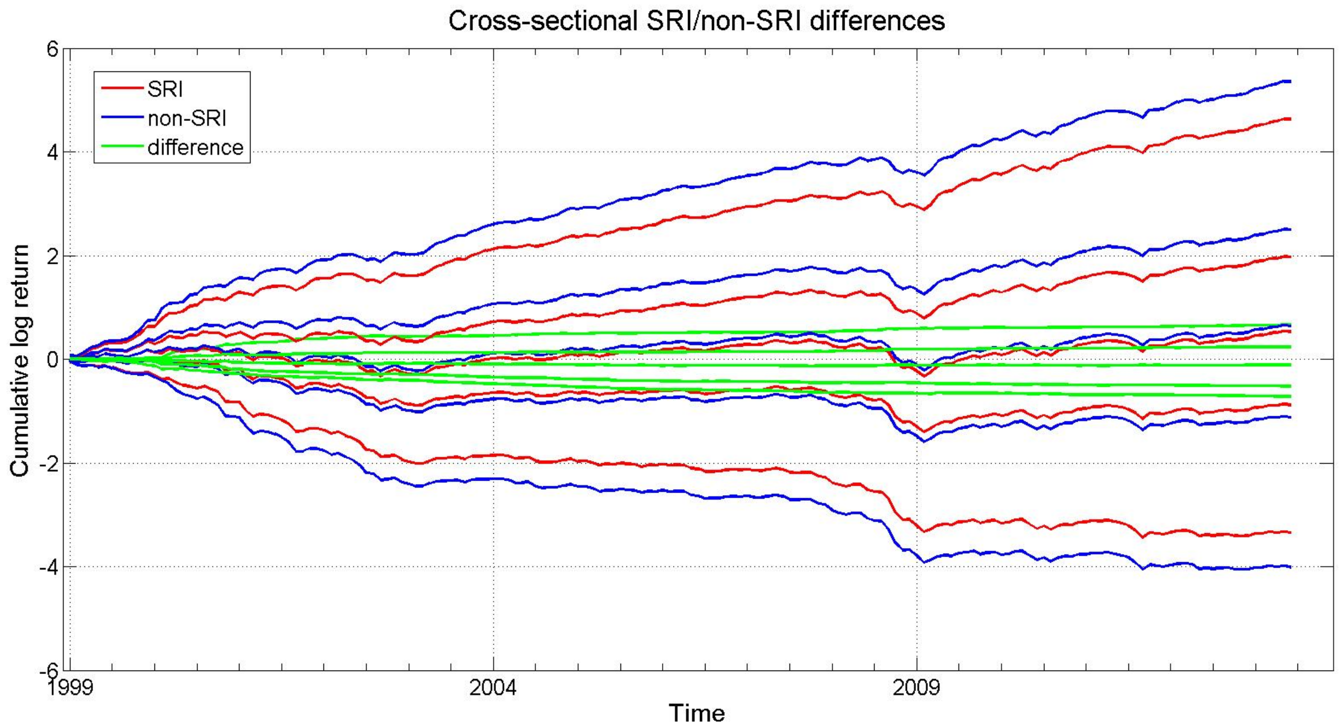

Figure 1: Cumulative total log return distribution for domestic equity mutual SRI and non-SRI mutual funds at various deciles (10th, 30th, 50th, 70th, 90th) in Morningstar Direct database (1999/01-2013/06). Domestic equity consists of LCC, LCG, LCV, MCC, MCG, MCV, SCC, SCG, SCV Morningstar categories. Each month we identify the universe of available funds, calculate the various deciles of this cross-sectional distribution of total returns, and use these decile values to calculate the cumulative return.

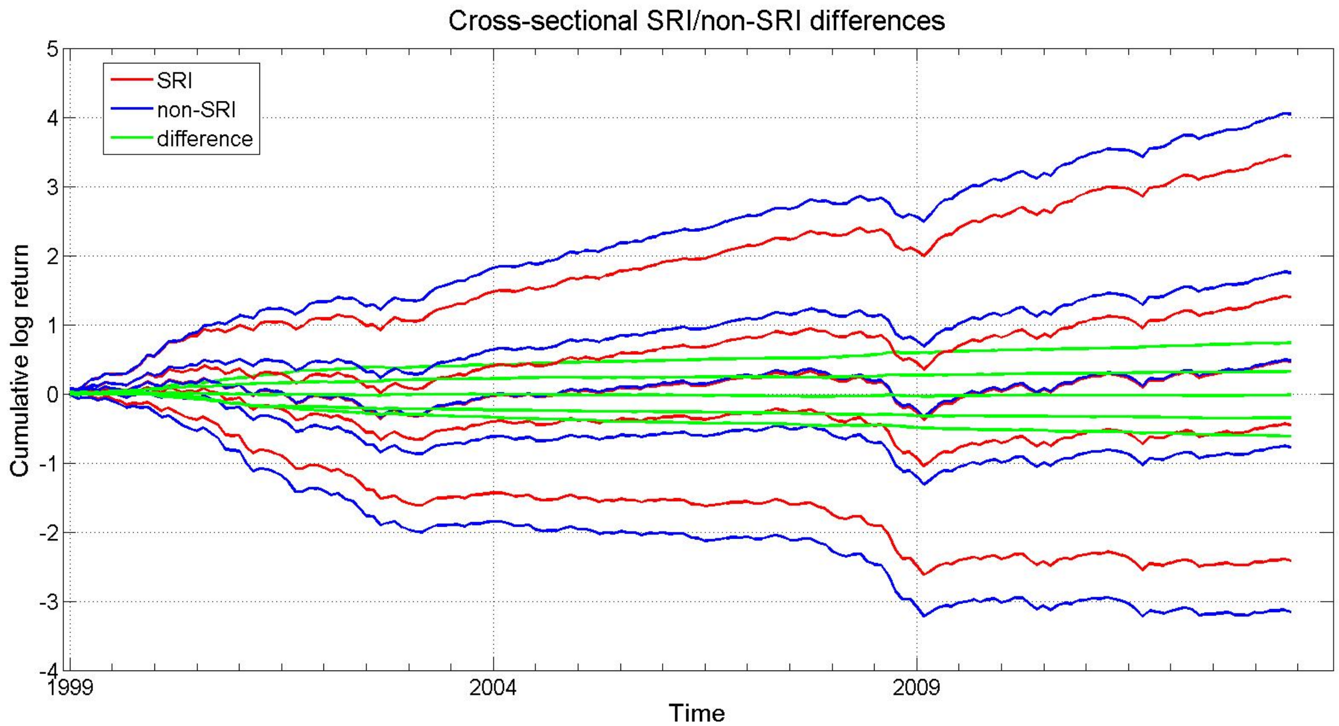

Figure 2: Cumulative total log return distribution for domestic large cap mutual SRI and non-SRI mutual funds at various deciles (10th, 30th, 50th, 70th, 90th) in Morningstar Direct database (1999/01-2013/06). Large Cap consists of LCC, LCG, LCV Morningstar categories. Each month we identify the universe of available funds, calculate the various deciles of this cross-sectional distribution of total returns, and use these decile values to calculate the cumulative return.

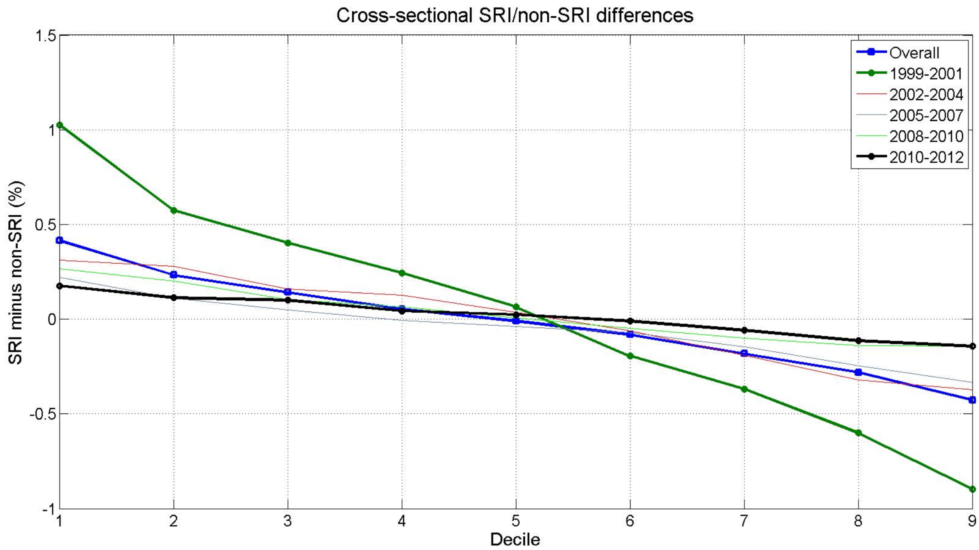

Figure 3: Differences in SRI and non-SRI fund alphas (SRI minus non-SRI) at various deciles for domestic equity mutual funds. Time period: 1999/01-2013/06 and various subperiods. Alphas are intercepts in the quantile Fama-French four-factor regressions for SRI/non-SRI domestic equity mutual funds in Morningstar database (1999/01-2013/06). Domestic equity consists of LCC, LCG, LCV, MCC, MCG, MCV, SCC, SCG, SCV Morningstar categories. Minimum 36-month contiguous data availability restriction is imposed. All the statistics are given on monthly basis – the frequency of return observations used to carry out the calculations. Units are percentage points.

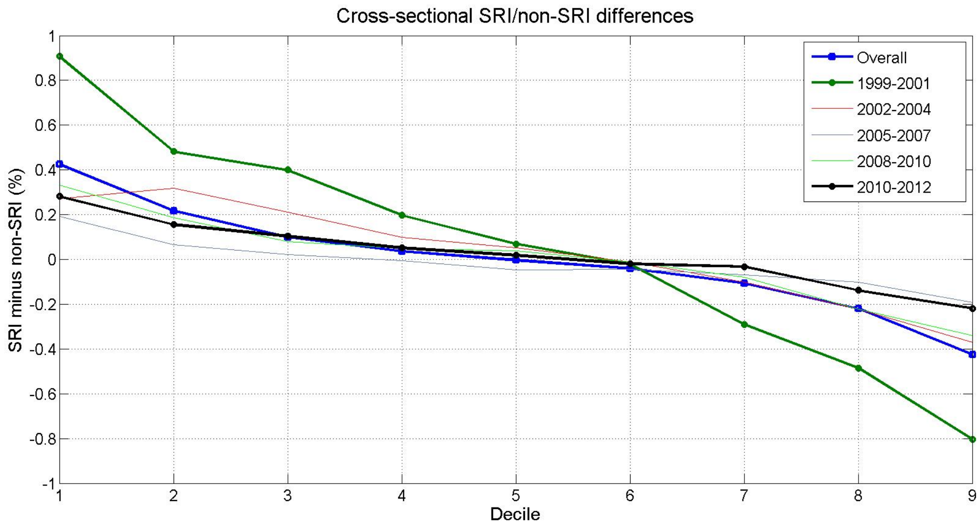

Figure 4: Differences in SRI and non-SRI fund alphas (SRI minus non-SRI) at various deciles for large cap equity mutual funds. Time period: 1999/01-2013/06 and various subperiods. Alphas are intercepts in the quantile Fama-French four-factor regressions for SRI/non-SRI domestic equity mutual fund funds in Morningstar database. Large Cap consists of LCC, LCG, LCV Morningstar categories. Minimum 36-month contiguous data availability restriction is imposed. All the statistics are given on monthly basis – the frequency of return observations used to carry out the calculations. Units are percentage points.

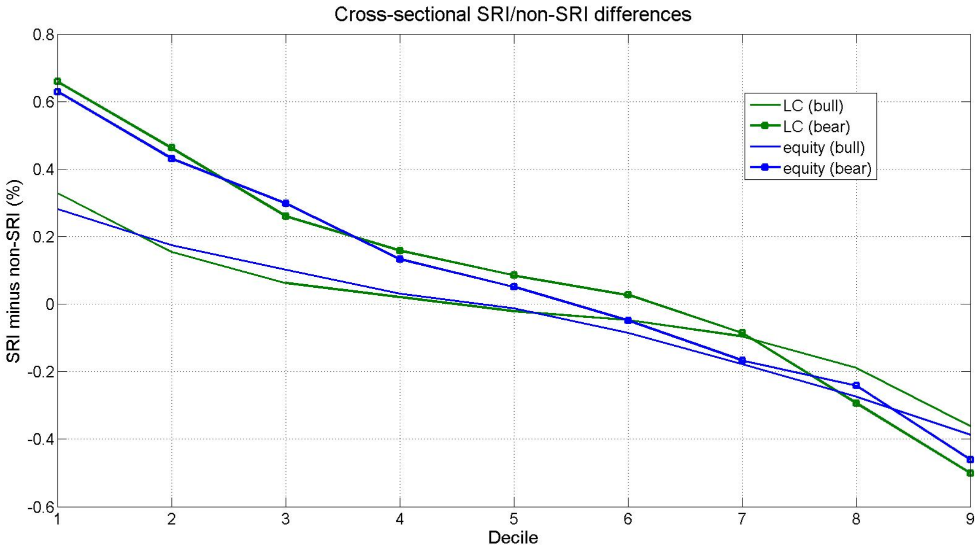

Figure 5: Differences in SRI and non-SRI fund alphas (SRI minus non-SRI) at various deciles for domestic equity and large cap mutual funds, across bull and bear markets (1999/01-2013/06). Bull markets: 01/1999 – 08/2000 & 03/2003 – 10/2007 & 03/2009 – 06/2013; bear markets: 09/2000 – 02/2003 & 11/2007 – 02/2009. Alphas are intercepts in the quantile Fama-French four-factor regressions for SRI/non-SRI domestic equity and large cap mutual funds in Morningstar database. Domestic equity consists of LCC, LCG, LCV, MCC, MCG, MCV, SCC, SCG, SCV Morningstar categories. Large Cap consists of LCC, LCG, LCV Morningstar categories. Minimum 36-month contiguous data availability restriction is imposed. All the statistics are given on monthly basis – the frequency of return observations used to carry out the calculations. Units are percentage points.

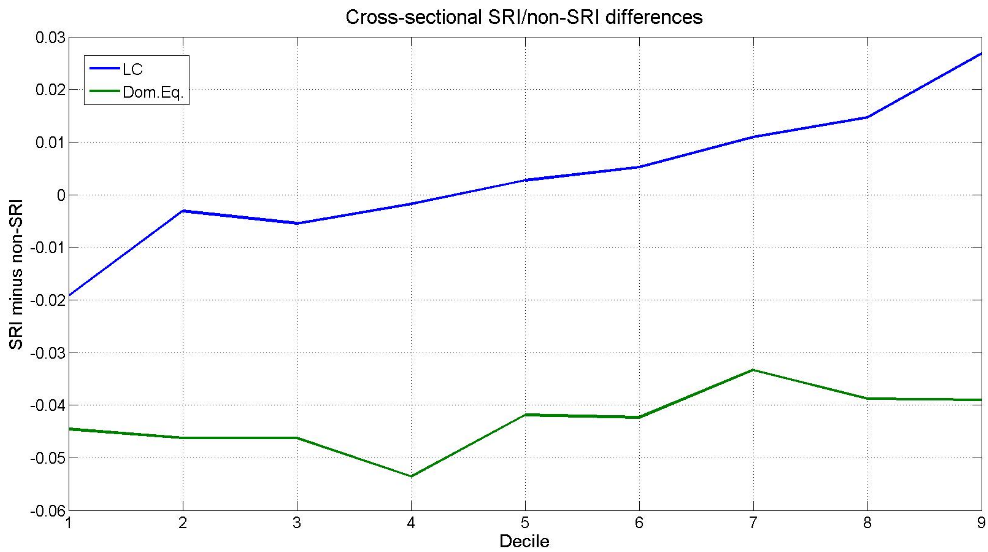

Figure 6: Differences in SRI and non-SRI fund market factor exposures (SRI minus non-SRI) at various deciles for domestic equity and large cap mutual funds (1999/01-2013/06). Market factor exposures are slope coefficients on the market factor in the quantile Fama-French four-factor regressions for SRI/non-SRI domestic equity and large cap mutual funds in Morningstar database. Domestic equity consists of LCC, LCG, LCV, MCC, MCG, MCV, SCC, SCG, SCV Morningstar categories. Large Cap consists of LCC, LCG, LCV Morningstar categories. Minimum 36-month contiguous data availability restriction is imposed. All the statistics are given on monthly basis – the frequency of return observations used to carry out the calculations.

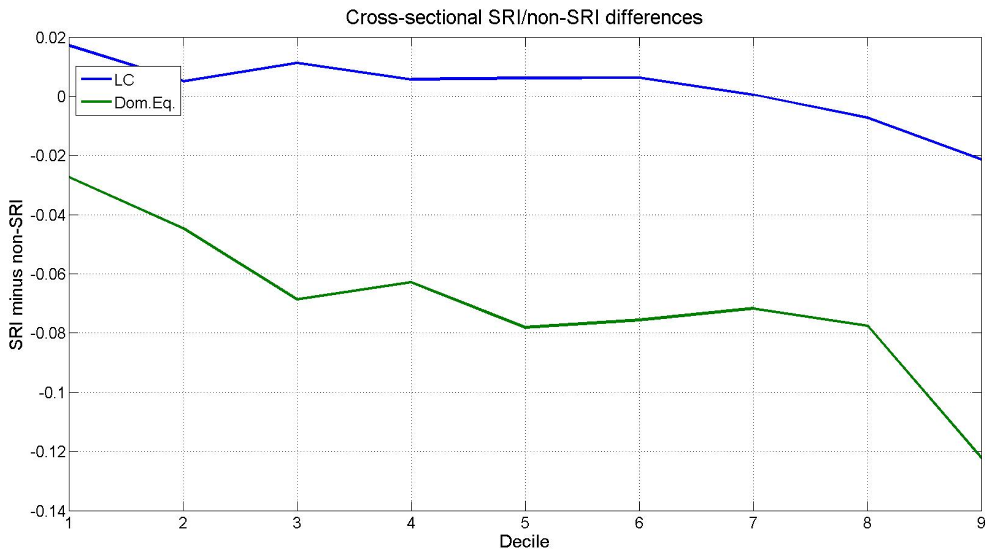

Figure 7: Differences in SRI and non-SRI fund size factor exposures (SRI minus non-SRI) at various deciles for domestic equity and large cap mutual funds (1999/01-2013/06). Size factor exposures are slope coefficients on the size factor in the quantile Fama-French four-factor regressions for SRI/non-SRI domestic equity and large cap mutual funds in Morningstar database. Domestic equity consists of LCC, LCG, LCV, MCC, MCG, MCV, SCC, SCG, SCV Morningstar categories. Large Cap consists of LCC, LCG, LCV Morningstar categories. Minimum 36-month contiguous data availability restriction is imposed. All the statistics are given on monthly basis – the frequency of return observations used to carry out the calculations.

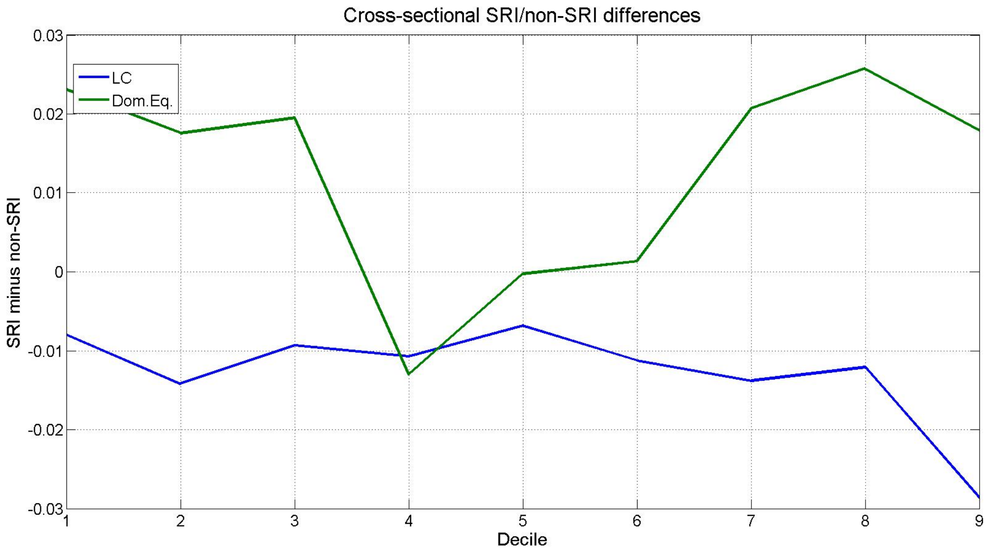

Figure 8: Differences in SRI and non-SRI fund value factor exposures (SRI minus non-SRI) at various deciles for domestic equity and large cap mutual funds (1999/01-2013/06). Value factor exposures are slope coefficients on the value factor in the quantile Fama-French four-factor regressions for SRI/non-SRI domestic equity and large cap mutual funds in Morningstar database. Domestic equity consists of LCC, LCG, LCV, MCC, MCG, MCV, SCC, SCG, SCV Morningstar categories. Large Cap consists of LCC, LCG, LCV Morningstar categories. Minimum 36-month contiguous data availability restriction is imposed. All the statistics are given on monthly basis – the frequency of return observations used to carry out the calculations.

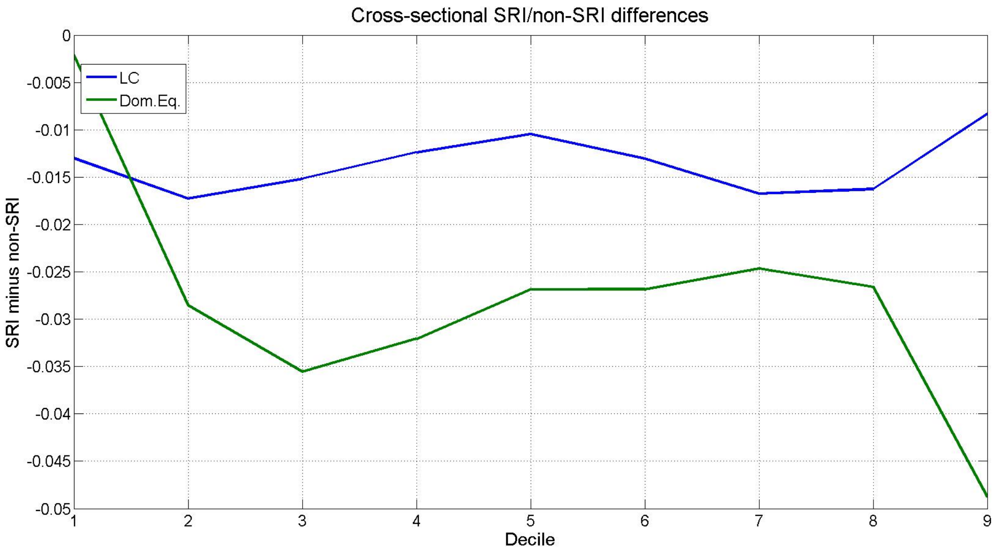

Figure 9: Differences in SRI and non-SRI fund momentum factor exposures (SRI minus non-SRI) at various deciles for domestic equity and large cap mutual funds (1999/01-2013/06). Momentum factor exposures are slope coefficients on the momentum factor in the quantile Fama-French four-factor regressions for SRI/non-SRI domestic equity and large cap mutual funds in Morningstar database. Domestic equity consists of LCC, LCG, LCV, MCC, MCG, MCV, SCC, SCG, SCV Morningstar categories. Large Cap consists of LCC, LCG, LCV Morningstar categories. Minimum 36-month contiguous data availability restriction is imposed. All the statistics are given on monthly basis – the frequency of return observations used to carry out the calculations.

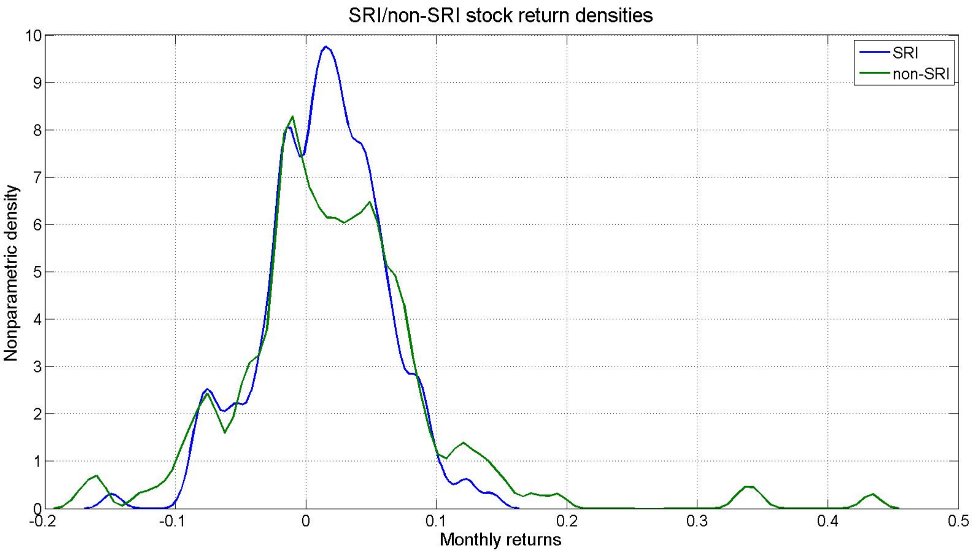

Figure 10: Nonparametric density plots of total returns of SRI and non-SRI domestic equity mutual fund holdings (1999/01-2013/06). Domestic equity consists of LCC, LCG, LCV, MCC, MCG, MCV, SCC, SCG, SCV Morningstar categories. For every month we construct a market capitalization weighted return across all SRI and non-SRI domestic equity mutual fund holdings, and construct this monthly return series across time (1999/01-2013/06). The density plots reflect the distribution of these monthly return series. All the statistics are given on monthly basis – the frequency of return observations used to carry out the calculations.

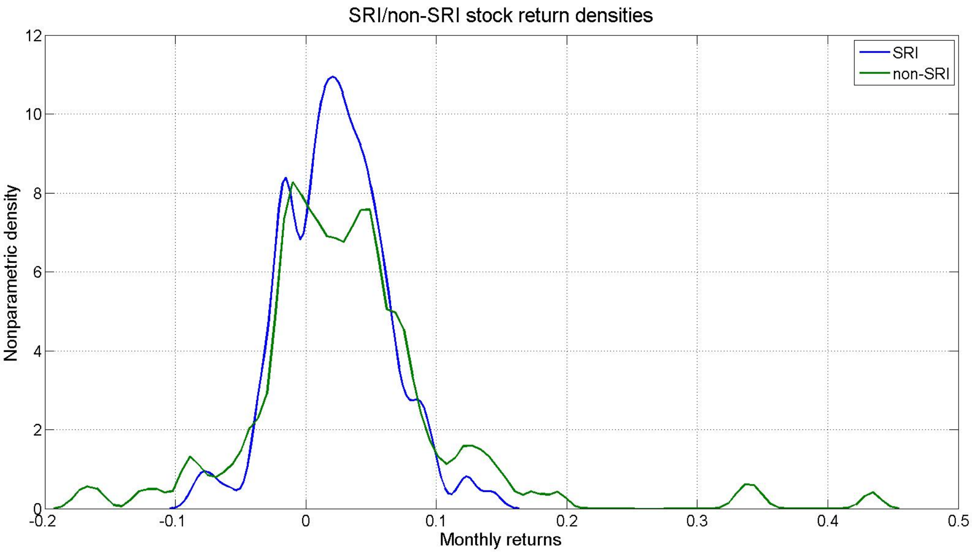

Figure 11: Nonparametric density plots of total returns of SRI and non-SRI domestic equity mutual fund holdings (1999/01-2013/06), across bull markets. Bull markets: 01/1999 – 08/2000 & 03/2003 – 10/2007 & 03/2009 – 06/2013; bear markets: 09/2000 – 02/2003 & 11/2007 – 02/2009. Domestic equity consists of LCC, LCG, LCV, MCC, MCG, MCV, SCC, SCG, SCV Morningstar categories. For every month we construct a market capitalization weighted return across all SRI and non-SRI domestic equity mutual fund holdings, and construct this monthly return series across time (1999/01-2013/06). The density plots reflect the distribution of these monthly return series. All the statistics are given on monthly basis – the frequency of return observations used to carry out the calculations.

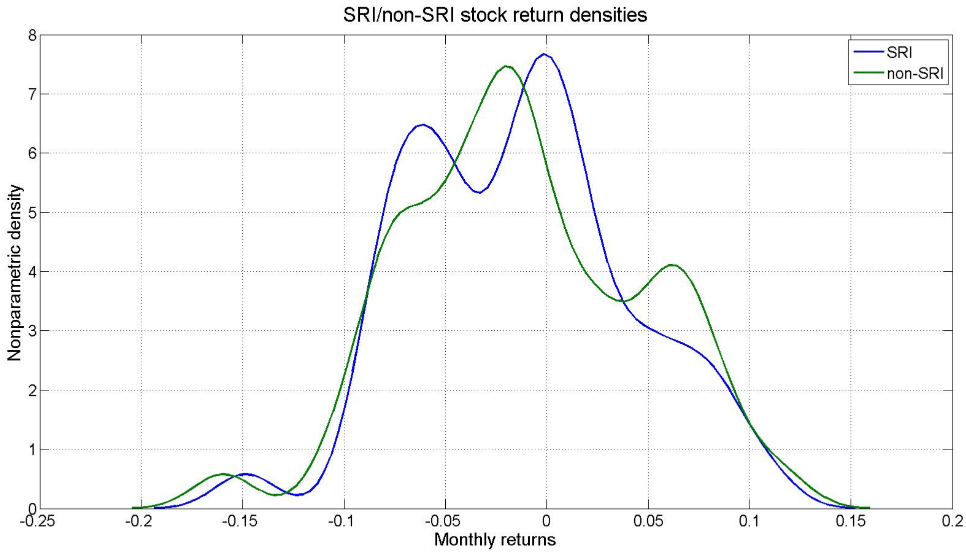

Figure 12: Nonparametric density plots of total returns of SRI and non-SRI domestic equity mutual fund holdings (1999/01-2013/06), across bear markets. Bull markets: 01/1999 – 08/2000 & 03/2003 – 10/2007 & 03/2009 – 06/2013; bear markets: 09/2000 – 02/2003 & 11/2007 – 02/2009. Domestic equity consists of LCC, LCG, LCV, MCC, MCG, MCV, SCC, SCG, SCV Morningstar categories. For every month we construct a market capitalization weighted return across all SRI and non-SRI domestic equity mutual fund holdings, and construct this monthly return series across time (1999/01-2013/06). The density plots reflect the distribution of these monthly return series. All the statistics are given on monthly basis – the frequency of return observations used to carry out the calculations.

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