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The Financial Performance of Socially Responsible Investments: Insights from the Intertemporal CAPM

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Abstract This study formulates a two-factor empirical model under the intertemporal CAPM framework to evaluate the cross-sectional implications of socially responsible investments in the US equity market. Our results show that socially responsible investments have no asset pricing impact on the US market. We argue that this 'no financial impact' finding indicates that investors will not be disadvantaged financially by investing in socially responsible funds or corporations.

Keywords Socially responsible investments · Intertemporal CAPM · Asset pricing · Economic tracking portfolios

Introduction

We formulate a two-factor empirical model under the intertemporal CAPM (ICAPM) framework to evaluate the cross-sectional implications of socially responsible investments in the US equity market.[1] We argue that if socially responsible investment (hereafter, SRI)[2] has a systematic financial impact on the US equity market, changes in the future aggregate amount of net assets of socially responsible funds (hereafter, NSF) should represent a state variable that affects investors' future opportunity sets, and, therefore, innovations of such a state variable should represent a priced Merton (1973) factor.

Broadly, we are motivated by recent evidence that SRI investment strategies are becoming increasingly popular and politically influential. For example, according to the US Social Investment Forum (US SIF 2014), approximately $6.57 trillion out of $36.8 trillion worth of assets in the US investment marketplace are under SRI portfolios and an increasing trend can be observed from 1995 to 2014.[3]

In the academic literature, there is much attention given to the relationship between corporate social performance (CSP) and corporate financial performance (CFP) (Sparkes and Cowton 2004; Mill 2006 and Renneboog et al. 2008a). From a theoretical perspective, there are two contrasting arguments: (1) the "cost-concern" argument, which proposes that CSP has a negative relationship with CFP and is based on modern portfolio theory and (2) the "value

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[1] The ICAPM is a linear factor model of wealth (the market factor) and state variables (economic variables) that can explain the cross-sectional variation of asset returns (Cochrane, 2005). Such a framework has been widely adopted throughout the literature in explaining asset returns under an intertemporal economy (e.g. Chen et al. (1986); Campbell (1996); Vassalou (2003); Hsu and Huang (2010); Kim et al. (2011) and Kang et al. (2011)).

[2] SRI is a long-term investment approach that integrates environmental, social and governance (hereafter, ESG) considerations into the investment "decision-making" process (US SIF 2014 and Eurosif 2014).

[3] http://www.ussif.org/Files/Publications/SIF_Trends_14.F.ES.pdf (date accessed, 24/9/15).

creation" argument, which argues a positive CSP–CFP relationship based on stakeholder theory.

The most prominent example of the cost-concern argument is developed by Friedman (1970, reprint from 1962) and is based on Markowitz's (1952) modern portfolio theory. Friedman (1970) contends that CSR practices are not consistent with the goal of maximizing shareholder wealth. Friedman's (1970) arguments are supported by numerous practitioners and regulators. From a practitioner's point of view, Walley and Whitehead (1994) argue that the costs of SRI greatly exceed its possible paybacks. Strategically and operationally, SRI may place risks on companies' core businesses and fundamentally change their cost structure.

Alternatively, a value creation argument based on stakeholder theory supports a positive relationship between CSR and CFP. Stakeholder theory (Freeman 1984) argues that corporations' long-term financial performance relies on their relationships with various stakeholders. The intuition is that stronger relationships between corporations and stakeholders lead to stronger financial performance. For example, Porter and Van der Linde (1995) argue that SRI could encourage development of new technologies once corporations are forced to employ their resources in a more cost-efficient way and would therefore lead to competitive advantages and long-term value creation.

However, as Renneboog et al. (2008a, p. 1735) note "…[t]he question as to whether SRI creates shareholder value is ultimately an empirical one". Unfortunately, the collective message delivered across the extensive empirical literature is mixed and inconclusive (Rathner 2013). See, for example, Hamilton et al. (1993); Statman (2000); Bauer et al. (2005); Derwall et al. (2005); Bauer et al. (2006); Mill (2006); Statman (2006); Hill et al. (2007); Bauer et al. (2007); Beurden and Gössling (2008); Galema et al. (2008); Lee and Faff (2009); Lee et al. (2009); Mercer (2009); Renneboog et al. (2011) and Borgers et al. (2015).

We argue that the inconclusive nature of this literature is largely due to the weakness/limitations of the empirical asset pricing models employed. Our proposed solution is the economic tracking portfolio method of Lamont (2001) to capture innovations in the SRI state variable and incorporate it into a two-factor empirical model under the ICAPM framework (i.e. the market factor and the economic tracking portfolio returns of the innovations of NSF).

Employing a sample of the US data over the period 1990 to 2013, our study applies the Fama and MacBeth (1973) approach[4] to examine the cross-sectional performance of the proposed two-factor model. Our results show that innovations of NSF have no detectable impact on the US stock market. Notably, this finding is robust to an alternative proxy for the state variable—changes in the future aggregate wealth of socially responsible companies (WSF).

As a benchmarking exercise, we also employ the performance evaluation techniques used in prior research on our sampled data to examine the financial impact of SRI. This analysis mimics the inconclusive nature of the extant literature—we see variation in the results depending on the asset pricing model employed and whether the analysis is run at the individual fund or portfolio level. In contrast, our investigation under the ICAPM approach provides consistent findings that are robust to alternative specifications of the SRI state variable and testing portfolios.

The remainder of this study is structured as follows. "Modelling Framework" section presents the modelling framework. "Empirical Framework" section outlines the research method and data. "Result" section reports the empirical results and robustness checking. "Summary and Conclusions" section concludes.

Modelling Framework

ICAPM

The intertemporal capital asset pricing model (ICAPM) of Merton (1973) provides an appealing solution to control for weaknesses inherent in the CAPM and Carhart (1997) models. The ICAPM framework centres on using both market beta and the innovations of state variables that forecast future investment opportunities to explain the cross-sectional variation of equity returns. The economic interpretation of the ICAPM is based on the assumption that investor opportunity sets change over time (Merton 1973; Petkova 2006). Specifically, if investment opportunities change over time and the associated uncertainties are not diversifiable, then asset's exposures to these changes will be important in explaining returns. Consequently, state variables that might induce time variation in the investment opportunity set are potentially important determinants. One can follow Campbell (1996), Vassalou (2003) and Petkova (2006) to establish an empirical asset pricing model for certain variables under such a framework. Within an ICAPM setting, we seek a proxy for state variables that forecast future investment opportunities.[5] None of the previous SRI studies embrace this approach.

Following Petkova (2006), we assume that asset returns are determined by the discrete-time version of the ICAPM of Merton (1973). Specifically, if investment opportunities

[4] This approach is widely adopted in the asset pricing literature. See, for example, Fama and French (1992); Lettau and Ludvigson (2001) and Fama (2014).

[5] Examples of such variables are the aggregate dividend yield, term spread, default spread and short-term T-bill (Petkova 2006) and future GDP growth (Vassalou 2003).

change over time, then, in addition to market beta, assets' exposures to these changes will be important in explaining cross-sectional variation in returns. Recently, approximately 18 % of assets under professional management in the US investment marketplace (i.e. $6.57 trillion out of $36.8 trillion) reside in SRI portfolios (US SIF 2014). If SRI has a financial impact on the US equity market and given the considerable weight of assets under SRI portfolios, changes in investment opportunities for these assets are a likely candidate to proxy for an ICAPM state variable.

Consistent with the discussion in the introduction, the financial impacts of SRI revolve around the net effects of its costs and benefits, and this neatly dovetails into the ICAPM framework as follows. It is quite plausible that the costs and benefits of SRI are realized in different states or time horizons. Specifically, the costs tend to be immediate and can be estimated reliably, while the SRI benefits need to be observed over a much longer horizon. Indeed, since such benefits are intangible and indirect, they are conditional on future economic uncertainty and are difficult to estimate reliably.[6] If such benefits truly exist, they will then largely depend on future economic conditions, as the realization of such benefits should be highly correlated with future economic conditions. In a steady state, SRI should affect asset returns through conventional channels; that is, it should not affect investors' future investment opportunity sets, since only the initial costs (such as initial investments in the development of new technology), which can be measured reliably, exist. However, during the transition period between the SRI states, which originate from the intangible benefits that arise, the financial impacts of SRI (i.e. the net effects of the costs and benefits) are uncertain since the "benefit" components of the net effects are conditioned on future economic uncertainty. Such uncertainty will change investors' investment opportunity set, and they will try to hedge against the risks associated with it.

Since the "benefit" component of the net effects is intangible and cannot be measured reliably, a state variable that can proxy for such uncertainty is required to operationalize an empirical model. To this end, once uncertainty regarding future economic conditions has been resolved, there could be two possible outcomes. If the benefits are realized (such as delivery of competitive advantages from the adoption of new technology) and they are large enough to cover all of the initial costs (such as the initial development costs on the new technology), the adoption of SRI will then lead to a positive net effect. As a consequence, the aggregate amount of net assets of SRI will increase since investors will be more willing to hold such equity (i.e. SRI funds or companies), as adoption of the SRI strategy will lead to positive returns. Conversely, if the benefits are either not realized or are not large enough to cover all of the initial costs, the adoption of SRI may then lead to a negative net effect and the aggregate amount of SRI assets will decrease. In either case, this will be reflected in the change in holdings of SRI equity.

We propose that if investors' investment strategies are motivated by maximizing portfolio returns, NSF (i.e. changes in the aggregate amount of net assets under SRI funds) should be conditioned on the economic determinants/uncertainties of the "net effect" (i.e. differences between costs and benefits)[7] that have been resolved during the transition period. Therefore, NSF can serve as a state variable that proxies for uncertainty arising from SRI and that changes investors' investment opportunity set.

Moreover, asset returns are driven by changes in information, specifically, driven by innovations in state variables (Campbell 1996). In the ICAPM setting, if NSF is a state variable that affects investors' opportunity set, the innovations (news components) of NSF should represent a priced Merton (1973) factor. Since innovations are unobservable ex-ante, we use the economic tracking portfolio approach of Lamont (2001) to extract innovations of NSF.[8] The economic tracking portfolio approach is designed to capture unexpected returns that are maximally correlated with unexpected components of a target state variable. The risk premium earned by such a portfolio can be used to assess the importance of the tracked state variable to expected returns.

Construction of the Economic Tracking Portfolio

In the spirit of Lamont (2001), if NSF matters for (ICAPM) asset pricing, innovations in excess returns (i.e. the unexpected returns) of base assets reflect innovations of NSF. That is

$$\begin{aligned} &\mathrm{NSF}_{t+k} - E_t(\mathrm{NSF}_{t+k}) = a\tilde{R}_{t,t+1} + \tau_{t+k}, \quad \text{or} \\ &E_{t+k}(\mathrm{NSF}_{t+k}) - E_t(\mathrm{NSF}_{t+k}) = a\tilde{R}_{t,t+1} + \tau_{t+k}, \end{aligned} \tag{1}$$

[6] For instance, one of the potential long-term benefits of SRI relates to the development of new (e.g. environmentally friendly) technology, which ultimately creates long-term competitive advantages (Porter and Kramer, 2006).

[7] In this study, the costs and benefits are discussed to highlight that two opposing factors are at play with different time dimensions. We are not concerned with trying to empirically disentangle the costs and benefits—this is not of relevance in an asset pricing framework. Rather, the "net effect" of the two is what really matters and is our focus.

[8] Such an approach has been adopted by numerous recent ICAPM studies in capturing the unexpected components of a target variable, for instance, Vassalou (2003) and Kim et al. (2011).

where $\tilde{R}_{t,t+1} \equiv R_{t,t+1} - E_t(R_{t,t+1})$ is a vector of innovations in excess returns on the base assets from month t to $t+1$, $E_{t+k}(\text{NSF}_{t+k}) - E_t(\text{NSF}_{t+k})$ represents the innovations (news components) of NSF from month t to month $t+k$, a is a non-zero coefficient and τ_{t+k} is the component of news that is orthogonal to unexpected returns. In this study, our economic tracking portfolios are constructed to track the innovations of NSF over the next year. This is based on the assumption that asset returns reflect innovations of next year's NSF. According to Vassalou (2003), if asset returns reflect innovations in state variables over a longer horizon, one would expect that most of these innovations will be realized in the next year. Based on the preceding discussion, since the benefits of SRI also need to be observed over a longer horizon, it is reasonable to assume that most of the innovations relate to next year's NSF. Therefore, k takes the value of 12 (i.e. 1 year).

Second, since $\text{NSF}_{t+k} = E_{t+k}(\text{NSF}_{t+k})$, the realization of NSF_{t+k} can then be rewritten as

$$\begin{aligned}\text{NSF}_{t+k} &= E_t(\text{NSF}_{t+k}) - E_t(\text{NSF}_{t+k}) + \text{NSF}_{t+k} \\ &= E_t(\text{NSF}_{t+k}) + \{E_{t+k}(\text{NSF}_{t+k}) - E_t(\text{NSF}_{t+k})\}.\end{aligned} \tag{2}$$

Third, let Z_t denote a vector of control variables that have the ability to predict future equity returns. If we assume that expected returns on the base assets at time t are linear functions of Z_t, then

$$E_t\left(R_{t,t+1}\right) = bZ_t, \tag{3}$$

and if we also define a projection equation for the expectations of NSF_{t+k} at time t on the control variables, we then have

$$E_t(\text{NSF}_{t+k}) = fZ_t + \mu_{t+k}. \tag{4}$$

Finally, combining Eqs. (1)–(4) yields

$$\text{NSF}_{t+k} = cR_{t,t+1} + dZ_t + \varepsilon_{t+k}, \tag{5}$$

where $c = a$, $d = f - ab$ and $\varepsilon_{t+k} = \tau_{t+k} + \mu_{t+k}$. The portfolio weights c in Eq. (5) can be estimated with an OLS regression. The tracking portfolio returns of innovations on NSF are obtained by taking the product of the estimated regression coefficients and the returns on the base assets:

$$E_{t+k}(\text{NSF}_{t+k}) - E_t(\text{NSF}_{t+k}) = \hat{c}R_{t,t+1}, \tag{6}$$

where $\hat{c}$ is the estimated coefficient. This is the factor associated with the news components of NSF, which we label "NSFTP" (which stands for NSF tracking portfolio). Since NSFTP is a testable factor, it enables us to formulate a testable two-factor ICAPM model (i.e. the market factor and NSFTP).

Empirical Framework

Research Method

We employ both time-series and cross-sectional regression tests. Based on the discussion above, we propose the following two-factor model for the time-series regression:

$$R_t^{ei} = a_i + \beta_{\text{MKT}} R_t^{\text{MKT}} + \beta_{\text{NSFTP}} R_t^{\text{NSFTP}} + \varepsilon_t, \tag{7}$$

where R_t^{ei} is test portfolio i's excess returns at time t. R_t^{MKT} is the excess market returns at time t. R_t^{NSFTP} is the tracking portfolio excess returns at time t. β_{MKT} and β_{NSFTP} are the factor loadings for the market factor and NSFTP, respectively.

For the cross-sectional analysis, we employ the Fama and MacBeth (1973) two-pass method. Initially, the estimated OLS time-series regression coefficients (i.e. $\hat{\beta}_{\text{MKT}}$ and $\hat{\beta}_{\text{NSFTP}}$) from Eq. (7) need to be extracted, and then the following cross-sectional regression is estimated:

$$R_a^{ei} = a_i + \lambda_{\beta_{\text{MKT}}} \hat{\beta}^i_{\text{MKT}} + \lambda_{\beta_{\text{NSFTP}}} \hat{\beta}^i_{\text{NSFTP}} + \varepsilon_i, \tag{8}$$

where R_a^{ei} is the average testing portfolio excess returns for portfolio i, $\hat{\beta}^i_{\text{MKT}}$ and $\hat{\beta}^i_{\text{NSFTP}}$ are, respectively, the estimated coefficients of the market factor and NSFTP for portfolio i and $\lambda_{\beta_{\text{MKT}}}$ and $\lambda_{\beta_{\text{NSFTP}}}$ represent, respectively, the factor risk premia of the market factor and NSFTP.

Following Cochrane (2005), to relax the assumption that the errors are serially uncorrelated, we estimate the standard errors of λ_{MKT} and λ_{NSFTP} based on the following equation:

$$\sigma^2\left(\hat{\lambda}\right) = \frac{1}{T}\left[(\beta'\beta)^{-1}\beta' \sum \beta(\beta'\beta)^{-1} + \sum_f\right], \tag{9}$$

where $\sum$ is the error variance–covariance matrix (i.e. the residuals from the time-series regressions), $\sum_f$ is the factor variance–covariance matrix and β represents the time-series regression coefficients.

Data and Portfolio Formation

The test portfolios are 25 size and book-to-market sorted portfolios. The proxy for the market factor is the excess market return. Data for these variables are sourced from Kenneth French's website. NSF represents changes in the future aggregate amount of net assets of the US SRI funds, estimated by the following procedures. First, according to the US SIF (US Social Investment Forum), there are 136 SRI mutual funds[9] in the US market by the end of

[9] SRI mutual funds are commonly adopted in studies examining the financial impact of SRI. See, for example, Haigh and Hazelton (2004); Barnett and Salomon (2006); Benson et al. (2006) and Borgers et al. (2015).

December 2013. The monthly net asset values of these funds are obtained from the CRSP mutual fund database, starting in December 1990, the earliest observation available. Due to absent fund profiles, we exclude 8 funds leaving a final sample of 128. For each month, we sum the net assets of all of the available funds, and the monthly aggregate value of net assets data is estimated across the full sample period. The monthly average aggregate amount of net assets for our sample of SRI funds exceeds $US 10.63 billion. The monthly changes in the future aggregate amount of net assets (NSF) is then calculated as follows:

$$\text{NSF}_t = \frac{\text{Aggregate amount of net assets}_{t+1}}{\text{Aggregate amount of net assets}_t} - 1, \qquad (10)$$

where NSF_t is the change in the future aggregate amount of net assets of SRI funds in month t and the numerator (denominator) is the aggregate amount of net assets in month $t + 1$ (t).

We use the economic tracking portfolio approach discussed above to extract the innovations of NSF (i.e. estimate the NSF tracking portfolio—NSFTP). Construction of the tracking portfolio based on Eq. (5) requires returns on the base assets and the lagged control variables. According to Lamont (2001) and Vassalou (2003), base assets should include all available assets whose unexpected returns are correlated with unexpected components of the economic variable. In this study, the unexpected components of NSF are the uncertainties regarding the financial impacts of SRI. Such uncertainties will result in investors shifting their investment between SRI funds and conventional funds. Consequently, the unexpected components of NSF should be correlated with the unexpected returns of all assets that are available in the market.

We follow Lamont (2001) and use the standard five value-weighted industry portfolios as our base assets: consumer goods, manufacturing, high-technology, health and others. The data for the industry portfolios are obtained from Kenneth French's website.

To capture unexpected components of the base asset returns, the control variables should have the ability to predict future equity returns. Following Petkova (2006), we include the dividend yield (DIV), the default spread (DEF), the short-term T-bill yield (RF) and the term spread (TERM) as control variables. All yield data are from the Federal Reserve Bank of St. Louis.

Table 1 NSF economic tracking portfolio

	(1)	(2)
Base Assets		
Consumer	−0.59	−0.50
	(−1.22)	(−0.71)
Manufacturing	−1.03	−0.84
	(−2.26)	(−1.46)
High-tech	0.37	0.62
	(2.11)	(0.67)
Health	0.29	0.27
	(1.21)	(0.58)
Others	0.84	1.06
	(1.55)	(0.97)
Small growth		−0.44
		(−0.83)
Small value		−0.05
		(−0.07)
Large growth		0.19
		(0.10)
Large value		−0.37
		(−0.35)
Control Variables		
Constant	−0.22	−0.22
	(−2.22)	(−2.27)
DIV	−3.73	−3.96
	(−0.85)	(−0.91)
DEF	13.79	14.07
	(2.63)	(2.72)
RF	5.32	5.37
	(3.08)	(3.17)
TERM	9.71	9.86
	(2.94)	(3.13)
R^2	0.20	0.21

This table reports the results for the following regression: $\text{NSF}_{t+k} = cR_{t,t+1} + dZ_t + \varepsilon_{t+k}$, where NSF_{t+k} is the change in the future aggregate amount of net assets of SRI funds, $R_{t,t+k}$ is the excess return on the base assets, Z_t are the control variables and k takes the value of 12. Base assets in the first column consist of five value-weighted industry portfolios. Base assets in the second column consist of five value-weighted industry portfolios augmented by four size and book-to-market sorted portfolios. Control variables are dividend yield (DIV), default spread (DEF), short-term T-bill yield (RF) and term spread (TERM). The sample period is from Dec 1990 to Dec 2013. t statistics are reported in parentheses

Estimation of the NSF Economic Tracking Portfolio

Table 1 provides the outcome of estimating the economic tracking portfolio regression. The first column relates to the specification based on the five value-weighted industry portfolios and the control variables. The sign of the regression coefficients of our base assets is generally consistent with intuition and arguments proposed in the SRI literature. For instance, the estimated coefficient on high-technology is positive, which is intuitive because one of the long-term benefits of SRI involves the development of new technology (Porter and Kramer, 2006). In addition, the estimated coefficient on manufacturing is negative, which is sensible because initiating SRI activities for this industry might incur large costs, such as costs involving a change of management structure in the production line (Walley and Whitehead 1994). The estimated coefficients on DEF, RF and TERM are statistically significant, indicating that the control variables have power in predicting future equity returns. This is consistent with Vassalou (2003) and Petkova (2006). In contrast, except for the high-technology and manufacturing industry, the regression coefficients of the base assets are all statistically insignificant.

For robustness and following Vassalou (2003), we explore an alternative group of base assets. Specifically, we augment the five value-weighted industry portfolios with four size and book-to-market sorted portfolios (small growth, small value, large growth and large value). The second column in Table 1 presents the results. Given the generally weaker outcome of this alternative approach, we adopt the more parsimonious model for our analysis.

Descriptive Statistics

The average return for NSFTP is 0.160 % per month and it is insignificant. Note that since the NSFTP factor is in the form of a portfolio excess return, its average (the unconditional mean) is interpreted as its risk premium. As such, insignificance suggests that it might not able to explain the cross-sectional variation of returns. MKT is positive and significant at the 1 % level, and this is generally consistent with results reported from the previous literature. The sample correlation between NSFTP and MKT is 0.336.

Results

Time-Series Regressions

If NSFTP is important in explaining returns, its factor loading should have systematic patterns across firm size and book-to-market sorted portfolios (Kim et al. 2011). To assess this, we employ 25 size and book-to-market sorted portfolios as our test portfolios. Table 2 presents the results. Panel A of Table 2 reports the factor loadings associated with MKT (β_{MKT}). The t statistics for β_{MKT} are significant for all of the 25 cases. Panel B of Table 2 reports the factor loadings for NSFTP (β_{NSFTP}) with their respective t statistics, and the results are very interesting. Specifically, while 14 of the 25 factor loadings are significant, with the exception of two cases, all are negative in sign. Moreover, almost all negative significant factor loadings relate to "medium" firm size portfolios, which implies that SRI has a significantly negative financial impact on these groups of firms. This finding is consistent with the arguments documented in the SRI literature, and our reasoning is as follows.

Since initiating SRI is costly (Walley and Whitehead 1994), it is unlikely that small companies will be heavily engaged in SRI activities. Therefore, it is not surprising to find no significant financial impact on the "small" firm size portfolios. At the other end of the spectrum, large corporations will tend to have lengthy experience in adoption and implementation of SRI and have competitive and/or political pressures that induce such behaviour. Their experiences in the adoption of SRI combined with their "economies of scale" advantage could enable them to incorporate socially responsible activities into the decision-making process without harming their core businesses. As such, it is intuitively appealing that SRI has no significant negative financial impact on those corporations. However, for medium-sized corporations, implementing socially responsible practices could come at the expense of (partially) sacrificing their core business due to limited experience in adoption of SRI and a reduced capacity to absorb/pass on the extra costs. As such, the adoption of SRI might adversely affect their financial performance.

However, it is also notable that β_{NSFTP} does not present any systematic pattern. Specifically, it does not increase or decrease with firm size or book-to-market ratios. Therefore, a cross-sectional association between the factor loading on NSFTP and average returns cannot be observed from our time-series tests. While this suggests that NSFTP is not able to explain average stock returns, a more formal test is warranted before drawing such a conclusion. Accordingly, we now turn to this formal cross-sectional analysis.

Cross-Sectional Regressions

Table 3 provides the estimation results for the Fama and MacBeth (1973) cross-sectional regressions. In the first stage, the beta estimates of the two factors (i.e.β_{NSFTP} and β_{MKT}) are obtained from the full-sample time-series regressions. In the second stage, in each quarter, we regress the cross-sectional portfolio returns on these factor betas to estimate the factor risk premia, $\lambda_{\beta_{\text{NSFTP}}}$ and $\lambda_{\beta_{\text{MKT}}}$. Finally, we apply Eq. (9) to estimate the respective standard errors (t statistics) for those factor risk premia. In addition, the "Shanken-t" is also estimated using Shanken's (1992) correction to control for the errors-in-variables bias.

The estimates of both $\lambda_{\beta_{\text{MKT}}}$ and λ_{NSFTP} are statistically insignificant. Specifically, the t statistics (Shanken-t) on $\lambda_{\beta_{\text{MKT}}}$ and λ_{NSFTP} are -0.27 (-0.26) and -1.09 (-1.09), respectively. This evidence suggests that innovations of NSF are not priced. Further, the adjusted R^2 of the regression is only 11 %. This analysis indicates that

Table 2 Time-series coefficient estimates for the two-factor model

	Regression coefficients					*t* statistics				
BM	Low	2	3	4	High	Low	2	3	4	High
Panel A: Regression coefficients and *t* statistics for the market factor										
Size										
Small	1.34	1.15	1.01	0.93	1.05	20.14	18.80	16.71	13.79	13.35
2	1.33	1.12	1.03	1.03	1.15	23.26	20.99	17.78	14.92	13.09
3	1.27	1.14	1.03	1.03	1.05	24.36	27.47	20.23	18.44	15.07
4	1.21	1.08	1.10	1.01	1.05	24.73	24.20	18.61	18.71	13.74
Large	0.95	0.90	0.92	0.84	0.96	37.54	32.33	21.28	13.48	13.47
Panel B: Regression coefficients and *t* statistics for NSFTP										
Size										
Small	0.33	0.15	0.05	0.03	−0.06	1.98	1.05	0.42	0.24	−0.61
2	0.12	−0.13	−0.21	−0.22	−0.20	1.21	−1.52	−2.50	−2.37	−1.60
3	0.12	−0.24	−0.29	−0.37	−0.31	1.36	−4.07	−4.34	−5.20	−3.59
4	0.05	−0.26	−0.35	−0.35	−0.28	0.72	−5.15	−4.94	−5.24	−2.96
Large	0.10	−0.13	−0.15	−0.17	−0.10	2.78	−2.58	−2.68	−1.83	−1.08

This table reports coefficient estimates from time-series regressions for the two-factor model (MKT and NSFTP) on 25 size and book-to-market sorted portfolios. *t* statistics are corrected for autocorrelation and heteroskedasticity using the Newey–West (1987) estimator with five lags. The sample period is from Dec 1990 to December 2013

Table 3 Cross-sectional regression analysis

	Constant	$\lambda_{\beta_{MKT}}$	$\lambda_{\beta_{NSFTP}}$	Adj. R^2
Estimate	0.95	−0.16	−0.49	0.11
t statistic	(1.93)	(−0.27)	(−1.09)	
Shanken-*t*	(1.91)	(−0.26)	(−1.09)	

This table reports estimation results for the Fama and MacBeth (1973) cross-sectional regressions for the two-factor model. In the first stage, the loadings on the factors are obtained from the time-series regressions results. In the second stage, each month, we regress the cross-sectional portfolio returns on the factor loadings from the first stage. MKT is the market return in excess of the riskless rate of return, and NSFTP is the economic tracking portfolio capturing innovations in NSF. "*t* statistic" is computed using the uncorrected Fama–MacBeth standard errors. "Shanken-*t*" is computed using Shanken's (1992) correction for the errors-in-variables bias. Both the *t* statistics and Shanken-*t* are reported in parentheses. The adjusted R^2 is computed following Jagannathan and Wang (1996). The test portfolios are the 25 size and book-to-market sorted portfolios. The sample period is from Dec 1990 to Dec 2013

NSFTP cannot explain the cross-sectional variation of stock returns. This is consistent with our previous finding in the time-series analysis that a cross-sectional association between the factor loading on NSFTP and average returns cannot be observed. Overall, our results under the time-series and cross-sectional analyses indicate that SRI has no financial impact on the US market.

Since our finding of no financial impact could be sensitive to the choice of the state variable and testing portfolios, a number of robustness tests are conducted. First, we propose an alternative state variable with similar intuition to NSF in formulating our two-factor ICAPM model. Second, we perform additional cross-sectional tests of alternative versions of the two-factor model using a different set of test portfolios.

Robustness Test: Alternate State Variable Proxy

Similar to the intuition underlying NSF, if investors' investment strategies are motivated by maximizing portfolio returns, we argue that changes in the future aggregate wealth of SRI companies (WSC) should also only be conditioned on the economic determinants/uncertainties of the SRI benefits that have been resolved during the transition period. Based on this reasoning, we formulate an alternative version of the two-factor model using WSC as the state variable.

Specifically, we define the aggregate wealth of SRI companies as their total market capitalization. Moreover, we target "mature" SRI companies, i.e. companies implementing socially responsible strategies over a relatively longer period, for two reasons. First, SRI is widely accepted as a long-term investment strategy and thus, to the extent that it delivers benefits, they will be realized over a longer period. Second, in response to the concern highlighted by Porter and Kramer (2006) that the previous negative findings of SRI in the literature could be caused by the inclusion of corporations unable to efficiently incorporate social responsible activities into their core business, examining mature SRI companies should be advantageous. We identify mature SRI companies from KLD Research & Analytics, a division of MSCI. Accordingly, we obtain monthly data from 1990 to 2013, for the aggregate market capitalization of the 400 companies in the KLD 400 Social index (these data are sourced from MSCI).[10]

Table 4 reports the estimated tracking portfolio coefficients on WSC (similar to the counterpart displayed earlier for NSF in Table 1), together with their associated t statistics. The first column of estimates in Table 4 presents the results of regressing WSC on the five value-weighted industry portfolios and control variables. The second column of estimates provides the results for the five industry and four size and book-to-market sorted portfolios. As before, after estimating the regression coefficients, returns on the WSC tracking portfolio are obtained by multiplying the estimated regression coefficients with the returns on the base assets and summing these components at each monthly observation. This is the factor associated with the news components of WSC, which we label "WSCTP".

Table 5 provides the Fama and MacBeth (1973) cross-sectional regressions for the alternative model. Once again, the estimates of both $\lambda_{\beta_{\text{MKT}}}$ and λ_{WSCTP} are statistically insignificant. Specifically, the t statistics (Shanken-t) on $\lambda_{\beta_{\text{MKT}}}$ and λ_{WSCTP} are −0.20 (−0.20) and −0.99 (−0.98), respectively. This evidence suggests that innovations of WSC are not priced. Further, the adjusted R^2 of the regression is only 9 %. The above findings from both approaches suggest that the WSCTP factor in our alternative two-factor model has no power in explaining the cross-sectional variation in returns and further confirms that SRI has no financial impact on the US equity market.

Robustness Test: Alternative Test Portfolios

We also perform cross-sectional regressions of the two-factor model using alternative test portfolios. Specifically, in this robustness check, thirty value-weighted industry portfolios are used. Panels A and B of Table 6 report the estimation results. Again, we find that neither λ_{NSFTP} nor λ_{WSCTP} is statistically significant.

[10] The KLD 400 Social index is also commonly employed in recent SRI studies. See for example, Harjoto and Jo (2011); Cai et al. (2012) and Giuli and Kostovetsky (2014).

Table 4 Robustness test: WSC economic tracking portfolio

	(1)	(2)
Base Assets		
Consumer	−0.01	−0.00
	(−1.51)	(−0.26)
Manufacturing	−0.01	−0.00
	(−1.84)	(−0.44)
High-tech	0.00	0.01
	(2.38)	(1.59)
Health	0.00	0.01
	(1.08)	(1.18)
Others	0.01	0.01
	(1.20)	(1.39)
Small growth	–	−0.01
		(−1.85)
Small value	–	0.00
		(−0.58)
Large growth	–	−0.01
		(−0.60)
Large value	–	−0.01
		(−1.49)
Control Variables		
Constant	−0.00	−0.00
	(−0.84)	(−0.90)
DIV	0.15	0.15
	(3.44)	(3.58)
DEF	−0.07	−0.07
	(−1.24)	(−1.27)
RF	−0.01	−0.02
	(−1.02)	(−1.19)
TERM	−0.03	−0.03
	(−0.95)	(−1.12)
R^2	0.16	0.18

For robustness, changes in the future aggregate wealth of SRI companies (WSC) are employed to formulate an alternate two-factor ICAPM. This table reports the results for the following regression specification: $\text{WSC}_{t+k} = cR_{t,t+1} + dZ_t + \varepsilon_{t+k}$, where WSC_{t+k} is the change in the future aggregate amount of net assets of SRI companies, $R_{t,t+k}$ is the excess return on the base assets, Z_t are the control variables and k takes the value of 12. Base assets in the first column consist of five value-weighted industry portfolios. Base assets in the second column consist of five value-weighted industry portfolios augmented by four size and book-to-market sorted portfolios. The sample period is from Dec 1990 to Dec 2013. t statistics are reported in parentheses

Conventional Performance Evaluation

In this section, we apply the performance evaluation techniques that have been commonly adopted in previous SRI studies, on our sampled 128 SRI funds to examine the

Table 5 Robustness test: cross-sectional regression using the WSC factor

	Constant	$\lambda_{\beta_{\mathrm{MKT}}}$	$\lambda_{\beta_{\mathrm{WSCTP}}}$	Adj. R^2
Estimate	0.91	−0.11	0.00	0.09
t statistic	(2.00)	(−0.20)	(−0.99)	
Shanken-*t*	(1.99)	(−0.20)	(−0.98)	

This table reports estimation results for the Fama and MacBeth (1973) cross-sectional regressions when future aggregate wealth of SRI companies (WSC) is employed to formulate the two-factor model. In the first stage, the loadings on the factors are obtained from the time-series regression results. In the second stage, each month, we regress the cross-sectional portfolio returns on the factor loadings from the first stage. MKT is the market return in excess of the riskless rate of return, and WSCTP is the economic tracking portfolio capturing innovations in WSC. "*t* statistic" is computed using the uncorrected Fama–MacBeth standard errors. "Shanken-*t*" is computed using Shanken's (1992) correction for the errors-in-variables bias. Both the *t* statistics and Shanken-*t* are reported in parentheses. The adjusted R^2 is computed following Jagannathan and Wang (1996). The test portfolios are the 25 size and book-to-market sorted portfolios. The sample period is from Dec 1990 to Dec 2013

financial impact of SRI. Specifically, we estimate Jensen, Fama–French (1993) and Carhart alphas[11] using the following models:

$$R_t^{\mathrm{SRI}} = a_{\mathrm{SRI}}^{\mathrm{Jensen}} + \beta_{\mathrm{MKT}} R_t^{\mathrm{MKT}} + \varepsilon_t, \quad (11)$$

$$R_t^{\mathrm{SRI}} = a_{\mathrm{SRI}}^{\mathrm{FF}} + \beta_{\mathrm{MKT}} R_t^{\mathrm{MKT}} + \beta_{\mathrm{SMB}} \mathrm{SMB}_t + \beta_{\mathrm{HML}} \mathrm{HML}_t + \varepsilon_t, \quad (12)$$

$$R_t^{\mathrm{SRI}} = a_{\mathrm{SRI}}^{\mathrm{Carhart}} + \beta_{\mathrm{MKT}} R_t^{\mathrm{MKT}} + \beta_{\mathrm{SMB}} \mathrm{SMB}_t + \beta_{\mathrm{HML}} \mathrm{HML}_t + \beta_{\mathrm{MOM}} \mathrm{MOM}_t + \varepsilon_t, \quad (13)$$

where R_t^{SRI} is the fund/portfolio excess return at time *t*. R_t^{MKT}, SMB_t, HML_t and MOM_t are the market, size, book-to-market and momentum factors in month t, respectively. Data for these variables are sourced from Kenneth French's website. $a_{\mathrm{SRI}}^{\mathrm{Jensen}}$, $a_{\mathrm{SRI}}^{\mathrm{FF}}$ and $a_{\mathrm{SRI}}^{\mathrm{Carhart}}$ are the Jensen, Fama–French and Carhart alphas, respectively.

Panel A of Table 7 shows that most funds have significantly negative alphas. Specifically, 94 SRI funds (out of 128) have significantly negative Jensen alphas, 101 funds have significantly negative Fama–French alphas and 102 have significantly negative Carhart alphas. These results indicate that SRI has a negative financial impact on the US market. This is inconsistent with our findings under the ICAPM framework.

[11] For examples of studies that use these performance metrics, see, Luther et al. (1992); Hamilton et al. (1993); Luther and Matatko (1994); Statman (2000); Derwall et al. (2005); Bauer et al. (2005); Bauer et al. (2006); Mill (2006); Bauer et al. (2007); Hill et al. (2007); Renneboog et al. (2008b) and Gil-Bazo et al. (2010).

Table 6 Robustness test: cross-sectional regressions with industry-based test portfolios

	Constant	$\lambda_{\beta_{\mathrm{MKT}}}$	$\lambda_{\beta_{\mathrm{NSFTP}}}$	Adj. R^2
Panel A: using NSFTP as the economic tracking portfolio				
Estimate	0.51	0.14	−0.22	0.12
t statistic	(1.68)	(0.35)	(−0.70)	
Shanken-*t*	(1.67)	(0.35)	(−0.70)	
	Constant	$\lambda_{\beta_{\mathrm{MKT}}}$	$\lambda_{\beta_{\mathrm{WSCTP}}}$	Adj. R^2
Panel B: using WSCTP as the economic tracking portfolio				
Estimate	0.48	0.17	−0.00	0.09
t statistic	(1.51)	(0.42)	(−0.74)	
Shanken-*t*	(1.51)	(0.42)	(−0.74)	

This table reports estimation results for Fama and MacBeth (1973) cross-sectional regressions. Thirty industry portfolios are employed as the test portfolios. In the second stage, each month, we regress the cross-sectional portfolio returns on the factor loadings from the first stage. MKT is the market return in excess of the riskless rate of return, and NSFTP and WSCTP are the economic tracking portfolios capturing innovations in NSF (change in the future aggregate amount of net assets of SRI funds) and WSC (change in the future aggregate wealth of SRI companies), respectively. "*t* statistic" is computed using the uncorrected Fama–MacBeth standard errors. "Shanken-*t*" is computed using Shanken's (1992) correction for the errors-in-variables bias. Both the *t* statistics and Shanken-*t* are reported in parentheses. The adjusted R^2 is computed following Jagannathan and Wang (1996). The sample period is from Dec 1990 to Dec 2013

We then estimate Jensen, Fama–French and Carhart alphas on an (value-weighted) aggregated portfolio of all 128 SRI funds. Table 7, Panel B, reports the portfolio alphas. The Jensen and Carhart portfolio alphas are statistically insignificant (*t* statistics are −0.99 and −1.53, respectively). However, the Fama–French alpha is negatively significant (−2.12), which indicates a negative financial impact. In sum, the portfolio estimation results are not fully consistent with our results under the ICAPM framework. They are also inconsistent with the analysis using individual funds as the test assets (i.e. the insignificance of the Jensen and Carhart alphas).

Finally, we perform regressions using the KLD 400 Social index as our test portfolio. The results are presented in Table 7, Panel B. Interestingly, although the Jensen alpha is statistically insignificant, the Fama–French and Carhart alphas are now positively significant (*t* statistics are 3.04 and 3.34, respectively). This is clearly inconsistent with our results under the ICAPM framework. It is also inconsistent with the analysis above on SRI funds even though the same performance metrics are used.

Overall, in this section, we apply three performance measures (i.e. Jensen, Fama–French and Carhart alphas) that have been commonly adopted in previous studies to examine the financial impact of SRI. The results vary widely. More precisely, (1) all of the three performance

Table 7 Conventional performance evaluation

	No. of significantly negative alphas	Total	Percentage
Panel A: individual fund results—alphas estimated for each of the 128 SRI funds			
Jensen alpha	94	128	73
Fama–French alpha	101	128	79
Carhart alpha	102	128	80

	128 SRI funds	400 KLD stocks
Panel B: portfolio funds results—alphas estimated for portfolios of SRI funds and KLD stocks		
Jensen alpha	−0.000	−0.001
	(−0.99)	(−1.75)
Fama–French alpha	−0.001	0.002
	(−2.12)	(3.04)
Carhart alpha	−0.001	0.002
	(−1.53)	(3.34)

This table reports estimation results using several conventional performance evaluation techniques. Specifically, Jensen, Fama–French and Carhart alphas are reported. Alphas are estimated for 128 US SRI funds both individually and as an aggregated portfolio. They are also estimated for a portfolio of 400 SRI companies, which comprise the KLD 400 Social Index. The sample period is from Dec 1990 to Dec 2013. *t* statistics are reported in parentheses

measures estimated using individual SRI funds as the test assets imply that SRI has a negative financial impact on the US market, (2) two of the performance measures (the Jensen and Carhart alphas) estimated from using a portfolio of SRI funds as the test asset indicate that SRI has no financial impact and (3) two of the performance measures (the Fama–French and Carhart alphas) estimated from a portfolio of SRI company returns as the test asset indicate that SRI has a positive financial impact.

Summary and Conclusions

This study establishes a two-factor model under the ICAPM framework and, specifically, adopts the economic tracking portfolio method of Lamont (2001) to capture the innovations of our state variable—changes in the future aggregate amount of net assets of SRI funds (NSF). Our results indicate that socially responsible investment has no financial impact on the US market. In particular, we find that innovations in a factor designed to correlate with SRI is not priced. The findings are robust to alternative specifications of the model. Corporations now have lengthy experience in adoption and implementation of SRI, and these experiences should enable them to incorporate socially responsible activities into the decision-making process without greatly harming their core business activity. Our findings are consistent with this contention.

In the SRI literature, a non-significant relationship has been documented by a number of previous studies (e.g. Hamilton et al. (1993); Statman (2000); Bauer et al. (2005); Bauer et al. (2006) and Bauer et al. (2007)). However, we address potential limitations in the research methods employed in this literature. For example, Hamilton et al. (1993), Statman (2000) and Bauer et al. (2007) use Jensen's alpha to examine the financial impact of SRI. We argue that such performance measures can only implicitly explain the financial performance of SRI. In contrast, we formulate a two-factor empirical model under the ICAPM framework, allowing us to explicitly analyse the performance of SRI by directly examining whether there is an SRI risk premium. Further, after comparing our model's consistent results with the widely varying findings generated from using conventional performance evaluation techniques, we believe that we have a new and superior approach to examine the challenging question of what is the financial impact of SRI.

We conclude that socially responsible investments have no financial impact on the US market. Our findings have two main contributions: First, Friedman's (1970) cost-concern argument, developed based on Markowitz's (1952) modern portfolio theory, might not fit the philosophy of modern investment strategies since there is no direct evidence supporting the view that the cost of SRI is well beyond its possible payback. Second and most importantly, based on our evidence, investors will not be disadvantaged financially by investing in socially responsible funds or corporations.

Our analysis provides further evidence explaining the increasing trend of socially responsible holdings in the US market, along the lines of Geczy et al. (2005), Renneboog et al. (2008a) and Adam and Shavit (2008). That is, investors who invest in socially responsible companies have utility that depends on "doing the right thing", as well as consumption. Our finding that investors will not be disadvantaged financially by investing in socially responsible funds or corporations could suggest that the overall utility of investors who invest in socially responsible companies will be "rationally" improved.

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