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SOCIALLY RESPONSIBLE INVESTING: CONSIDERABLE ALTERNATIVE TO CONVENTIONAL INVESTING?

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Pro gradu -tutkielman tarkoituksena oli tutkia eettistä sijoittamista, sen taustaa, kehitystä, sekä kilpailukykyä verrattuna perinteiseen eli konventionaaliseen sijoittamiseen. Tutkielmassa tarkastellaan rahoituksen teorioiden avulla eettisen sijoittamisen mahdollisia puutteita, sekä käydään läpi aiheesta aiemmin tehtyjä, yhdysvaltalaista dataa käyttäviä tutkimuksia, joissa pääosin todetaan eettisen sijoittamisen pärjäävän yhtä hyvin perinteisen sijoittamisen kanssa.

Empiirisen tutkimuksen avulla selvitetään eettisen Calvert-indeksin, Yhdysvaltain osakemarkkinoita kuvaavan S&P 500 -indeksin, sekä teknologiapainotteisen Nasdaq-indeksin välisiä tuottoeroja toukokuun 2000 ja marraskuun 2008 väliseltä ajalta. Tutkimuksessa käytetään yksinkertaisen tuoton mittareita, sekä riski-tuottosuhdetta kuvaavia tunnuslukuja. Empiirisen tutkimuksen tuloksena todetaan eettisen sijoittamisen alisuoriutuneen suhteessa perinteiseen sijoittamiseen, mikä poikkeaa useimmista aiemmista tutkimuksista. Käytetyn aikaperiodin todetaan kuitenkin olevan poikkeuksellinen verrattuna aiempien tutkimusten sisältöön, mutta yksilöllisiä syitä alisuoriutumiseen ei tutkimuksessa nimetä.

ABSTRACT

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The aim of the thesis was to examine socially responsible investing, its background, development, and performance relative to conventional investing. Finance theory was exploited in the study in order to find possible weaknesses of socially responsible investing. A number of U.S.-based studies about the same subject were analyzed as well. According to the majority of the studies, socially responsible investing performs equally well with conventional investing.

Return differences during May 2000 through November 2008 were measured by conducting an empirical study about the Calvert Social Index, the broad-based S&P 500 index, and the technology-based Nasdaq index. Return differences were observed by using measures of simple return and risk-return ratios. Based on this empirical research we state that socially responsible investing underperforms conventional investing, which differs from the majority of the earlier study results. We also state that the time period used in this study is exceptional compared to that of the earlier studies, however, any factors causing the underperformance were not identified.

1. INTRODUCTION

Socially responsible investing (SRI) has gained increasing popularity in recent years and it has become a noteworthy investment option for institutional and individual investors. Especially global warming has driven investors to consider their investments in green point of view, as 'greener' companies and products might improve the quality of life in the future. Also worth mentioning are the conflicts in the Middle East that gather sympathy all over the world and therefore investing in companies that exploit these conflicts may, from socially conscious investor's perspective, be wrong and unethical.

However, as rightful and ethical socially responsible investing may seem, investors need compensation for the risk they are taking and the money they are investing. An essential question is whether socially responsible investing pays off or not; can it compete with conventional investing and give returns high enough to convince ethical investors that by keeping their green, tobacco-, or gambling-free portfolios will make the world a better place without missing better investment options. In any case, the Social Investment Forum (2007) reports the seeming success of being socially aware, as in the United States nearly one out of every nine dollars from assets under professional management are involved in SRI.

1.1 The purpose of this research

In this study we try to clarify the nature of socially responsible investing, is it actually a considerable alternative to conventional investing that produces wealth and peace of mind at the same time, or just an insignificant and temporary investment style adopted by surprisingly numerous individual and institutional investors in hopes of polishing their social image in the battle against climate change or violations of human rights?

Earlier studies about socially responsible investing have introduced various views about the consequences of being socially responsible. Hamilton et al. (1993), for example, state that the market does not price social responsibility feature and being ethical does not harm or improve investment performance. On the other hand, modern portfolio theory suggests that any subset of market portfolio should lead to inferior returns. We scrutinise various studies about socially responsible investing and also introduce how finance theories explain this investment style. In our own empirical study we examine how socially responsible investing has performed relative to conventional investing during May 2000 through November 2008. We intend to compare our findings to the results of earlier studies about the same subject and to find similarities and differences between them. As we use newer data than most of the earlier studies, we identify the most important market events and their consequences to the two investing alternatives.

In this study the Calvert Social Index is a proxy for socially responsible investing, whereas the S&P 500 index presents conventional investing. In addition, the technology oriented Nasdaq is being compared to the performance of the two aforementioned indices.

1.2 The outline of the thesis

The second chapter goes deeper inside socially responsible investing and clears up some misunderstandings related to the concept of SRI. This chapter also examines the history and present situation of socially responsible investing in the United States. After this we introduce different strategies of SRI and try to characterise ethical investors. Some of the best known SRI indices are described at the end of the second chapter.

The third chapter concentrates on earlier studies conducted about socially responsible investing and its competitiveness with conventional investing.

This chapter is divided in three parts based on the approach the earlier studies use. The approaches are modern portfolio theory, arbitrage pricing theory, and value investing.

In the fourth chapter we measure the performance of socially responsible investing during 2000–2008 by using empirical data. The indices analyzed in this research are the Calvert Social Index, the S&P 500, and the Nasdaq. Based on the study we seek for an answer to the question, whether socially responsible investing is indeed a considerable alternative to conventional investing or not. This chapter gives results and compares them to previous studies about the same topic. The fifth chapter concludes this paper.

2. SOCIALLY RESPONSIBLE INVESTING IN GENERAL

In this chapter we define the concept of socially responsible investing and divide it in different categories based on various investment styles. After that we take a look at the history of socially responsible investing and see how it became a notable investment class during the last decade. Finally we characterise ethical investors and introduce some of the leading SRI indices that give good benchmarks for investors worldwide.

2.1 Defining socially responsible investing

The Social Investment Forum (2007) defines SRI as follows: “Socially responsible investing integrates environmental, social and governance factors into investment decisions”. Corporate responsibility and concerns about societal issues should be parts of criteria when making investment decisions. SRI should still satisfy investors as far as financial performance is concerned, while having a positive impact on society. Socially conscious investors want to make a difference by recommending corporations to pollute less, have more versatile board of directors in gender and race, or promote business operations that respect human rights.

Socially responsible investing is sometimes called *ethical investing, green investing, sustainable investing, guideline investing, screened investing, social investing*, or *natural investing* (Kurtz, 2005). As the concepts differ from each other, they can also be understood differently. For example green investing refers to investment style that prefers non-polluting companies and renewable energy, whereas ethical investing may represent various personal values of an investor and therefore be very subjective. One person may not share the same ethical values than the other but the concept of green investing seems to be objective. In any

case, the mentioned concepts are used interchangeably in this paper, mainly focusing on *socially responsible investing* and *ethical investing*.

2.2 The history of socially responsible investing

Socially responsible investing is not a new idea as the roots of this investing style date back several hundred years when Jewish law included directives on ethical investing. It is generally believed that the founder of Methodism, John Wesley, adopted SRI and thereby created a movement for this investment style. Later religious investors continued not to invest in companies that exploited slavery and profited from killing human beings. Apparently Methodist and Quaker immigrants were the first in the new world (which later became the United States) who used the concept of social responsibility. (Schueth, 2003)

Basically religious organizations adopted socially responsible investing since they wanted to prohibit alcohol, tobacco, and gambling from their members, therefore promoting healthy values and enterprises representing them. The 1960s can be named as the period when modern socially responsible investing was born. In the United States people were protesting against the Vietnam War, cold war, and discrimination of women. All this lead to a demand of accountability and social responsibility, especially in the 1980s when numerous individuals and organizations showed their concerns about the racist apartheid system that the government of South Africa was supporting. (Schueth, 2003)

Nowadays socially responsible investing is vast business in the U.S. as the SRI assets under management comprised $2.71 trillion in the year of 2007. The growth has been significant in just two years of time since in 2005 the SRI assets were $2.29 trillion. Social investing presents about 11 per cent of all professionally managed assets ($25.1 trillion) in the U.S.

Table 1 shows the development of socially screened funds in recent years. (The Social Investment Forum, 2007)

Table 1. Socially screened funds in 1997–2007

The assets of $202 billion in 2007 include all funds, including alternative investments, analyzed in Social Investment Forum's Report on Socially Responsible Investing Trends in the United States. The figure also includes other pooled products that are not aggregated into the total $2.7 trillion in SRI assets identified in the same report.

(Assets in Billions)	1995	1997	1999	2001	2003	2005	2007
Number of Funds	55	144	168	181	200	201	260
Total Net Assets	$12	$96	$154	$136	$151	$179	$202

Source: the Social Investment Forum (2007)

Renneboog et al. (2008) believe that socially responsible investing is likely to continue worldwide. For example, global warming, the Kyoto Protocol and microfinance are factors that gain attention by governments and investors. The 2007 Nobel Peace Prize was awarded to the UN Intergovernmental Panel on Climate Change and Al Gore for their work on educating people on climate change, which Renneboog et al. see as a sign of increasing interest in SRI. Also pension funds are investing more in SRI assets, like the California Public Employees' Retirement System which is the largest pension fund in the world, is promoting social responsibility among companies.

2.3 Different strategies of socially responsible investing

Schueth (2003) names three basic strategies of socially responsible investing that are supposed to make money and make a difference. Those strategies are screening, shareholder advocacy, and community investing.

Screening is a portfolio building method which takes into consideration social criteria. Practically socially aware investors exclude or include companies from portfolios based on the criteria and they aim for a profitable but socially responsible portfolio. Usually investment managers start looking for stocks with the client's desired financial characteristics, which results in portfolios that include companies not involved in tobacco or gaming industry, or which have good employer-employee relations etc.

Screening does not guarantee that an investor gets exactly what he or she wants. Quite often some of the companies screened are involved in socially questionable operations, yet included in socially responsible portfolio. There are rating companies by SRI characteristics that give scores to companies based on SRI indicators, which helps the investor to make careful decisions. For instance, some companies get fewer points for corporate governance and more for employee relations and therefore they might be selected by the investor.

Shareholder advocacy is a strategy that involves active investors hoping to change policies of the companies they are owners in. These shareholders use submitting and voting proxy resolutions, and verbal and written campaigns to show management how to lead the company in financially and socially profitable way. The new way of leading should enhance the well being of the stakeholders too, including customers, employees, the environment etc.

Community investing is about investing in entities that work to bring about a wanted change. These entities provide capital to people in underdeveloped communities that do not have the access to money through conventional channels. For example, depositing money in banks that lend in poor neighbourhoods is part of community investing.

Harrington (2003) also mentions social venture capital as a part of different approaches of SRI. This strategy is for investors who want to buy shares of new or growing companies before they go public. In this way investors give the desired investment capital for companies who seek for social responsibility in their operations. Table 2 below reveals the magnitude of different SRI strategies.

Table 2. Socially responsible investing in the U.S. 1995-2007

Overlapping assets involved in Screening and Shareholder Advocacy are subtracted to avoid potential double-counting. Tracking Screening and Shareholder Advocacy together only began in 1997, so there is no datum for 1995.

(In Billions)	**1995**	**1997**	**1999**	**2001**	**2003**	**2005**	**2007**
Social Screening	$162	$529	$1,497	$2,010	$2,143	$1,685	$2,098
Shareholder Advocacy	$473	$736	$922	$897	$448	$703	$739
Screening and Shareholder	N/A	($84)	($265)	($592)	($441)	($117)	($151)
Community Investing	$4	$4	$5	$8	$14	$20	$26
TOTAL	**$639**	**$1,185**	**$2,159**	**$2,323**	**$2,164**	**$2,290**	**$2,711**

Source: the Social Investment Forum (2007)

The Social Investment Forum (2007) names some key factors to the rapid growth of SRI in its *2007 Report on Socially Responsible Investing Trends in the United States*. According to the report asset managers are more socially aware as they want to satisfy clients who increasingly demand social and environmental factors in their business activities. Corporations are constantly coming up with new products and fund styles that accelerate the growth in socially and environmentally screened funds.

Climate change and its risk for portfolios is no doubt a major factor to the growing interest in SRI. Socially conscious investors value green

technology, alternative and renewable energy, and other environmentally driven business more than ever before which allocates more money in socially responsible assets. Also institutional investors are more heavily making their concerns known about the consequences associated with climate change by supporting shareholder resolutions on socially responsible issues.

Community investing has grown as industry developments enable investors to participate in this investing field. In national level institutional investors are increasingly allocating more of their portfolios in community investing assets in order to make their contributions to communities deeper. International microfinance opportunities are also popular and that way socially aware investors can support for social and economic development outside the United States.

Graaf and Slager (2006) name three complementary SRI strategies. Investment driven strategy means that financial objectives are the main direct goals that are restricted by social objectives. This approach is close to a normal investment strategy that exploits the inefficiencies of the SRI market. Ethical based strategy considers the social objectives as the main direct goals that are restricted by financial objectives. Basically, ethical standards are more important than investment returns. In value ensuring strategy financial objectives are the main goals and they must be ensured in the long run, while taking into consideration social objectives as well. This approach presupposes a responsibility of the investor to ensure functioning of the market.

2.4 Characterising socially responsible investors

Based on the traditional finance theory, there are only two factors entering the investment optimization problem: the expected portfolio return and its risk. However, the investment decision process is not only quantitative and

as we have already mentioned, investors also consider other factors affecting their level of satisfaction. Several studies have tried to analyze the nature and characteristics of social investors, which could separate those investors from conventional ones.

Schueth (2003) divides socially responsible investors in two groups based on motivations. The first group believes that by investing money in something that is close to their personal values and priorities, will bring them happiness and good feeling. These investors are known as “feel good” investors as they feel better after investing ethically. The second group is more active and in the need of improving quality of life. These investors put their money to work so that it would actually bring a positive change in society; they desire to make a change and difference.

Bollen (2007) studies the dynamics of investor cash flows in socially responsible mutual funds. He finds that socially responsible investors, compared to conventional investors, are more loyal to funds they have money in. Social investors move money in and out of their mutual funds at a notably lower rate than investors in other funds. Bollen uses values of the 25th, 50th, and 75th percentiles of the cross-sectional distribution of monthly volatility of percentage fund flows for two samples of equity mutual funds taken from the Center for Research in Security Prices (CRSP) database. The evidence roughly suggests that a $100 million fund experiences monthly flows with standard deviation of about $8 million for the socially responsible funds and $10 million for the conventional funds.

There is no evidence in the existing finance theory to prove that investors pay attention to attributes unrelated to investment performance, but Bollen believes there is an extra-financial socially responsible attribute to lower the rate at which investors trade mutual funds. The preferences of social investors can be represented by a conditional multi-attribute utility function, which suggests that they derive utility from being exposed to the socially responsible attribute, especially in the time of positive returns.

Investors in socially responsible funds are less sensitive to negative returns than conventional investors, which seems even logical as social investors also value other factors besides return.

2.5 Leading SRI indices

Probably one of the best known SRI indices is the Domini 400 Social Index (DS 400 Index) provided by KLD Research & Analytics, Inc. DS 400 Index was launched in May 1990 and it is the first benchmark index created using factors associated with environment, sociality and governance. KLD is trying to maintain the same composition of index holdings that consist of 250 S&P 500 companies, 100 additional large and mid cap companies chosen for sector diversification, and 50 smaller companies that are environmentally and socially responsible. (KLD Indexes, 2008)

According to the KLD, companies involved beyond specific criteria in alcohol, tobacco, firearms, gambling, nuclear power and military weapons are not eligible for the DS 400 Index. KLD also screens companies on the basis of financial factors including market capitalization, earnings, liquidity, stock price and debt to equity ratio. Companies in the DS 400 Index should have positive social and environmental records in community relations, diversity, employee relations, human rights, and product quality and safety, environment and corporate governance. The DS 400 Index will at all times consist of 400 companies, yet removing some companies is possible as long as they are being replaced by some others. Removing is based on corporate actions or poor social or environmental performance. KLD seeks to maintain DS 400 Index turnover at a rate consistent with turnover on the S&P 500.

The Calvert Social Index (Calvert Index) was created by Calvert and the index is constructed for measuring the performance of large U.S.-based

socially responsible companies. When constructing the index, Calvert takes 1,000 largest U.S.-based companies that have stocks listed on NYSE, NASDAQ and AMEX. Then Calvert analyzes the companies selected and screens them more carefully. The company's products should be safe, useful and beneficial, as companies producing firearms, tobacco, alcohol, pornography, casino games or military weaponry are ineligible for the index. The selected companies should also support positive environmental values, and labour and community relations. There are 641 companies in the index but the number may change due to company mergers or changes in social criteria. (Calvert, 2008)

Dow Jones Sustainability United States Index (DJSI US) consists of US companies picked up from the Dow Jones Sustainability North America Index (DJSI North America). The Dow Jones Sustainability Indexes, created in 1999, are a cooperation of Dow Jones Indexes, STOXX Limited and Sam Group. The criteria for choosing the companies for the DJSI US Index are based on climate change strategies, energy consumption, human resources development, knowledge management, stakeholder relations and corporate governance. The companies should also be sustainability leaders in their industry sectors. All industries are included in the selection process and in the composition of the DJSI US, but investors are provided with the possibility to apply filters against certain sectors. (Dow Jones Sustainability Indexes, 2008)

Statman (2006) studies socially responsible indices and points out some differences between them. He finds that SRI indices vary in composition and social responsibility scores, but S&P 500 index has a mean social score lower than that of the SRI indices. Naturally this seems logical but SRI indices also differ from each other, as DS 400 Index is ranked the highest among all indices on environment while the Calvert Index gets high scores on corporate governance.

Calvert excludes for example Wal-Mart from its index because it sells firearms, whereas KLD has included it in the Domini Index. KLD has decided just to address its concerns about Wal-Mart's activities to its management. The DJSI US includes the best companies in each industry and it differs from aforementioned indices because it does not exclude all companies involved in tobacco, gambling or alcohol industry.

As a summary, the indices differ from each other and investors must always decide what values they want to support and whether some company is ethical enough for them or not. There are no companies that are totally socially responsible due to very broad business or some other relations organizations have with each other. However, SRI indices aim at meeting the various needs of socially aware investors, but the investor will always determine the guidelines before investing in any SRI asset.

3. EARLIER STUDIES ABOUT SRI PERFORMANCE

3.1 Modern portfolio theory and SRI

Moskowitz (1972) was among the first to suggest that a socially responsible portfolio might perform as well as or even better than an unscreened portfolio. He showed that a screened portfolio outperformed the Dow Jones Industrials in a short time period. However, subsequent studies showed large variations in relative performance.

Kurtz (2000) names two partially opposing views about the performance of SRI portfolios; the *Markowitz view* and the *Moskowitz view*. Kurtz mentions that financial theorists who believe in CAPM argue that SRI portfolios are subsets of the market portfolio and therefore they can not outperform it over the long run. This happens because under CAPM, the market portfolio will outperform all its subsets if markets are efficient. Basically, as the market becomes more efficient, the more obvious should also the performance impact of SRI become. Kurtz names this view as the Markowitz view. This view is based on the modern portfolio theory, which suggests that restricting the universe for any reason pushes the investor into a suboptimal portfolio.

Kurtz reminds how some management theorists believe that SRI portfolios include important information not totally understood by the markets and therefore they could outperform market benchmarks. This view is referred to as the Moskowitz view due to the findings of Moskowitz that were mentioned earlier.

What makes the situation problematic is that there is no strong consensus about which view is right; screened and unscreened portfolios seem to perform equally well, according to Kurtz. Markowitz and Moskowitz have given arguments that Kurtz finds somewhat contradictory, but to a certain

extent similar. Markowitz states that markets are quite efficient and if investors own a subset of the market portfolio, they should experience a diversification cost, whereas Moskowitz finds that SRI portfolios can outperform the market portfolio. Kurtz does not see a contradiction in these arguments, because financial markets are efficient enough so that SRI portfolios do have a diversification cost, but inefficient enough for this cost to be compensated by an SRI anomaly.

Socially responsible investing has an impact on diversification because SRI portfolios are active. Screening makes those portfolios different from their benchmarks, as there are no random effects in the screening process and therefore one can not believe in diversification benefits, which include removing most unsystematic risk, gained by randomly choosing a reasonably large number of stocks. Kurtz mentions that social screening can therefore create uncompensated risk, which is generally used as an objection to SRI.

Kurtz summarizes the findings of several studies about SRI and it is presented in Table 3. Screened portfolios seem to have smaller capitalizations, higher P/B and P/E ratios, and Kurtz finds it hard to gather strong evidence in favor of SRI if these studies are taken into account.

Table 3. Expected impact of typical SRI exposures

The “Excellence” ratios consist of such ratios as asset growth, equity growth, return on capital, return on equity, and return on sales.

Effect	**SRI Exposure**	**Implied Impact**
Size Effect	Smaller capitalization	Neutral?
Price/Book Ratio	Higher P/B	Negative
Price/Earnings Ratio	Higher P/E	Negative
“Excellence” Ratios	More “excellent” companies	Neutral?

Source: Kurtz (2000)

Hickman et al. (1999) study whether the effectiveness of diversification is improved when social funds are included in a portfolio. Modern portfolio theory suggests that diversification reduces investor's risk exposure, as the return correlation between securities is not perfect. By effectively diversifying the portfolio one is able to eliminate the idiosyncratic risk but not the unavoidable and broadly experienced market risk.

Hickman et al., however, reckon that social investors may act differently during a recession or other economy-wide event that affects the valuation level of securities. It is possible that the social performance is not affected and therefore socially responsible investors may keep their investments unchanged. The authors present two hypotheses based on this assumption: the portfolio turnover of social funds is lower than that of traditional funds and secondly, correlations between social funds and the market continue to be lower than between the market and traditional investments. From modern portfolio theory's point of view this should lead to greater risk-adjusted returns if one chose to invest both in social and traditional securities.

Six social funds were used in the study (presented in Table 4) and the authors constructed a portfolio possibilities curve (or efficient frontier) over the period of 1991 through 1995. The curve reveals how an investor can increase return or reduce risk by selecting the appropriate mix of fund proportions of the six social funds and the S&P 500 index fund.

Table 4. Social funds examined in the study

Six funds used in the study are presented in the first paragraph. Returns and variance are monthly and in decimal form.

Fund Name	Mean Return	Variance
Calvert Social Equity	0.00896	0.00334
Dreyfus Third Century	0.00090	0.00149
New Alternatives	0.00349	0.00069
Parnassus	0.01434	0.00736
Pax World	0.00340	0.00069
Rightime Social	0.01354	0.00469

Source: Hickman et al. (1999)

The portfolio possibilities curve reveals that investing all funds in the S&P 500 is not an optimal decision. Including social funds in one's portfolio gives better risk-return relationship but the curve does not identify the funds that decrease the portfolio variance. Therefore, the authors use a bilateral complementary analysis initiated by Elton et al. in 1987. The analysis should tell whether including a fund in a well-diversified portfolio improves its risk-adjusted return. The analysis is of the form:

$$\frac{\overline{R}_{fund} - \overline{R}_{Tbill}}{\sigma_{fund}} > \left(\frac{\overline{R}_{S\&P} - \overline{R}_{Tbill}}{\sigma_{S\&P}} \right) corr_{fund,} S\ \&\ P \qquad (1)$$

where $\overline{R}_{fund} - \overline{R}_{Tbill}$ is the difference between mean returns of a fund and a Treasury bill, σ_{fund} is the fund's standard deviation, $\overline{R}_{S\&P}$ is the mean return of the S&P 500, $\sigma_{S\&P}$ is the standard deviation of the S&P 500, and $corr_{fund,S\&P}$ is the correlation between the fund and the S&P 500. In case the inequality is correct, then the fund should be included in the benchmark portfolio (S&P 500).

Parnassus seems to be the best social fund as its correlation with the S&P is the lowest (0.124) and the mean monthly return the highest (1.43 %). Hickman et al. state that the results of the study confirm their reasoning

about social funds and low correlations with the market. Diversification benefits should therefore be improved as correlations decline, which is the case with Parnassus. The study also shows that the portfolio turnover of social funds is almost 30 % lower than that of traditional funds.

Hamilton et al. (1993) study socially responsible mutual funds' performance and present three alternative hypotheses about the relative returns of socially responsible portfolios and conventional portfolios. The first hypothesis suggests that the risk-adjusted expected returns are equal between socially responsible and conventional portfolios. This hypothesis is based on the assumption that the social feature of stocks is not priced. As an assumption it falls under the category of traditional theory of finance, which implies that factors not proxies for risk do not affect expected returns.

According to the second hypothesis, the expected returns of socially responsible portfolios are lower than that of conventional portfolios. In this case the social feature of stocks is priced in the market and socially responsible investors also affect stock prices by increasing the value of socially responsible companies with the means of decreasing the expected returns and the cost of capital of those companies.

The third hypothesis encourages ethical investors by stating that the expected returns of stocks of socially responsible portfolios are higher than the expected returns of conventional portfolios. Hamilton et al. reckon that this might happen if many investors consistently underestimate the probability that negative information will be released about unethical companies. The stock prices of these companies will decline after unfortunate events and the returns will be lower.

In order to test the hypotheses Hamilton et al. analyze 32 socially responsible mutual funds and measure the excess returns of them by

using Jensen's alpha. Table 5 presents the excess returns and general performance statistics on the funds founded in 1985 or before that.

Table 5. Excess returns for 17 socially responsible mutual funds established in 1985 or earlier

T-statistics are in parentheses. Annualized excess returns are calculated by multiplying monthly excess returns by 12. The asterisk (*) presents that the result is significantly different from zero at the 5 % level.

Fund	Monthly excess returns	Excess returns (% per year)	β	Adj. R^2
Calvert Social Investment Fund	0.0066 (0.0460)	0.08	0.5937	0.8087
Dreyfus Third Century Fund	-0.0339 (-2.1440)*	-4.01	0.8424	0.8597
Evergreen Fund	–0.0627 (-0.3870)	-0.75	0.9613	0.8808
Greenspring Fund	0.4136 (2.3500)*	4.96	0.3523	0.5431
IDS Equity Fund	–0.1202 (-0.8570)	-1.44	1.0274	0.9182
New Alternatives Fund	-0.1538 (-0.7670)	-1.85	0.9075	0.8409
New Economy Fund	0.1439 (0.9000)	1.73	0.9378	0.9193
Parnassus Fund	-0.2525 (-0.6600)	-3.03	1.1549	0.8142
Pax World Fund	0.0235 (0.1770)	0.28	0.6970	0.8528
Pioneer II	0.0604 (0.4320)	0.72	0.9710	0.9101
Pioneer III	-0.1265 (-0.5540)	-1.52	0.9642	0.8216
Putnam Health Services Fund	-0.1960 (-0.6960)	-2.35	1.0532	0.7823

Putnam OTC Emerging Growth	0.2014 (0.5390)	2.42	1.2795	0.7514
Royce FD: Value	0.0953 (0.4480)	1.14	0.7314	0.7570
Scudder Growth & Income	-0.2537 (-1.6180)	-3.04	0.8577	0.8625
SFT Environmental Awareness	-0.5274 (-1.2980)	-6.33	0.9121	0.7091
Transamerica Capital Appreciation	0.4785 (0.8020)	5.74	1.1127	0.6618
Mean Excess Return	**-0.0630**	**-0.76**		

Source: Hamilton et al. (1993)

Table 5 shows that only two of the 17 funds have excess returns significantly different from zero. The mean excess return is negative and the authors state that the results are similar for the other 15 mutual funds established after 1985.

Hamilton et al. make an assumption based on previous studies that, on average, mutual funds trail large stock indices. Hence, they believe it is possible that socially responsible mutual funds have low excess returns compared to the NYSE; yet, the returns are higher than the mean excess returns of traditional mutual funds. To test this assumption the authors created a conventional mutual fund benchmark and divided it into two groups which consist of funds established before 1985 and funds established after that.

The excess returns of the both benchmarks are not statistically different from zero. The authors report that the market does not price social responsibility feature. Overall, social investors will not lose or win anything by investing in socially responsible mutual funds as expected stock returns or companies' cost of capital are not affected by ethical characteristics.

Statman (2000) extends the conversation about socially responsible mutual funds by Hamilton et al. (1993) and examines the performance of both mutual funds and stock indices. Statman uses the S&P 500 and the Domini Social Index as performance benchmarks to compare the returns of socially responsible and conventional funds over the period of 1990 through 1998. Where Hamilton et al. use solely Jensen's alpha, Statman also exploits a measure of risk called "excess standard-deviation-adjusted return (eSDAR)" which is a modified version of the Sharpe ratio. It is of the form:

$$eSDAR = R_F + \left(\frac{R_{DSI} - R_F}{SD_{DSI}} \right) SD_{SP} - R_{SP}, \qquad (2)$$

where R_F is monthly return of 30-day U.S. T-bills, R_{DSI} is monthly return of the DSI, SD_{DSI} is the standard deviation of the return of the DSI, SD_{SP} is the standard deviation of the return of the S&P 500, and R_{SP} is monthly return of the S&P 500.

Hamilton et al. used Lipper's list when choosing socially responsible mutual funds for examination but only four of those funds were on Morningstar's list (which was free of survivorship) that Statman uses in his study. Therefore the results are not totally comparable. Out of 31 socially responsible funds only two funds, Citizens Index and Noah, outperformed the S&P 500 in raw returns. The mean annualized return for the 31 funds was 13.03 % and 19.28 % for the S&P 500 (tracking error being -6.26 pps.)

Citizens Index was the only fund with a positive alpha (0.16) relative to the S&P 500, whereas the mean annual alpha was -5.02 pps. The mean eSDAR for the socially responsible funds was -6.73 pps. relative to the S&P 500. The authors also compared the performance of socially responsible funds to the DSI that is more closely related to the style of SRI. The mean alpha of the 31 funds relative to the DSI was -2.59 pps,

and the mean eSDAR was -5.16 pps. The socially responsible funds performed better relative to the DSI than to the S&P 500. However, the indices outperformed the funds.

The performance of conventional funds was slightly weaker than that of socially responsible funds but the difference was not statistically large enough. Statman mentions that there is possibly a good reason behind the weaker relative performance of mutual funds, socially responsible and conventional ones, with the performance of the S&P 500. Mutual funds have generally favoured small-cap stocks, which leads to underperformance in the time period of the study (May 1990 to September 1998) when large-cap stocks had higher returns.

Shank et al. (2005) express their more recent view on the performance of socially responsible mutual funds. The academic evidence of Hamilton et al. (1993) and Statman (2000) do not indicate statistically different portfolio performance between socially responsible and conventional funds. Shank et al. compare three portfolios made up of 31 socially responsible mutual funds (SRMF), the NYSE Composite Index (NYSE), and 11 firms most valued by SRMF managers (MostSRF).

In order to evaluate the portfolio performance the authors use Jensen's alpha and a formula (Equation 3) to calculate returns for all portfolios. The formula is:

$$R_r = \left[V_{t+1} - V_t + D_{0t}\right] / V_t, \tag{3}$$

where R_t is the portfolio return at time t, V_{t+1} is the portfolio value at the end of the holding period, and D_{0t} is any dividend payout during the period t.

For the period of June 2000 through May 2003 the excess returns of 29 of the 31 funds are not statistically different from zero (at the 95 % level).

Two funds, the Dreyfus Premier Third Century R and the Noah Fund, provided statistically significant and negative returns. The MostSRF portfolio's return is negative (like the return of the market) and not statistically different than the market.

The five-year performance (June 1998 - May 2003) is quite similar as none of the SRMF had significantly different returns from the market index. The result is same with the MostSRF. The results, however, are different for longer time period as the ten-year performance (June 1993 - May 2003) for the MostSRF was good: it had a positive and significant annual excess return (15.08 %). Only five of the 31 funds had a return history of ten years, but the returns for them were not significantly different, although positive.

Shank et al. conclude that the results of their study are very similar to those of Hamilton (1993) and Statman (2000). The performance of SRMF is not significantly different from other managed portfolios. Also the MostSRF did not gain excess return relative to the market. The longer time-horizon showed some features different from the previous results as the MostSRF had statistically significant and positive return, which indicates that the market prices social feature of a company in the long run.

Reyes and Grieb (1998) examine the performance of 15 socially responsible mutual funds (SRMFs) during the period 1986–1995. A cointegration analysis is used in the study in order to analyze the temporal behaviour of fifteen funds compared to their peer group that consists of funds with similar investment goals. The analysis should tell whether a SRMF and the peer group have a similar return pattern. If the two do not drift together, then social screens affect the behaviour of SRMF portfolios and they are not cointegrated.

Reyes and Grieb use the Engle-Granger two-step procedure in order to test for cointegration. The first stage includes running the cointegrating regression with a constant:

$$P_{Fund\,i,t} = \gamma_0 + \gamma_1 P_{Peer,t} + u_{it}, \tag{4}$$

where $P_{Fund\ i,t}$ is the SRMF i's end-of-month price level, $P_{Peer,t}$ is the corresponding end-of-month price level on the SRMF i's peer group, and the error term u_{it} is a linear combination of $P_{Fund\ i,t}$ and $P_{Peer,t}$. The next stage is to use the augmented Dickey-Fuller procedure to test for a unit root in the error term. The procedure is:

$$\Delta\hat{u}_{Fund\,i,t} = \delta_{Fund\,i}\hat{u}_{Fund\,i,t-1} + \sum_{k=1}^{q} \Phi_k \Delta\hat{u}_{Fund\,i,t-k} + w_{Fund\,i,t} \tag{5}$$

The null hypothesis is δ=0, and if it can not be rejected then the SRMF and its peer group do not follow the same trend. The authors report that the tests fail to reject (at the 1 % level) the null hypothesis in all of the SRMFs, meaning that social screening has an impact on the portfolio performance.

The authors also use the Sharpe measure to test whether SRMFs have similar risk-return performance to other funds. The average compounded annual rate of return for the SRMFs is 13.8 %. Only four funds have higher Sharpe measures than their respective peer groups. The Jobson-Korkie test statistic is used to test whether the investment performances are significantly different between the 15 SRMFs and their peer groups. The Jobson-Korkie is of the form:

$$Z - stat = \frac{\overline{R}_i s_I - \overline{R}_I s_i}{\sqrt{\theta}}, \tag{4}$$

where $\overline{R}_i$ is fund *i*'s mean monthly return, $\overline{R}_I$ is the mean monthly return of fund *i*'s peer group, s_i is the standard deviation of fund *i*, and s_I is fund *i*'s peer group standard deviation. The estimated variance θ is:

$$\theta = \frac{1}{T}\left[2s_i^2 s_I^2 - 2s_i s_I s_{i,I} + \frac{1}{2}\overline{R}_i^{\,2} s_I^2 + \frac{1}{2}\overline{R}_I^{\,2} s_i^2 - \frac{\overline{R}_i \overline{R}_I}{2s_i s_I}(s_{i,I}^2 + s_i^2 s_I^2) \right], \quad (5)$$

where $s_{i,I}$ is the estimated covariance between the returns on fund *i* and its peer group I.

The authors report that the Jobson-Korkie significance test shows no evidence of equivalent performance between the 15 SRMFs and their peers. The risk-adjusted performance of SRMFs is not statistically different from their peers. As in the earlier studies, Reyes and Grieb also conclude that the market does not price social responsibility features.

Sauer (1997) examines the performance of SRI from a slightly different perspective than previous authors in their studies. Sauer wants to neutralize the effect of transaction costs, management fees, and differences in investment policy that are associated in actively managed mutual funds. The Domini 400 Social Index (DSI) is used in the study to represent a portfolio, whose performance does not reflect the characteristics of actively managed mutual funds.

The performance of the DSI is compared to two unrestricted and well diversified benchmark portfolios, the S&P 500 and Chicago Center for Research in Security Prices (CSRP) Value Weighted Market Indexes. As with the DSI, the two benchmark portfolios are not actively managed and therefore transaction costs, management fees, and differences in investment policy are not affecting the portfolios' performance. Sauer considers the S&P and CSRP as ideal proxies for the unrestricted investment universe of equity securities traded in the United States.

Sauer compares the portfolios' average monthly raw returns and variability, Jensen's alpha, and Sharpe's index. The examined time period is 1986 through 1994. By comparing the raw returns Sauer examines the statements of SRI critics who believe that restricting the investment universe by screening offers only more volatile firms with less return potential for investors. The proponents of SRI suggest that by building loyalty with SRI firms' customers, vendors, and employees can be a success factor.

The average monthly return for the DSI over the period of 1986 through 1994 is 1.16 % and higher than the returns for the S&P (1.09 %) and CSRP (1.02 %) but the differences are not statistically significant. The results for two subperiods (1986 through 1990, and 1990 through 1994) are similar. The standard deviation of monthly returns for the DSI is 4.83 %. The number for the S&P is 4.54 % and 4.47 % for CSRP. The differences are not statistically significant.

The Jensen alphas for the DSI over the entire period are insignificantly different from zero. Sauer mentions that for a socially responsible investor a more suitable measure of risk exposure could be total risk instead of market risk. The Sharpe ratio is used for this purpose. In order to establish the statistical significance of performance differences Sauer exploits the Jobson-Korkie transformed difference (mentioned earlier in the study of Reyes and Grieb, 1998). The transformed differences in the Sharpe ratio between the DSI and both benchmarks are minimal and statistically insignificant.

Sauer extends his performance evaluation to mutual funds as he compares the performance of the Domini Social Equity Mutual Fund (DSE) to the Vanguard Index 500 Mutual Fund and the Vanguard Extended Market Mutual Fund. The DSE naturally represents socially responsible values and it is not actively managed, meaning that no changes are made to the structure of the fund when the market changes. The structure

changes only when firms fail to meet the social criteria appointed to them. The Vanguard Index 500 and the Vanguard Extended Market Mutual Funds represent the characteristics of the S&P 500 and CSRP Market Indexes.

The results are not surprising when considering the earlier tests of the study. The average monthly return for the DSE is 0.77 %, whereas the Vanguard Index 500 Mutual Fund returns 0.76 % and Vanguard Extended Market Mutual Fund 1.01 %. The differences are not statistically significant. Also the Jensen alphas are insignificantly different from zero, as are the Jobson and Korkie transformed difference in Sharpe ratio between the DSE and the Vanguard funds.

The results of the study indicate that social screening does not weaken the performance of SRI. Sauer mentions that the potential performance costs of using social criteria are minimal and negligible. Individual investors can also find investments suitable for their criteria, as the Domini Social Equity Mutual Fund, based on the empirical evidence, performed well compared to the two well diversified Vanguard funds.

Goldreyer et al. (1999) examine 49 social funds and compare their performance to random samples of conventional mutual funds. The authors mention that their study extends previous work (e.g. the work of Hamilton et al. in 1993) in the area by employing different methods. They use a larger sample of funds and three abnormal performance indicators, and partition sample of funds by investment strategy (equity, bond, and balanced funds). Sample funds are also partitioned by portfolio size and systematic risk, and finally into funds that use inclusion screens versus those that do not employ such screening.

The three performance indicators used are Jensen’s alpha, the Sharpe ratio, and the Treynor ratio. The latter is of the form:

$$TR = \left(\bar{r} - \bar{r}_f\right) / \beta, \quad (6)$$

where $\bar{r}$ is expected return on the mutual fund, $\bar{r}_f$ is return on the risk free asset (one-year treasury security rate) , and β is an estimate of the fund's systematic risk.

The equity funds produced the highest average returns, whereas the bond funds had the lowest returns. The return differences are not statistically significant between 29 social equity funds and 20 corresponding conventional equity funds. However, 0.15 % monthly return difference (for the benefit of conventional funds) between 11 social balanced funds and 20 conventional funds is statistically significant. Similarly, for 9 social bond funds and their counterparts the mean return difference is 0.19 % and statistically significant.

Taking into consideration fund size and systematic risk, only one category (large low-beta funds) out of nine seems to have statistically significant return difference for the benefit of conventional funds. Jensen's alphas are larger for conventional funds among all investment strategies. The difference is the largest between equity funds. Sharpe ratios are as well larger for conventional funds but the Treynor ratio seems to be more beneficial for social funds in all investment strategies.

Social funds have higher alphas among funds that are small, middle-size medium-beta, and large high-beta funds. In general, the social and conventional funds perform equally well when examining alphas by fund size and systematic risk. Sharpe ratio estimates, however, are clearly larger for conventional funds. Small low-beta funds are the only socially responsible funds that outperform their conventional benchmarks. The authors are surprised of this result as bond funds had the highest performance difference for the favour of conventional bond funds. Sharpe ratios seem to be higher for large conventional funds.

Treynor ratio estimates are higher for only two social fund categories, small low-beta funds and medium-size low-beta funds, when taking into consideration fund size and systematic risk. Goldreyer et al. consider these results surprising because, as it was mentioned earlier, Treynor ratios by investment strategy favoured social funds. Treynor ratios are higher for large medium- and high-beta conventional funds and medium-size large-beta conventional funds.

The authors report that socially responsible funds that employ inclusion screens outperform sample funds that do not employ those screens. Inclusion screening is defined in the article as “a portfolio selection strategy in which the portfolio manager specifically includes firms in his/her portfolio that conduct some positively regarded social policy and/or firms that have recently abandoned a policy that had some negatively regarded social consequence”. The Jensen alphas are statistically significant in this finding. The authors presume that performance differences between inclusion screening and non-inclusion screening funds are not correlated to aggregate market effects.

Goldreyer et al. conclude that conventional funds tend to outperform socially responsible funds more often which, however, does not tell the whole truth as social funds perform better in many important situations. The authors also consider their finding about the inclusion screening as the most interesting one from the study.

Geczy et al. (2005) examine socially responsible mutual funds from the perspective of an investor who includes U.S. domestic equity mutual funds in his portfolio. The funds should have the highest return-risk tradeoff measured by Sharpe ratio and their investment policies should include non-financial social objectives. The authors assume that when investors make their portfolio selections they combine the information in the historical returns data with their opinion about different asset pricing models and about fund managers’ potential stock picking skills. The SRI

portfolio is compared to an optimal portfolio chosen from various conventional funds. This process should tell the difference between certainty-equivalent returns of the portfolios and more specifically the cost of using SRI constraints.

The authors mention that the cost of incorporating social criteria depends primarily on a mutual fund investor's beliefs about pricing models and fund manager skill. If an investor does not believe in fund manager's skill, the SRI constraint can not be significantly high. However, diversification costs may occur due to the narrower selection of investments, which leads to a situation where the investor is unable to optimally balance the portfolio's factor-related risk exposures. Geczy et al. state that this diversification cost is minimal, only a few basis points per month for an investor who ignores skill and believes in the CAPM. This kind of investor can select and mix SRI funds into a portfolio whose returns track those of a market index fund. An investor, who believes in the three-factor model of Fama and French (1993), experiences diversification costs (caused by SRI constraints) of at least 30 basis points per month. In this case the SRI fund selection is inadequate in order to offer the exposures to the size and value factors included in optimal portfolios under the Fama-French model, which is of the form:

$$r - R_f = \beta_3 * \left(K_m - R_f\right) + \beta_s * SMB + \beta_v * HML + \alpha, \quad (7)$$

where r is the portfolio's return rate, R_f is the risk-free return rate, K_m is the return of the stock market,

The SRI cost is even higher if the investor believes in Carhart's four-factor model (Equation 9). Geczy et al. believe that the highest SRI costs are not caused by diversification. Investors who believe in fund managers' skills of picking the right stocks will face high costs, even 1000 basis points per month. Those investors rely on funds' return histories and try to estimate their future performance based on that information.

The authors also examine the SRI costs more broadly as they believe that the costs can still be significant even when one invests only a portion of his/her funds in SRI funds. The cost is 16 basis points per month for an investor who believes in the Fama-French model and whose overall portfolio includes at least one third of SRI funds. Monthly diversification costs for investors who believe in the Fama-French or Carhart's model increase at least by 10 basis points when stocks related to alcohol, tobacco, and gambling industries are screened out in a more restricted SRI selection process.

Geczy et al. assume that expenses might be higher for the average socially responsible fund than for the average conventional fund, since managing of socially responsible funds requires monitoring and analyses of how the firm is meeting social criteria. This seems to be true as the average conventional fund sample has an expense ratio of 1.10 % as for the average social fund the ratio is 1.36 %. The expense ratio is the percentage of total investment that fund shareholders pay for the fund's management and administrative expenses. Turnover ratio for the average conventional fund is 172.2 % per year and for the average SRI fund only 83.3 % per year. The size difference is also notable as the average SRI fund's total net assets are $153 million versus the conventional fund's $260 million.

In order to calculate the cost of SRI restrictions the authors use the concept of certainty-equivalent loss and the investor is supposed to choose an optimal portfolio by maximizing the mean variance objective:

$$C_p = E_P - \frac{1}{2} A\sigma_p^2, \tag{8}$$

where E_p and σ_p are the predictive mean and standard deviation of the portfolio's excess return, and A = 2.75, which is the approximate value that would result if the investor allocated all of his wealth to the stock-market

index portfolio when it is the only risky asset available. After this, the certainty-equivalent loss associated with the SRI constraint can be calculated using the following formula:

$$\Delta C_p = C_{p,AllFunds} - C_{p,SRI}, \tag{9}$$

where $C_{p,AllFunds}$ is the maximized value of C_p (Equation 8), when funds can be selected from the broad universe, and $C_{p,SRI}$ is the maximized value of C_p when only SRI funds can be selected.

The overall results of SRI costs reveal that when the investor believes in the Fama-French model, Carhart's four factor model, or fund manager skills, the certainty equivalent losses associated with the SRI constraint are the largest and economically significant. The cost is especially high for an investor who allocates his entire mutual fund investments to socially responsible funds. However, the cost is also large for the average SRI investor who uses only one third of his investments to social funds. The cost can be only 1 or 2 basis points per month when investors believe in the CAPM and not in the fund manager skills.

Schröder (2006) analyses SRI equity indices without measuring the performance of investment funds. Schröder believes this type of examination has the advantage of capturing the effect of a SRI screen relatively directly. Analysing indices also releases from considering market timing and the use of publicly available information as instruments for conditional tests. Furthermore, the transaction costs of investment funds need not to be considered, which comforts the process of analysing index performance. The aim of the study is to find out how SRI equity indices perform compared to conventional benchmark indices. The risk level of the two groups is also examined as well as the ability of conventional benchmark indices to replicate SRI equity indices.

Schröder studies 29 international SRI equity indices, of which seven have a global investment universe and ten cover European stocks. Then there are 12 indices containing stocks of single countries, of which seven are from United States. Since this paper concentrates on SRI performance in the U.S., we primarily report the performance of the seven US based indices. Table 6 reveals the characteristics of the SRI indices and benchmark indices.

Table 6. Index performance versus benchmark performance

The first column shows the names of the US based SRI indices; the following two columns express annualised mean excess return of the SRI index and the benchmark index (BM). Standard deviations (σ) of the aforementioned groups are expressed in the fourth and fifth column, and the last two columns include Sharpe ratios. Excess returns and Sharpe ratios are calculated using the 1-month US interbank offered rate as risk-free interest rate. Returns are calculated as logarithmic differences to the month before and are denominated in US dollars.

Index Name	Mean	Mean BM	σ	σ BM	Sharpe	Sharpe BM
Calvert Social Index	–0.114	–0.087	0.732	0.631	–0.155	–0.139
FTSE4Good US 100	0.054	0.043	0.692	0.606	0.078	0.071
FTSE4Good US	0.049	0.043	0.697	0.606	0.070	0.071
Humanix 175 US	–0.080	–0.057	0.763	0.629	–0.105	–0.090
KLD Domini 400 Social Index	0.074	0.063	0.554	0.522	0.133	0.121
KLD Broad Market Social Index	–0.064	–0.055	0.721	0.645	–0.089	–0.085
KLD Large Cap Social Index	**–0.074**	**–0.062**	**0.724**	**0.644**	**–0.102**	**–0.097**

Source: Schröder (2006)

In 3 out of 7 cases the mean excess return is higher for the SRI index. When the risk-adjusted returns are compared, the result is slightly worse for SRI indices as in only two cases they outperform the benchmark indices. The observed differences are, however, quite narrow. US based SRI indices seem to perform worse than similar type of global indices: Schröder's study reveals that in 17 out of 29 cases the mean excess return and in 18 cases the Sharpe ratio is higher for the SRI index.

A linear regression of the excess returns of the benchmark index on the excess returns of the SRI index is used in the study to measure the relative performance of the SRI indices. The regression is of the form:

$$r_{i,t}^{SRI} = \alpha_i + \beta_i r_{i,t}^{BM} + \varepsilon_{i,t}, \tag{10}$$

where $r_{i,t}^{SRI}$ is the excess returns of the SRI index, α_i is Jensen's alpha, and $\beta_i r_{i,t}^{BM}$ is the excess returns of the benchmark index. The β_i-coefficient is used to compare the relative risk of the SRI index. Schröder also uses a so called spanning test to find out whether the SRI index can be replicated by the benchmark index. This test is equal to the test of the joint hypothesis H_0: ($\alpha_i = 0$ and $\beta_i = 1$) which suggests that if the null hypothesis is not rejected the SRI index can be replicated by the benchmark index. This means that, on average, there are no differences in risk and return of the SRI and benchmark investments. Table 7 shows the results of the regressions.

Table 7. Regression-based tests of the SRI and benchmark indices

The estimations are based on Equation 10. *, **, *** = H_0 rejected at a significance level of 10%, 5%, 1%, respectively. The second column shows the adjusted R^2, the third column contains the estimated values for the parameter α_i, and the fifth column contains the results for the β-coefficients and for the test documented in the first row of the same column. The last column shows the results for the spanning tests.

Index Name	Adj. R^2	Alpha H_0:α_1=0	Beta H_0:β_1=1	Spanning Test H_0:(α_1=0 and β_1=1)
Calvert Social Index	0.973	–0.014	1.144***	***
FTSE4Good US 100	0.893	0.0073	1.079**	*
FTSE4Good US	0.906	0.0012	1.095***	***
Humanix 175 US	0.953	–0.013	1.186***	***
KLD Domini 400 Social Index	0.967	0.008	1.044***	***
KLD Broad Market Social Index	0.984	–0.003	1.108***	***
KLD Large Cap Social Index	**0.982**	**–0.004**	**1.155*** **	***

Source: Schröder (2006)

Table 7 shows that spanning is rejected for six SRI indices at a significance level of 1 %, and for one at a level of 10 %. This means that there is a difference in relative risk compared to the benchmark. The risk-adjusted return is almost the same but the β-coefficients are higher. The high values of the adjusted R^2 suggest that the SRI indices can be strongly approximated by the benchmark indices. The alphas are quite close to zero, indicating no significant deviations from the estimated returns.

Schröder concludes that the SRI screens do not significantly harm or improve the SRI performance compared to the benchmarks. Schröder finds the former result interesting as the investment universe is reduced by

the SRI screening process, which should therefore lead to a reduction in the risk-adjusted return.

Statman (2006) states that some of the earlier studies about the performance of U.S. mutual funds by e.g. Hamilton et al. (1993) and Statman (2000) do not reveal the relative returns of stocks of socially responsible companies due to the expenses that create gaps between the returns of stocks and the returns of mutual funds that include these stocks. The studies only show that there is no statistically significant relationship between returns of socially responsible mutual funds and returns of conventional funds.

Statman uses an approach similar to that of Schröder's (2006) and compares indices of stocks of socially responsible companies to indices of conventional companies. The time horizon used in the study is May 1990 through April 2004 and the returns of four SRI indices are analysed. The indices are the DS 400 Index, the Citizens Index, the DJ Sustainability Index-US, and the Calvert Index. The performance of the indices is compared to the performance of the S&P 500.

A modified version of the Sharpe ratio is used in the study to exhibit the performance of the DS 400 Index and other SRI indices. The equation is:

$$\alpha_S = R_F + \left(\frac{R_{DS} - R_F}{SD_{DS}} \right) SD_{SP} - R_{SP}, \tag{11}$$

where R_F is the T-bill return, R_{DS} is the return on the DS 400 Index, SD_{DS} is the standard deviation of the return of the DS 400 Index, SD_{SP} is the standard deviation of the return of the S&P 500 index, and R_{SP} is the return on the S&P 500 index. Basically the α_S shows the excess return of the DS 400 Index over the return of the S&P 500 index, where the DS 400's standard deviation is modified to have the S&P 500's standard deviation.

Table 8 shows the performance of the DS 400 during the overall study period. The DS 400 outperformed the S&P 500 in mean monthly return by 0.10 percentage points. However, the standard deviation of the DS 400's returns was higher but the risk adjusted return measured by the Sharpe ratio was still higher (not shown in Table 8). The monthly alpha of the DS 400 was 0.09 percentage points higher than that of the S&P 500 but the difference is not statistically significant. The alpha-s of the DS 400 shows a minor excess return over the return of the S&P 500. Statman mentions that the S&P 500 was strongly tilted toward large-capitalization stocks and to a certain extent toward value stocks, whereas the DS 400 was tilted toward large-capitalization stocks and growth stocks. This phenomenon has been noticed in several studies and it has been said to explain the possible outperformance of SRI over the conventional investment assets during the bull market in the late 1990s.

Table 8. The performance of the DS 400 and the S&P 500 indices in May 1990 through April 2004

Table shows the performance characteristics of the DS 400 Index and the S&P 500. The third paragraph expresses the standard deviation of returns, the fourth paragraph contains the monthly alpha, and the last paragraph shows the Alpha-s. The t-statistic is in parentheses.

Index name	Mean monthly returns (%)	SD of returns	α	α_S
DS 400 Index	1.10	4.58	0.11 (1.39)	0.01
S&P 500 Index	1.00	4.03	0.02 (0.63)	
DS minus S&P	0.10	0.55	0.09	

Source: Statman (2006)

Table 9 shows the relative underperformance of the SRI indices in the beginning of the millennia. The S&P 500 outperformed the SRI indices in the period when the dot-com bubble bursted, which marked the beginning of a mild market slowdown. In the period all the five indices had negative

mean monthly returns, the S&P 500 performing better than the others. The result is similar with the alphas which, however, are not statistically significant. The values of alpha-s show, that the DS 400 gave the best excess return.

Table 9. The performance of four SRI indices and the S&P 500 in May 2000 through April 2004

Table contains the four SRI indices used in the study; in addition to the DS 400 the other three are the Citizens Index, the DJ Sustainability Index-US, and the Calvert Index.

Index name	Mean monthly returns (%)	SD of returns	α	α_S
DS 400 Index	-0.37	5.02	-0.12 (-0.63)	-0.03
Citizens Index	-0.71	6.27	-0.24 (-0.86)	-0.19
DJ Sust. Index US	-0.65	5.66	-0.28 (-0.79)	-0.21
Calvert Index	-0.48	5.76	-0.11 (-0.80)	-0.06
S&P 500 index	-0.32	4.90	-0.06 (-0.80)	

Source: Statman (2006)

According to Statman the relative underperformance of the DS 400 was primarily caused by differences in industry weights. The DS 400 includes more information technology and telecommunication service firms than the S&P 500. As it was mentioned earlier, this sector faced a market turmoil which obviously had its negative effect on the performance of the DS 400 Index. The correlation between returns of the DS 400 and returns of the S&P 500 during 1990-2004 was very high, 0.983. However, the differences between the two indices' returns were occasionally large. Statman reports that mean difference between the returns of the DS 400 and the S&P 500 was 2.49 percentage points during 12-month periods.

Overall, Statman mentions that there is some evidence of relative outperformance of socially responsible indices over the S&P 500. The test results reveal that the hypothesis suggesting that returns of socially responsible companies are equal to those of conventional companies can not be rejected due to the lack of statistical significance with alphas.

Diltz (1995) studies whether ethical screening has an impact on portfolio performance. He uses the ratings of individual firms provided by the Council on Economic Priorities, who examines eleven different SRI criteria of a firm. The criteria include, for example, environmental performance, nuclear involvement, and military business. Of 159 firms studied, Diltz constructs fourteen portfolio pairs, of which the first portfolio consists of firms receiving the highest rating for a certain ethical screen, and the other portfolio consists of firms receiving the lowest rating.

As a basic performance measurement Diltz estimates market model alphas for the fourteen pairs of portfolios. The portfolio consisting of firms with good environmental performance has a significantly higher alpha compared to the portfolio of firms with poor performance in the same category. Alphas are also significantly higher in portfolios of non-nuclear firms compared to firms associated with nuclear industry, and in portfolios consisting of firms operating in defence industry compared to weapons contractors.

Estimating cumulative average abnormal returns (CAARs) provides results that can be controversial. The portfolio of firms operating in South Africa has a significantly higher alpha, as well as the portfolio of firms rated poorly in providing family benefits. On The other hand, a portfolio consisting of combination of firms rated highly on charitable giving, community service, and family benefits performs significantly well.

Diltz concludes that ethical screening does have neither negative nor positive impact on portfolio performance. He considers the result as a

positive sign for individuals and institutions interested in socially responsible ownership. Diltz finds it significant that the additional ethical screens do not seem to restrict the maximization of portfolio return for a given systematic risk.

Derwall et al. (2005) define eco-efficiency as “the economic value a company adds relative to the waste it generates when creating that value”. They focus on the environmental perspective of social responsibility in their study and test whether more eco-efficient (or environmentally more responsible) companies deliver a long-run premium or penalty. Two mutually exclusive stock portfolios, with distinctive eco-efficiency characteristics, were built and ranked. The ranking is based on Innovest Strategic Value Advisors’ rating system, which provides ratings on companies based on eco-efficiency and within each industry companies are rated from best to worst.

The other portfolio built is the high-ranked portfolio and it consists of companies that are rated highest and whose capitalization is 30 % of the total capitalization of the companies rated by Innovest. The other, low-ranked portfolio consists of the lowest rated companies with a 30 % share of the total capitalization. The market proxy used in the study is the Center for Research in Security Prices database (CRSP).

Basic statistics show that the high-ranked portfolio outperformed the market proxy and the low-ranked portfolio. Mean return for the high-ranked portfolio was 12.2 % during the period of 1995–2003. The market proxy returned 11.31 % and the low-ranked portfolio 8.87 %. The volatility of the high-ranked portfolio was the highest of all (17.82 %), yet the Sharpe ratio being the best (0.46). Same figures for the market proxy were 17.07 % and 0.42; and 17.01 % and 0.28 for the low-ranked portfolio, respectively.

In order to account for differentials in the portfolios’ market risks Derwall et al. used the CAPM and an ordinary-least squares regression. This CAPM

framework provides performance results, which suggest that the performance of the market proxy was not significantly different from that of the other two portfolios. The difference between the alphas of the two ranked portfolios is positive of 3.05 %, meaning that the high-ranked portfolio exhibited greater annual market risk-adjusted return than the low-ranked portfolio. However, the difference is not statistically significant.

The authors test whether the previous results are industry sensitive, which would mean that sector exposures primarily drive SRI portfolio returns. A new model is used and it is composed of the excess market return and three industry factors orthogonal to the primary factor. The model is of the form:

$$R_{it} - R_{ft} = \alpha_i + \beta_{0i}(R_{mt} - R_{ft}) + \beta_{1-3i} IP_{1-3t} + \varepsilon_{it}, \quad (11)$$

where R_{it} is return on portfolio i in month t, R_{ft} is one-month U.S. T-bill rate at t, α_i is Jensen's alpha, β_{0i} is beta, R_{mt} is return on a value-weighted market proxy in month t, IP_{1-3t} represents three factors (principal components) capturing industry effects, and ε_{it} is an error term.

According to the authors running this regression gives industry bias-free alpha estimates. The annual return difference between the high-ranked and low-ranked portfolios increases from 3.05 % to 3.82 %, which suggests that industry exposures had an impact on the earlier results. However, the model intercept is not statistically significant.

Derwall et al. use Carhart's four-factor model and they also add three additional control variables in to it, in order to decrease biases caused by style tilts, e.g. size and momentum effects, in stock portfolios. The four-factor model used is of the form:

$$R_{it} - R_{ft} = \alpha_i + \beta_{0i}(R_{mt} - R_{ft}) + \beta_{1i} SMB_t + \beta_{2i} HML_t + \beta_{3i} MOM_t + \varepsilon_{it}, \quad (12)$$

where SMB_t is return difference between a small-cap portfolio and a large-cap portfolio in month *t*, HML_t is return difference between a value portfolio and a growth portfolio in month *t*, MOM_t is return difference between a portfolio of past 12-month "winners" and a portfolio of past 12-month "losers" in month *t*. The extended seven-factor model is of the form:

$$R_{it} - R_{ft} = \alpha_i + \beta_{0i}(R_{mt} - R_{ft}) + \beta_{1i}SMB_t + \beta_{2i}HML_t + \beta_{3i}MOM_t + \beta_{4-6i}IP_{1-3t} + \varepsilon_{it} \quad (13)$$

Running the four-factor model (Equation 12) gives greater and good adjusted R^2s compared to the earlier regression. The additional three variables are significant and on the *SMB* the coefficient is negative, suggesting a bias toward large-cap stocks in the Innovest database. *HML*'s coefficient reveals that the high-ranked portfolio was growth-oriented whereas the low-ranked portfolio was more value-oriented. The momentum factor coefficients were significantly negative, which surprised the authors. This finding suggests that stocks with bad and stocks with good past-year performance are rated poorly in the eco-efficiency ratings. The return difference between the two portfolios is 5.06 percent a year being significant at the 10 percent level. The portfolios do not significantly differ in exposure to market risk

Running the seven-factor model (Equation 13) that takes into consideration industry tilts show that the return difference increases to 6.04 percent a year being significant at the 5 percent level. Also the differences in exposure to market risk increase as *SMB* and *HML* are taken into account.

Derwall et al. conclude that the most eco-efficient large-cap companies outperformed their less eco-efficient counterparts during the period of 1995–2003. Differences in market sensitivity, investment style, or industry bias can not explain the performance difference. Adopting environmentally responsible behaviour into investment decisions seems to be beneficial.

The authors do not see a clear reason why the eco-efficiency premium exists. They mention one explanation that suggests the market is unable to price eco-efficiency in an efficient way. The study reveals that environmentally sensitive industries, like electric utilities, chemistry, and petroleum, face a lower eco-efficiency premium. In these industries investors may consider environmental information more closely when making investment decisions and the information is correctly priced, whereas in other sectors where environmental information is not being utilized as well, the market does not price the information appropriately.

3.2 Arbitrage pricing theory and SRI

Stephen Ross introduced the arbitrage pricing theory (APT) in 1976 which primarily assumes that there is interrelationship between the returns of securities. The relationship is caused by a macroeconomic factor or factors that affect two securities at the same time. The capital asset pricing model also recognizes the correlation between securities but unlike the APT, it does not specify the industrial or market factors behind the correlation. (Ross et al., 2005)

Dhrymes (1998) describes the APT by stating that the returns on a capital asset is a noisy function of the risk-free rate of return. Treasury Bills, for example, provide practically risk-free return but the noisy part of the return of an asset is a random variable that depends on variance components or factors. These components represent different sources of risk and the APT tries to identify them and measure their effect on the total risk.

Earlier we examined socially responsible investing in the modern portfolio theory framework. In this section we introduce some of the SRI studies that use the APT in order to analyze the performance of ethical investing, and to find specific factors causing the possible performance difference between socially responsible and conventional investing.

DiBartolomeo and Kurtz (1999) analyze the return differences between the Domini Social Index (DSI) and S&P 500, and try to show that the socially responsible behaviour of companies is not the factor causing the differences. The authors constructed reweighted DSI portfolios by using an arbitrage pricing theory style model. The portfolios were supposed to mimic the behaviour of the S&P 500 and to minimize stock specific risk as much as possible. The APT model used is of the form:

$$R_{it} = R_{ft} + \sum_{k=1to7} P_{kt} * \beta_{ik} + e_{it}, \qquad (14)$$

where R_{it} is return on stock i during period t, R_{ft} is risk free rate of return during period t (three month Treasury Bill), $_k$ is a macroeconomic variable, P_{kt} is an unexpected change in macroeconomic variable k during period t, β_{ik} is sensitivity of returns on stock i to changes in variable k, and e_{it} is error term for stock i during period t under traditional CAPM assumptions. The sample period was May 1990 through January 1999.

According to the results of the study, the (unoptimized) DSI outperformed S&P 500 as the mean monthly return for the former was 1.77 and 1.59 for the latter. The DSI had a higher average beta of 1.10 (1.04 for S&P 500) and also the overall volatility of the return was higher, 4.13 % per month vs. 3.84 %.

When the optimized (rebalanced) DSI portfolio (DSIO) was compared to S&P 500, the differences narrowed. The mean monthly return of the DSIO was reduced to 1.49 % and the average beta to 1.03. Also the overall return volatility of the DSIO became lower, 3.78 % as compared to 3.84 % of the S&P.

Performance study was also run for two sub-periods, May 1990 through August 1995 and September 1995 through January 1999. The results are very similar to the results for the overall period but the authors find a

notable difference between betas. The test portfolios had higher beta than S&P 500 during the first period, which, in the bullish market, resulted in a positive return contribution from active systematic risk. However, in the second period test portfolios had a lower beta and it therefore resulted in a negative return contribution from active systematic risk, as the market was still growing.

DiBartolomeo and Kurtz do not find any evidence of a so called social factor. They believe the relative outperformance of the Domini Social Index can be explained by the factor and industry bets that are caused by the social screening process and that are included in fundamental portfolio characteristics such as P/B and P/E ratios. The DSI is also more growth oriented than S&P 500 and therefore it should outperform in the rising market. The authors use an APT model to prove that when an investor, in an efficient market, chooses two portfolios with similar risk profiles, the returns should also be similar. After optimizing the DSI (matching the risk profile with S&P 500) the return performance does not statistically differ from that of the S&P and therefore the arbitrage pricing theory seems to hold up in this study.

Blank and Carty (2002) (like Derwall et al., 2005) use the concept of eco-efficiency in their study, which means the theorized tendency of environmentally conscious companies to deliver superior returns. Blank and Carty use an APT model and Innovest ratings to create an environmentally responsible version of the S&P 500.

Innovest claims that its ranks capture significant information not utilized or available to most investors, which could help determine the price at which stocks should trade. Blank and Carty analyze this hypothesis and study which results support it. The ratings were analyzed in three stages to determine whether the add value by identifying those companies that the market will reward for their environmental responsibility.

The first stage computed the returns of portfolios composed of the top-ranked companies and of all rated companies. The top-rated stocks outperformed the rated universe and even the total volatility of the portfolio of top-rated stocks is lower, which produces higher risk-adjusted return.

In the second stage the authors wanted to neutralize the factor bets that drive systematic risk, and determine whether the Innovest ratings add value. In order to create portfolios in which the factor bets are normal the authors use a model based on the arbitrage pricing theory. The model utilizes factor analysis to identify more than 20 systematic sensitivities of the US market, which means that every US stock has a co-efficient of risk on each factor relative to the market.

After neutralizing factor bets the authors constructed portfolios that have the same aggregate risk profile as the S&P 500 Index but which favours stocks of the companies that support green values and are ranked well by Innovest. On average the Innovest portfolio clearly outperformed the S&P 500, as seen in Table 10.

Table 10. A comparison of the S&P 500 Index and Innovest portfolio

The second row expresses the number of S&P 500 stocks rated by Innovest. Pearson's correlation coefficient is calculated between Innovest portfolio and S&P 500.

Characteristics	1997	1998	1999	2000
No. of S&P 500 stocks in Innovest Universe	128	153	248	363
Pearson's correlation coefficient between the portfolios	0.995	0.990	0.994	0.725
Tot. return of Innovest portfolio (%)	32.41	30.04	23.47	3.40
Tot. return of S&P 500 (%)	33.36	28.58	21.04	-9.10
Sharpe ratio of Innovest portfolio	1.99	1.96	1.83	-0.19
Sharpe ratio of S&P 500	-6	12	26	81

Source: Blank and Carty (2002)

Finally the authors compared the performance of top rated and bottom rated companies in the most environmentally sensitive industries. Annualized return in 1997–2000 for bottom rated stocks was 10.19 % and 17.99 % for the top rated portfolio. Annualized volatilities were 20.40 and 19.65, respectively.

Blank and Carty conclude that eco-efficiency is ought to be taken seriously by asset management firms since its outperformance has been evident. Innovest claims that it has found the eco-efficiency anomaly, which Blank and Carty are willing to agree with. Yet, one might criticise the shortness of the time period used in the study as it is only four years.

3.3 SRI as a part of value investing

Fama and French (1992) challenge the most basic prediction of Sharpe-Lintner-Black model, which assumes that average stock returns are positively related to market betas. Fama and French study US stock returns over the period of 1962–1989 and discover that book-to-market equity has a strong role in average returns. Basically, firms with low stock prices have historically earned better returns than firms valued highly in the market.

Kurtz (2005) mentions that Fama and French's finding is from social investors' point of view hard to accept since their portfolios often exhibit a growth bias. The Domini Index has a higher return volatility than the S&P 500 and it is more growth oriented, which therefore causes growth bias in the bull market.

Abramson and Chung (2000) study socially responsible investing and try to find out how it fits to the findings of Fama and French on value investing. Abramson and Chung search for attractive stocks by concentrating on relative dividend yield and relative market capitalization-

to-revenues. The authors test the performance of value stocks, defined by the above-mentioned metrics, within the Domini 400 Social Index. Value subsets of the Domini index are being compared to standard value indices and the purpose of the study is to determine whether it causes significant costs when investing in a socially screened value style for the period of 1990–2000.

Abramson and Chung consider two strategies: rebalance strategy and buy-and-hold strategy. The former strategy is based on a portfolio that is being rebalanced quarterly, as the portfolio in the latter strategy stays the same through the sample period. The value benchmarks used are the Russel 1000 Value, the S&P Barra Value, and the Wilshire Large Cap Value.

Purely examining the return performance of both strategies the results seem positive. The average annualized return for the three value benchmarks is 15.10 %, as the rebalance strategy returned 17.45 %. The rebalance strategy faces slightly higher volatility but the Sharpe ratio is 0.87 versus an average of 0.80 for the benchmarks. The buy-and-hold strategy gives an annualized average return of 16.15 %, which is not high enough when the volatility is taken into consideration. The Sharpe ratio for this strategy is 0.76.

In spite of the fact that the SRI value strategies, at least the rebalance strategy, did well in the test, the authors remind that results could have been different if the holding periods had as well been different. They conclude, in any case, that socially responsible investing is style-neutral and it is possible to invest in ethical value stocks in order to get a competitive return. A passive value style SRI does not seem to create a significant cost either. It also seems that a consistently diversified subset of value stocks can be built from the Domini Index.

4. AN EMPIRICAL STUDY OF THE PERFORMANCE OF SOCIALLY RESPONSIBLE INVESTING

In this chapter we examine and compare the performance of SRI to a conventional stock index. We use the Calvert Social Index as a proxy for socially responsible investing, whereas the S&P 500 index represents conventional investing. Previous studies on the subject that are mentioned in this paper primarily use data that have been acquired before the millennia. We, however, concentrate on more recent data as the Calvert Index was established April 28, 2000. Performance comparison and analyses are therefore made covering data from May 2000 through November 2008.

By using newer data we examine how competitive SRI has been and whether the results are similar to those of the previous studies. The data are divided into three subperiods, the first covering the period of May 2000 - October 9, 2002. The second period is October 10, 2002 to June 13, 2006, and the last period is June 14, 2006 to November 28, 2008.

The first subperiod was the time of the dot-com bubble when the market reacted negatively to the fall of many Internet-based companies. The second subperiod marks the beginning of a new rise in the stock market. This bullish period continued as far as to the final quarter of 2007 but we limit our subperiod to end ealier. The last subperiod is especially interesting as the market kept rising for the first 16 months, whereupon notorious subprime news led to a strong downward slope in the value of the S&P 500. Figure 1 illustrates those market movements in the mentioned time periods.

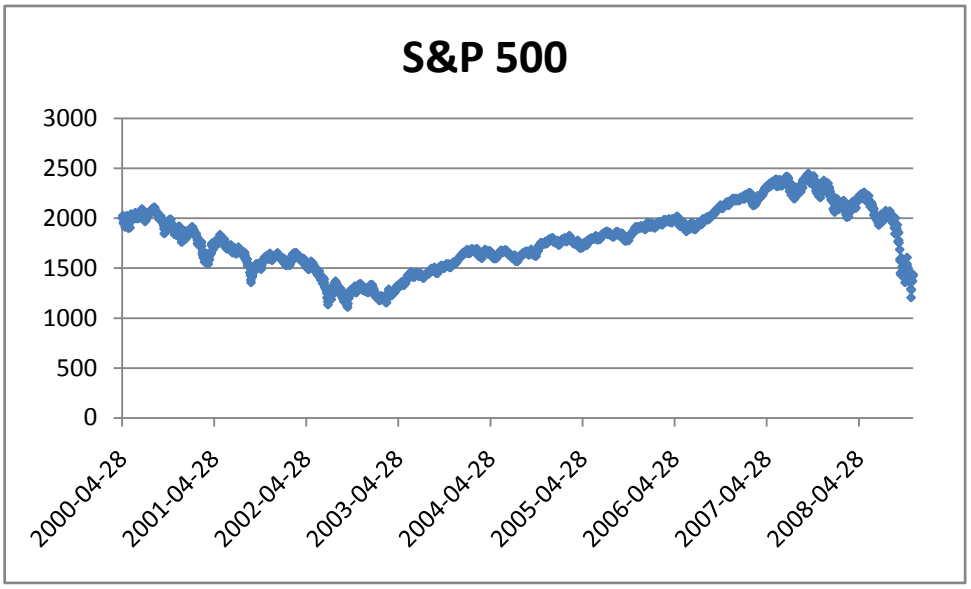

Figure 1. Value graph of the S&P 500 in 2000–2008

The figure presents the values (numerically in the vertical axis) of the S&P 500 in the period of April 28, 2000 through November 28, 2008.

Table 11 shows sector weightings of the S&P 500 and Calvert. The industrial structures of the two indices are rather similar as information technology and financials are leading sectors in the both. The Calvert, however, has notably larger weightings in information technology and financials, whereas the weightings of all sectors in the S&P 500 are more balanced and diversified. It was mentioned in some of the earlier SRI studies about relative outperformance of the Domini 400 Social Index, which could be explained by its tilt toward IT and growth companies.

Table 11. Sector weightings of S&P 500 and Calvert

Table shows the sector weightings of the indices. The weightings may change whenever companies are removed from or added in the index. The data in the table is from the year 2008.

S&P 500	%	Calvert	%
Information Technology	15.96	Information Technology	26.45
Financials	15.85	Financials	21.34
Energy	13.36	Health Care	15.63
Health Care	13.09	Consumer Staples	11.04
Consumer Staples	12.20	Consumer Discretionary	8.64
Industrials	11.08	Industrials	7.23
Consumer Discretionary	8.48	Telecomm Service	3.95
Utilities	3.56	Energy	2.92
Materials	3.37	Materials	1.60
Telecomm Service	3.05	Utilities	1.20
	100.0		100.0

Source: Standard & Poor's (2008), Calvert (2008)

Figure 1 already showed the value history of the S&P 500 but in Figure 2 one can see how closely the S&P and the Calvert follow each other during 2000–2008. The Nasdaq, on the other hand, reacted more heavily on the dot-com bubble and the drop in its value was far greater than with the other two. Also the recovery has been longer and slower, and the Nasdaq did not reach its base value after the year 2000, whereas the S&P and the Calvert exceeded their base values in May 2006 and May 2007, respectively.

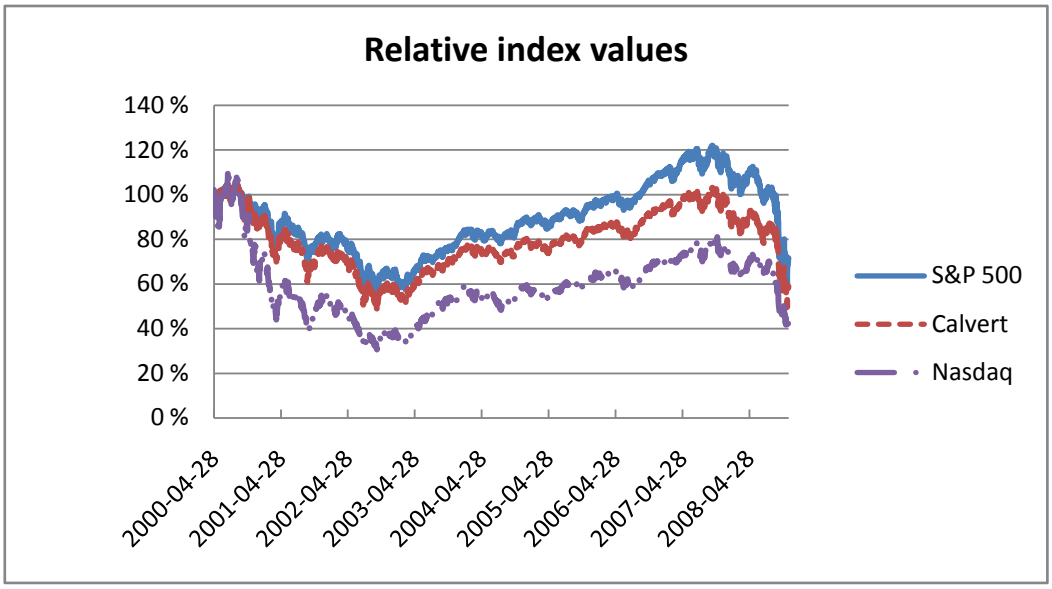

Figure 2. Relative index values in 2000–2008

Figure shows the relative index values of the Nasdaq, the S&P 500, and the Calvert indices. The base value of each index is 100 %, and the base date is April 28, 2000.

At first we measure the basic performance of the Calvert and S&P 500 during the period of 2000–2008. Table 12 shows that mean logarithmic returns per annum for the Calvert, the S&P 500, and Nasdaq are -6.16 %, -3.88 %, and -9.69 %, respectively. Similarly, the S&P 500 outperforms the two other indices when measured by arithmetic returns. In the first subperiod the returns were highly negative, especially with the technology-based Nasdaq. In the second subperiod the returns of the Calvet and the S&P 500 were close to each other, whereas the Nasdaq (including a lot of growth companies) outperformed the other two. Interestingly, the Calvert underperformed the Nasdaq in the last subperiod.

Overall the results differ quite clearly, for example, from that of Statman (2006) whose data covers the period of 1990–2004. He mainly reports positive mean monthly percentage returns apart from the period of 2000–2004. Especially in May 1990 - April 2004 the mean monthly returns of Domini Social Index are relatively high, 1.10 %, whereas our results indicate positive per annum returns only in the second subperiod.

Table 12. Index returns from May 2000 through November 2008

The second column shows the logarithmic mean returns per annum (calculated by multiplying logarithmic day returns by 261, which is presumed to be the average number of trading days per year. Then, arithmetic average is taken from the logarithmic day returns). The third column shows the mean return per annum based on the day returns and presuming 261 trading days.

Indices	**Log mean p.a.**	**Mean R_t p.a.**
May 2000 - Nov 2008		
Calvert	-6.16 %	-3.57 %
S&P 500	-3.88 %	-1.68 %
Nasdaq	-9.69 %	-5.39 %
May 2000 - Oct 2002		
Calvert	-29.5 %	-22.9 %
S&P 500	-24.2 %	-19.5 %
Nasdaq	-48.5 %	-33.1 %
Oct 2002 - Jun 2006		
Calvert	13.9 %	16.2 %
S&P 500	14.2 %	16.4 %
Nasdaq	17.6 %	21.2 %
Jun 2006 - Nov 2008		
Calvert	-12.9 %	-8.81 %
S&P 500	-10.6 %	-6.74 %
Nasdaq	**-11.9 %**	**-7.77 %**

Following the methodology of technical analysis we use moving average in order to partially forecast the future direction of the Calvert's prices. In this case, however, the estimated prices are ex post values that can only be

compared to the actual and observed values. Figure 3 shows the 90-day moving average of the Calvert.

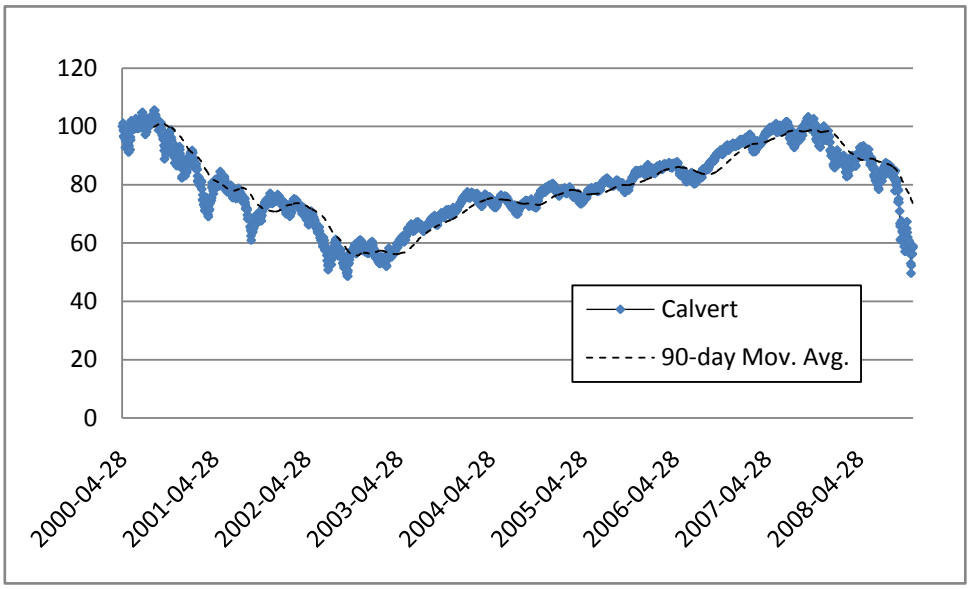

Figure 3. 90-day moving average of Calvert

The figure shows the 90-day moving average of the Calvert Social Index. The vertical axis indicates the index values. Moving average values are calculated starting from Aug 31, 2000 as the inception date of the Calvert is Apr 28 and no earlier data can therefore be obtained.

From Figure 3 one can visually estimate the ability of 90-day moving average to forecast the actual values of the Calvert. Regression results tell in more details how accurate moving average is. Table 13 shows results of regressions run on 30-day moving averages and actual values of the Calvert and S&P. In regressions, moving averages are independent factors and the actual values are dependent ones.

30-day moving average seems to forecast future values of the indices rather well. There is only a minor difference between the two indices, as the adjusted R square is higher for S&P 500 more often. It is obvious and not surprising that the forecasting ability of the moving average is notably weaker in the last period.

Table 13. 30-day moving average statistics

The table shows statistics of regressions run on the 30-day moving average and actual index values. Adjusted R square is in the second column and t-statistics of the beta in the third column, in which "sig" means that the result is significant at the 95 % confidence level. The first period is exceptionally shorter than normally (starting from Jun 9, 2000) as the inception date of the Calvert is Apr 28, 2000 and no earlier data can therefore be obtained.

Index	Adj. R^2	t-stat
Jun 2000 - Nov 2008		
Calvert	94.78 %	sig
S&P 500	96.22 %	sig
Oct 2002 - Jun 2006		
Calvert	96.72 %	sig
S&P 500	97.75 %	sig
Jun 2006 - Nov 2008		
Calvert	87.92 %	sig
S&P 500	87.91 %	sig

From Table 14 it can be numerically seen the visual evidence of Figure 3. It also tells how large the difference is between the abilities of 30 and 90-day moving averages in forecasting the actual values. Similarly to 30-day moving averages, the adjusted R squares are higher for S&P in the first two periods but not in the last one. The R^2 values drop below 70 % in the third period, when Calvert's values seem to be more predicable compared to the S&P. The bullish (and rather stable) period in 2002–2006 is longer than the other two periods and by using moving average with ex post values gives unquestionably more accurate predictions compared especially to the highly volatile last period.

Table 14. 90-day moving average statistics

The table shows statistics of regressions run on the 90-day moving average and actual index values. Adjusted R square is in the second column and t-statistics of the beta in the third column, in which "sig" means that the result is significant at the 95 % confidence level. The first period is exceptionally shorter than normally (starting from Aug 31, 2000) as the inception date of the Calvert is Apr 28, 2000 and no earlier data can therefore be obtained.

Index	Adj. R^2	t-stat
Aug 2000 - Nov 2008		
Calvert	85.23 %	sig
S&P 500	89.45 %	sig
Oct 2002 - Jun 2006		
Calvert	92.78 %	sig
S&P 500	95.08 %	sig
Jun 2006 - Nov 2008		
Calvert	67.09 %	sig
S&P 500	63.61 %	sig

It can be argued about the usability of moving average in estimating future values. In this study, however, we use ex post values and instead of trying to predict future values we compare the relationship between the future index values and its historical values. Secondly, we compare the mentioned relationship between the two indices.

Statman and Scheid (2004) and Statman (2006) use expected dispersion in order to compare SRI indices and S&P 500. In the case of two assets, expected dispersion is the difference between the return of each asset and a portfolio that combines the two in equal proportions. The formula is:

$$Expected\ Dispersion = \sigma\sqrt{(1-\frac{\rho}{2})}\,, \qquad (15)$$

where σ is the standard deviation of the returns of the two assets, and ρ is the correlation between the returns of the two. We measure dispersion

between the S&P 500 and the Calvert by calculating standard deviation and correlation from daily returns.

Tracking error is a useful tool for investor whose portfolio should track the returns of the selected index. Portfolio manager makes weighting deviations, intentionally or not, which leads to deviations from the benchmark. Therefore tracking error is also called active risk due to portfolio manager's actions. Despite the fact that the Calvert is not supposed to track the returns of any other index, we measure tracking error between the Calvert and the S&P 500. Tracking error and expected dispersion are shown in Table 15.

Table 15. Return differences from S&P 500

All figures are calculated from daily logarithmic returns. Standard deviations of daily returns are in the second column, return correlation in the third, expected dispersion in the fourth, and annualized tracking error in the fifth column.

	SD of Daily Returns	Corr. to S&P 500	Expected Dispersion	Tracking Error
May 2000 - Nov 2008				
Calvert	1.391	0.974	0.963	5.214 %
Nasdaq	1.782	0.884	1.163	14.207 %
S&P 500	1.295			
May 2000 - Oct 2002				
Calvert	1.645	0.974	1.093	6.867 %
Nasdaq	2.502	0.867	1.525	23.722 %
S&P 500	1.398			
Oct 2002 - Jun 2006				
Calvert	0.918	0.985	0.634	2.660 %
Nasdaq	1.120	0.918	0.735	7.672 %
S&P 500	0.861			
Jun 2006 - Nov 2008				

Calvert	1.669	0.974	1.195	6.113 %
Nasdaq	1.720	0.962	1.220	7.547 %
S&P 500	1.669			

Table 15 shows that the standard deviation of daily returns is the lowest on the S&P 500 in every period. The last period, however, is relatively more volatile in the returns of the S&P when the standard deviation of daily returns equals that of the Calvert. The Nasdaq has the highest standard deviations in every period, the first subperiod being the most volatile with the standard deviation of 2.502.

The correlation between the daily returns of the Calvert and those of the S&P is over 0.97 in every period. Not surprisingly, the correlation between the Nasdaq and the S&P is lower, especially in the first subperiod (0.867). Expected dispersion of the Calvert is the highest in the last subperiod, whereas the Nasdaq's dispersion is the highest in 2000–2002. Tracking errors are annualized numbers in order to make them comparable. The tracking error of the Calvert is the highest in the first subperiod (6.867 %). The same number for the Nasdaq is as high as 23.722 % in the first subperiod. The second subperiod, the time of bullish market, narrows the return differences between the S&P and the Calvert as the tracking error is only 2.660 %.

As it can be seen from Figure 1, the S&P and the Calvert move very closely together in the period of 2000–2008. A closer investigation on the relationship of the two indices can be done by running a regression, in which the S&P returns are independent variables, and the Calvert returns are dependent variables. This Ordinary Least Squares (OLS) regression is based on the Capital Asset Pricing Model (CAPM) and it should tell more about the effect the S&P has, or has not, on the returns of the Calvert.

Table 16 provides results on the regressions run on the indices in every subperiod (see Appendix 1 for detailed statistics). For comparison reasons regressions were also run on Nasdaq. Adjusted R squares are extremely high between the Calvert and the S&P, meaning that a high proportion of the variation in the Calvert returns is accounted for by the returns of the S&P. The figure is over 95 % in every subperiod, being the highest (96.99 %) in the second period when the market was rising. Similarly with Nasdaq, the adjusted R square is the lowest in the first subperiod when several technology and growth companies fell.

The beta coefficients of the Calvert are close to the market (in this case the S&P 500) beta. The beta for the whole time period is as low as 1.05. In the first subperiod the beta is the highest (1.22) and in the last subperiod it falls below one (0.97), which may be a consequence of the Calvert's relative underweighting in the financial sector when compared to the S&P 500. Not surprisingly the Nasdaq has higher betas than the Calvert and the difference is the greatest (0.30) in the second subperiod. All the alphas are extremely close to zero but none of them, however, shows statistical significance.

Table 16. Regression statistics

The table shows the results of regressions run on the indices. The independent (explanatory) variable consists of the daily logarithmic returns of the S&P 500, whereas the daily logarithmic returns of the Calvert and the Nasdaq are dependent variables. The second column shows the adjusted R square, the beta coefficient is in the third column, and the fourth column shows the constant alpha. All beta coefficients are significant at the 95 % level. None of the alphas is significant at the same level. Appendix 1 includes detailed information of the regressions.

	Adj. R^2	β	α
May 2000 - Nov 2008			
Calvert	94.80 %	1.05	>-0.01
Nasdaq	78.14 %	1.22	>-0.01
May 2000 - Oct 2002			
Calvert	94.87 %	1.15	>-0.01
Nasdaq	75.09 %	1.55	>-0.01
Oct 2002 - Jun 2006			
Calvert	96.99 %	1.05	>-0.01
Nasdaq	84.23 %	1.19	<0.01
Jun 2006 - Nov 2008			
Calvert	94.91 %	0.97	>-0.01
Nasdaq	92.60 %	0.99	>-0.01

We use rolling beta in order to analyze the Calvert's fluctuations more carefully in the last subperiod when the beta is lower than one. Rolling beta takes into account earlier data and predicts the future sensitivity of an index (or a stock) to market movements. Figure 4 presents 643-day rolling beta of the Calvert during the final subperiod which is 643 days. The beta is higher than the market beta during the first year and then it falls below one in July 2007. The beta stays right below one for the next months and exceeds one in April, 2008. The beta has the most dramatic drop in September, 2008, of which after it meets its lowest value. Despite the fact that rolling beta gives estimates about the future movements, it uses historic data and therefore it can not be fully trusted. In addition, rolling

beta is usually calculated by using data of 250 trading days prior to the date from which the estimated period begins.

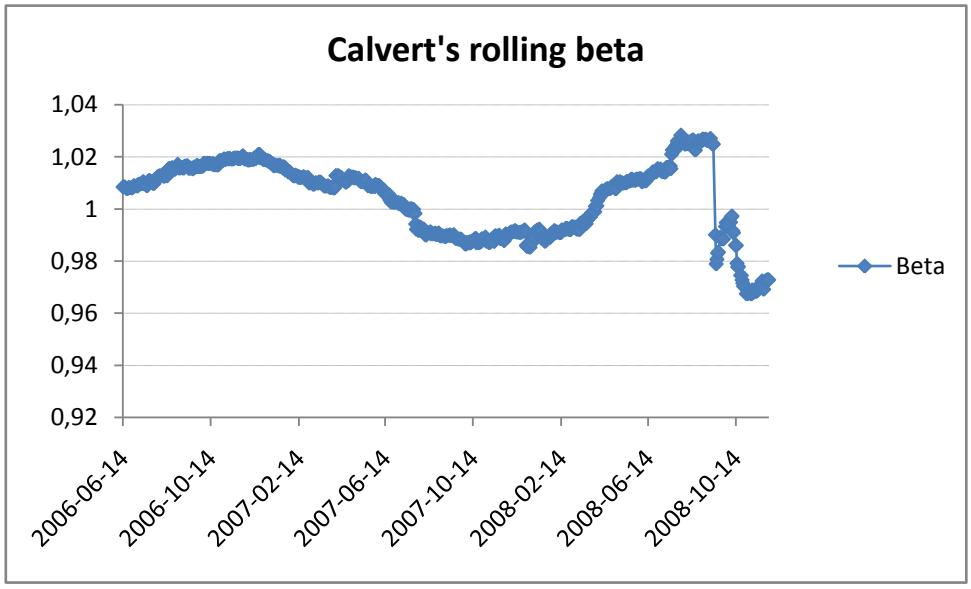

Figure 4. Calvert's 643-day rolling beta

The Figure shows 643-day rolling beta of the Calvert. The beta values are in the vertical axis and the dates in the horizontal axis. The betas are calculated from daily logarithmic returns from 642 days before and after of June 14, 2006.

So far we have examined return differences between social and conventional assets, and the Calvert's sensitivity to market movements. An essential part of performance comparison is to measure the risk-return relationship of assets. One needs to know how much the investment should return at its current risk level and whether superior return is caused by high amount of risk embedded in the investment. Commonly used measures of risk-return relationship are information ratio, Sharpe ratio, Treynor ratio, and Jensen's alpha. Table 17 contains these ratios measured on the Calvert, the S&P, and the Nasdaq.

Table 17. Risk ratios

The Table contains information ratios, Sharpe ratios, Treynor ratios, and Jensen's alphas of the indices. All the figures are in per annum form. U.S. 3-month Treasury constant maturities middle rate presents the risk-free interest rate.

	Information ratio	Sharpe Ratio	Treynor Ratio	Jensen's Alpha
May 2000 - Nov 2008				
Calvert	-43.77 %	-0.406	-0.059	-1.97 %
Nasdaq	-40.90 %	-0.439	-0.080	-4.33 %
S&P 500		-0.327		
May 2000 - Oct 2002				
Calvert	-77.28 %	-1.248	-0.258	-1.23 %
Nasdaq	-102.05 %	-1.288	-0.312	-8.85 %
S&P 500		-1.233		
Oct 2002 - Jun 2006				
Calvert	-4.75 %	0.791	0.132	-0.89 %
Nasdaq	44.73 %	0.854	0.147	1.10 %
S&P 500		0.864		
Jun 2006 - Nov 2008				
Calvert	-36.82 %	-0.605	-0.132	-2.61 %
Nasdaq	-17.75 %	-0.555	-0.121	-1.46 %
S&P 500		-0.522		

The information ratio follows an equation:

$$IR_t = \frac{R_p - R_b}{TE_t}, \quad (16)$$

where R_p is index return, R_b is return of the benchmark index, and TE_t is the tracking error of the index. Basically the upper part of the formula, R_p-R_b, can be defined as active return that is divided by the amount of risk taken relative to a benchmark index. The Nasdaq outperforms the Calvert when measured by the information ratio. In 2000–2008 the information ratios for the Nasdaq and the Calvert are -43.77 % and -40.90 %, respectively. In the second subperiod the ratios are highly negative and

the Calvert outperforms, whereas in the last two subperiods it underperforms relative to the Nasdaq.

The risk-adjusted return, measured by Sharpe ratio, is the highest (-0.327) for the S&P 500 during 2000–2008 when the ratios for the Calvert and the Nasdaq are -0.406 and -0.439, respectively. The Calvert outperforms the Nasdaq only in the first subperiod but the differences between the two are rather narrow in every subperiod. Compared to the results of Schröder (2006), Sharpe ratios differ strongly as the ratio of the Calvert in his study is -0.155 when measured from July 2000 through December 2003. However, the time period also differs along with the risk-free rate used, as Schröder uses 1-month US interbank offered rate.

Unlike Sharpe ratio, Treynor ratio takes into consideration the market return and by using this measure of performance the Calvert hardly outperforms the Nasdaq. The first subperiod heavily punishes the Nasdaq, whereas the other subperiods are more favourable to it. As it was case with Sharpe ratios, the differences are relatively narrow also in Treynor ratios.

Jensen's alpha measures the difference between the realized return and the expected return, which is based on the capital asset pricing model. Jensen's alpha is higher for the Calvert in 2000–2008 (-1.97 % vs. -4.33 %). The first subperiod has once again a highly negative effect on the Nasdaq, as its alpha is -8.85 % compared to -1.23 % of the Calvert. In the second subperiod the Nasdaq's alpha is 1.10 %, whereas the same figure for the Calvert is negative (-0.89 %). The difference between the Jensen alphas of the two in the second subperiod is surprisingly high, 1.15 percentage units for the Nasdaq. The alphas are, however, negative. Schröder (2006) reports that the Jensen's alpha of the Calvert is -1.4 % in 2000–2003, which is close to the alpha (-1.23 %) we report from the period of 2000–2002.

In addition to all the risk-return figures of Table 17 there is also a measure called appraisal ratio that measures the abnormal return per unit of unsystematic risk. The formula is:

$$AR = \frac{\alpha_p}{\sigma(e_p)}, \quad (17)$$

where α_p is Jensen's alpha, and $\sigma(e_p)$ is residual standard deviation (or unsystematic risk). Basically the ratio measures the fund manager's stock picking ability, or when we deal with indices, what type of an effect the company selection criteria have on the index performance. Table 18 shows appraisal ratios of the Calvert and Nasdaq.

Table 18. Appraisal ratios

The table contains appraisal ratios of the Calvert and Nasdaq.

	Appraisal ratio
May 2000 - Nov 2008	
Calvert	-0.384
Nasdaq	-0.322
May 2000 - Oct 2002	
Calvert	-0.200
Nasdaq	-0.219
Oct 2002 - Jun 2006	
Calvert	-0.347
Nasdaq	0.153
Jun 2006 - Nov 2008	
Calvert	-0.430
Nasdaq	-0.194

As the formula of appraisal ratio implies, the higher the ratio, the better the performance of the index. The Nasdaq outperforms Calvert rather clearly, only the first subperiod is more advantageous for the Calvert, which is quite expected. The results are similar to the other risk-return ratios and in

the second subperiod the Nasdaq performs the best. The difference between the appraisal ratios is notably high in the last subperiod (0.236).

5. CONCLUSIONS

Socially responsible investing has become an interesting alternative to numerous individual and institutional investors. The climate change is probably the most important reason behind the increased popularity of this investment style. Investors seek for a possibility to make a difference by investing in companies who provide green energy or who reduce the amount of waste the production process generates. Along with green thinking, investors pay attention to other ethical criteria as well when they choose their investments. Some may be concerned about the negative influence of gambling, tobacco, or alcohol, and therefore they do not want to invest in companies that produce such products. However, socially responsible investing has to be financially beneficial as well in order to maintain its interest among investors.

In this paper we examine previous studies about socially responsible investing and its performance relative to conventional investing. Some studies support ethical investing, whereas some are against it. There are several explanations about the possible underperformance of socially responsible investing, including the assumption of traditional financial theory, according to which SRI portfolios are subsets of market portfolios and for that reason they can not outperform the market portfolio in the long run. Proponents of SRI believe that careful company selection by fund managers may lead to effective portfolios that are ethical and profitable. Most of the studies state, however, that socially responsible criteria do neither harm nor hinder the performance of a portfolio.

In our own empirical study we use slightly newer data compared to previous studies mentioned in this paper. The time period of May 2000 through November 2008 consists of the dot-com bubble, a bullish period, and the subprime/financial crisis. The Calvert Social Index presents socially responsible investing in this study, whereas the well known and

broad-based S&P 500 expresses the nature of conventional investing. The Nasdaq is also included in some of the tests in order to produce wider view of different investing areas. We compare the performance of these indices and find that socially responsible investing underperforms conventional investing in 2000–2008, both in simple returns and risk-adjusted returns. When compared the Calvert to the technology-based Nasdaq, we find that the first outperforms the latter primarily during the dot-com bubble in 2000–2002, whereas the Nasdaq is stronger after this period.

In this study we do not identify possible reasons behind the underperformance of socially responsible investing in 2000–2008. However, the Calvert includes more growth-oriented and information technology companies, from which one can assume that the high drops in 2000–2002 and in 2007–2008 caused by the dot-com bubble and the subprime/financial crisis, would naturally lead to inferior returns in this index. For the same reason some suggest that ethical investing outperformed conventional investing in the late 1990s when the stock market was rising.

Future research could examine more than one socially responsible index and compare their performance during the market shocks present in the time period used in this study. It is also interesting to find out the specific factors behind the underperformance of ethical investing, which no doubt will continue to grow after the market is stabilised.

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APPENDICES

APPENDIX 1 A: Regression statistics, Calvert - S&P 500, May 2000 – Nov 2008

Regression statistics	
Multiple R	0.973656127
R Square	0.948006254
Adjusted R Square	0.947983021
Standard Error	0.003172034
Observations	2240

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.410578	0.410578	40805.64	0
Residual	2238	0.022518	1.01E-05		
Total	2239	0.433096			

	Coefficients	*Std. Error*	*t-stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-8.05888E-05	6.7E-05	-1.20235	0.229353	-0.000212028	5.09E-05	-0.000212	5.085E-05
Beta	1.046046884	0.005178	202.0041	0	1.035892021	1.056202	1.035892	1.0562017

APPENDIX 1 B: Regression statistics, Nasdaq - S&P 500, May 2000 – Nov 2008

Regression statistics	
Multiple R	0.883971
R Square	0.781405
Adjusted R Square	0.781307
Standard Error	0.008334
Observations	2240

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.555681	0.555681	8000.102	0
Residual	2238	0.15545	6.95E-05		
Total	2239	0.711131			

	Coefficients	*Std. Error*	*t-stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.00019	0.000176	-1.08107	0.279784	-0.00054	0.000155	-0.00054	0.000155
Beta	1.216932	0.013606	89.44329	0	1.190251	1.243613	1.190251	1.243613

APPENDIX 1 C: Regression statistics, Calvert - S&P 500, May 2000 – Oct 2002

Regression statistics	
Multiple R	0.974047321
R Square	0.948768183
Adjusted R Square	0.94868763
Standard Error	0.003726779
Observations	638

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.163586	0.163586	11778.16	0
Residual	636	0.008833	1.39E-05		
Total	637	0.172419			

	Coefficients	*Std. Error*	*t-stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-6.73891E-05	0.000148	-0.45573	0.648739	-0.000357762	0.00022298	-0.00035776	0.000223
Beta	1.146373082	0.010563	108.5272	0	1.125630511	1.16711565	1.125630511	1.1671157

APPENDIX 1 D: Regression statistics, Nasdaq - S&P 500, May 2000 – Oct 2002

Regression statistics	
Multiple R	0.866744
R Square	0.751244
Adjusted R Square	0.750853
Standard Error	0.012488
Observations	638

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.299541	0.299541	1920.726	2.6E-194
Residual	636	0.099185	0.000156		
Total	637	0.398726			

	Coefficients	*Std. Error*	*t-stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-0.00042	0.000495	-0.83868	0.401962	-0.00139	0.000557	-0.00139	0.000557
Beta	1.551249	0.035396	43.82609	2.6E-194	1.481742	1.620755	1.481742	1.620755

APPENDIX 1 E: Regression statistics, Calvert - S&P 500, Oct 2002 – Jun 2006

Regression statistics	
Multiple R	0.984874169
R Square	0.969977128
Adjusted R Square	0.969945757
Standard Error	0.001590659
Observations	959

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.07823	0.07823	30918.7	0
Residual	957	0.002421	2.53E-06		
Total	958	0.080652			

	Coefficients	*Std. Error*	*t-stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-3.82335E-05	5.15E-05	-0.74287	0.457743	-0.000139235	6.2768E-05	-0.00013924	6.277E-05
Beta	1.04991702	0.005971	175.8371	0	1.038199329	1.06163471	1.038199329	1.0616347

APPENDIX 1 F: Regression statistics, Nasdaq - S&P 500, Oct 2002 – Jun 2006

Regression statistics	
Multiple R	0.917836
R Square	0.842423
Adjusted R Square	0.842258
Standard Error	0.004448
Observations	959

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.101221	0.101221	5116.226	0
Residual	957	0.018934	1.98E-05		
Total	958	0.120154			

	Coefficients	*Std. Error*	*t-stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	2.6E-05	0.000144	0.180482	0.856812	-0.00026	0.000308	-0.00026	0.000308
Beta	1.194268	0.016697	71.5278	0	1.161502	1.227034	1.161502	1.227034

APPENDIX 1 G: Regression statistics, Calvert - S&P 500, Jun 2006 – Nov 2008

Regression statistics	
Multiple R	0.974283536
R Square	0.949228408
Adjusted R Square	0.949149201
Standard Error	0.003764376
Observations	643

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.169822	0.169822	11984.17	0
Residual	641	0.009083	1.42E-05		
Total	642	0.178905			

	Coefficients	*Std. Error*	*t-stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-9.668E-05	0.000148	-0.65106	0.515242	-0.000388278	0.00019492	-0.00038828	0.0001949
Beta	0.974325614	0.0089	109.4722	0	0.956848529	0.9918027	0.956848529	0.9918027

APPENDIX 1 H: Regression statistics, Nasdaq - S&P 500, Jun 2006 – Nov 2008

Regression statistics	
Multiple R	0.96237
R Square	0.926155
Adjusted R Square	0.92604
Standard Error	0.004676
Observations	643

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0.175775	0.175775	8039.39	0
Residual	641	0.014015	2.19E-05		
Total	642	0.18979			

	Coefficients	*Std. Error*	*t-stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	-5.5E-05	0.000184	-0.29752	0.766165	-0.00042	0.000307	-0.00042	0.000307
Beta	0.991256	0.011055	89.66264	0	0.969547	1.012965	0.969547	1.012965